

**THE OREGON STATE ALUMINUM INDUSTRY
ECONOMIC IMPACT STUDY**

DRAFT – FINAL REVIEW REQUIRED

Prepared for

The Pacific Northwest Aluminum Industry

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EXECUTIVE SUMMARY

The aluminum industry has been a fixture in the Pacific Northwest economy for the past sixty years. The purpose of this study is to estimate the economic importance of the aluminum industry to two counties in the State of Oregon, Multnomah County and Wasco County, which have major aluminum plants. The year of analysis is 1998.

In 1998, the Pacific Northwest aluminum industry sold more than \$3 billion worth of products and employed approximately 10,000 people in Oregon, Washington, and Montana. One-fifth of the industry was located in Oregon:

- The aluminum industry in Oregon engaged 2,240 workers. The two largest producers, Northwest Aluminum Company and Reynolds Metals Company, accounted for one-half of the industry's total employment in the state. (Note that Alcoa and Reynolds completed a merger in May 2000.)
- Aluminum industry employees in Oregon earned \$91.4 million in wages and salaries (excluding non-wage benefits) in 1998. The average wage and salary was \$40,880 per year, approximately 1.4 times the state average. Labor income (including non-wage benefits) totaled \$108.9 million for an average of \$48,620 per employee.
- In 1998, the aluminum industry's employment impact on the Oregon economy extended beyond the 2,240 people working for the industry, since the industry's payroll and other operating expenditures created job opportunities in other businesses through the so-called multiplier (responding) process. With an estimated employment multiplier of 3.5, the industry's total economic impact amounted to approximately 7,800 jobs or 0.4 percent of total state employment.

The impact of the aluminum industry on the Oregon economy was significant, but its relative impact on Wasco County was much greater:

- The Troutdale facility operated by Reynolds is located in Multnomah County. With 520 employees earning \$28.3 million in labor income (including non-wage benefits), Reynolds supported a total of 1,200 jobs in the county, according to the Multnomah County economic base model. The company accounted for 0.2 percent of the employment in the county. The personal income impact was estimated at \$31.7 million or 0.2 percent of county income.
- In relative terms, the aluminum industry played a big role in the Wasco County economy. In 1998, Northwest Aluminum employed 530 workers, who earned \$28.8 million in labor income. Including the indirect impact, the company support 1,320 jobs in the county, accounting 10.7 percent of total employment or one out of every nine county jobs. The aluminum plant added \$51.0 million to Wasco County personal income, representing 10.2 percent of county income, and raised per capita income in the county by an estimated \$351 (1.6 percent). Directly and indirectly, Northwest Aluminum supported 2,010 people living in Wasco County. This meant

that one out of every eleven residents was economically dependent upon the aluminum industry.

- The aluminum industry in the two counties generated \$5.9 million in state and local taxes, most of which came from personal and corporate income taxes. The aluminum industry and its employees directly accounted for \$3.4 million in taxes. In Wasco County, the aluminum industry constituted nearly 10 percent of the county tax base.

In an economic sense, the term "two Orecons," referring to the urban-rural split in the state economy, is an oversimplification, since the state is in fact composed of several economically diverse areas. Nevertheless, there is a group of counties, many of them highly dependent upon agriculture and forest products, that have not shared in the state's recent economic prosperity. Despite the presence of the aluminum industry, Wasco County is among these distressed counties:

- Wasco County has had relatively little growth since the 1970s. Between 1980 and 1998, while Oregon added 530,000 wage and salary jobs, Wasco County added a little over 1,000. As a result, in 1998, its unemployment rate stood at 7.8 percent, 2.2 percentage points above the state average. With a comparatively small fraction of its population gainfully employed, Wasco County per capita income was only \$21,667, leaving it 16.4 percent below the state average (\$25,912).
- The loss of a high-wage aluminum plant in an economically distressed rural county would be disastrous. Based on the economic impact estimates, the long-run losses in Wasco County, for example, would amount to 1,300 jobs, \$50 million in personal income, and \$3 million in local taxes. Recognizing that there would be no replacement for the aluminum industry, Wasco County would stand to lose one-tenth of its economy.

The aluminum industry plays several roles in our economy. Foremost, it is a producer of a strong and light-weight material that is used in thousands of products. In the State of Oregon, the industry is also a major provider of high-paying jobs. Many of these jobs are found in rural counties, which have not only struggled with the ups and downs of their resource industries, but also have not benefited from the rapid growth of the state's high-technology sector. This has left many of them with stagnating economies, high unemployment rates, and low per capita incomes. In such circumstances, the loss of the aluminum industry (its employees and payroll as well as its impact on other businesses and households) would be economically disastrous.

THE OREGON STATE ALUMINUM INDUSTRY ECONOMIC IMPACT STUDY

1. INTRODUCTION

The aluminum industry has been a fixture in the Pacific Northwest economy for the past sixty years. The purpose of this study is to estimate the economic importance of the aluminum industry to two counties in the State of Oregon which have major aluminum plants.

The study draws upon economic base models built specifically for this study. These county models have the ability of measuring the impact of changes in one industry, such as the aluminum industry, on the rest of the economy.

The rest of the report is divided into three parts. Section 2 describes the aluminum industry, highlighting its history and current operations. Section 3, which is the centerpiece of the study, presents estimates of the aluminum industry's economic impact on Multnomah and Wasco Counties. The impacts are measured primarily in terms of employment, income, and taxes. The third section discusses the particular importance of the aluminum industry to Wasco County, which is one of Oregon's economically distressed counties. The report closes in Section 4 with a few concluding remarks.

2. THE ALUMINUM INDUSTRY

History

The hydroelectric potential of the Columbia River remained untapped until the 1930s, when the federal government financed dam building as one way to alleviate the economic suffering caused by the Great Depression. The immediate aim of the projects was to provide badly needed jobs. In the resource-dependent Pacific Northwest, the unemployment rate had risen to 25 percent, the average income had fallen by 50 percent, and many timber companies and farmers had been forced into bankruptcy. In the long term, the Columbia River dams were built to provide flood control, allow navigation of the river, generate electricity for homes and factories, and supply water to irrigate the Columbia Basin.

On July 17, 1933, ground was broken in northeastern Washington for Grand Coulee Dam, the greatest construction project undertaken to that time. In 1941, when the dam was completed, it stood 550 feet high and measured 5,232 feet across. At the peak of construction, the project engaged 8,800 workers. Hundreds of other jobs sprung up in the half dozen small settlements near the dam, where the construction workers lived and spent their earnings.

The federal government encouraged aluminum companies to construct aluminum production facilities, which are very power intensive, in the Pacific Northwest to provide a use for the electricity produced at federal hydroelectric dams. The federal government's role in the building of aluminum plants continued into the 1940s and 1950s.

In 1940, the United States was on the brink of entering World War II and needing all the power it could muster to support military-related industries. In the Pacific Northwest, manufacturers were

called upon to produce food, clothing, lumber, metals, machinery, ships, and aircraft for the war. For example, in 1944, at the height of the war, Boeing employed 50,000 people and rolled out sixteen B-17s and six B-29s each day.

Aluminum, which was light-weight, strong, and dissipated heat quickly, was a critical war material, especially for aircraft. At the outset of World War II, the Pacific Northwest had two aluminum reduction plants, both in Washington: the Aluminum Company of America plant in Vancouver and the Reynolds Metals Company plant in Longview.¹ As the war effort built up, the federal government constructed additional smelters in Spokane, Tacoma, and Troutdale, Oregon, all of which were operated by Alcoa. To meet the electricity requirements of these plants Congress appropriated \$2 billion for a six-fold increase in the generating capacity of the Columbia River dams between 1941 and 1945. At the end of the war, the federal government sold the Troutdale smelter to Reynolds and the Spokane and Tacoma smelters to Kaiser Aluminum & Chemical Corporation.

Boosted by the post-war economic boom, the domestic demand for aluminum rose rapidly. New products were developed for construction (e.g., aluminum siding), household uses (e.g., aluminum foil), and food and beverage packaging (e.g., TV dinners).

In the 1950s, the Korean War prompted a 70 percent increase in U.S. aluminum production capacity, resulting in construction of new facilities at Columbia Falls, Montana, Wenatchee, Washington, and The Dalles, Oregon. Additional smelters were built in the mid-1960s at Ferndale and Goldendale, Washington. At that point, the Pacific Northwest produced 40 percent of the nation's primary aluminum and the regional aluminum industry, as we know it today, was more or less in place.

The road for the aluminum industry since that time has not been smooth. Cyclical downturns in the industry, a slowdown in long-term demand because of competing materials (e.g., vinyl for siding and plastics for packaging), and the construction of dozens of aluminum smelters around the world at locations with low power costs have threatened the survival of more than one Pacific Northwest plant. Perhaps most problematic for the local aluminum industry has been the rising cost of electricity. In fact, at the time of this report, Kaiser and Vanalco have temporarily curtailed production in response to high market prices for power.

Current Operations

Essentially two facts explain the presence of the aluminum industry in the Pacific Northwest. First, the Columbia River, which winds its way through the region, embodies 40 percent of the nation's capacity for hydroelectric energy, the country's cheapest source of power. Second, 6-8 kilowatt-hours of electricity are required to produce one pound of aluminum ingot, the basic material for aluminum products. Thus, the supply of low-cost federal hydroelectric power in the state and the encouragement of the federal government have been a draw to aluminum companies for the past sixty years.

¹ Alcoa and Reynolds completed a merger in May 2000. Alcoa now owns Reynolds' Longview and Troutdale plants, but under the merger agreement it must sell a minority portion of the Longview facility.

The aluminum industry is a highly integrated operation. The products of one plant are often used as inputs to production in another plant. Of the primary aluminum produced in the Pacific Northwest, one-fifth is sold to aluminum fabricating plants in the region, where it is manufactured into sheet and plate. These semi-finished products, which are ultimately used in airplanes, automobiles, packaging, and construction materials, are then sold throughout the world.

In 1998, the Pacific Northwest aluminum industry sold more than \$3 billion worth of products and employed about 10,000 people in Oregon, Washington, and Montana, according to industry data. The aluminum industry in Oregon engaged 2,240 workers (Table 1). The two largest producers, Northwest Aluminum Company and Reynolds, accounted for one-half of the industry's total employment in the state. Similar in size, Northwest Aluminum employed 530 workers in Wasco County, while Reynolds employed 520 workers in Multnomah County. The Oregon aluminum industry also had 1,190 employees working in a number of smaller establishments. These operations included aluminum foundries and fabricating shops.

Table 1

**OREGON STATE ALUMINUM INDUSTRY EMPLOYMENT
AND WAGES AND SALARIES, 1998**

Employment	2,240
Northwest Aluminum Company	530
Reynolds Metals Company	520
Other	1,190
Wages and salaries* (mils. \$)	91.4
Average wage and salary* (\$)	40,880
Average Oregon State wage and salary* (\$)	29,550

*Excludes non-wage benefits.

Aluminum industry employees in Oregon earned \$91.4 million in wages and salaries (excluding non-wage benefits) in 1998. The average wage and salary was \$40,880 per year, approximately 1.4 times the state average. Including non-wage benefits, labor income totaled \$108.9 million. With an average labor income of \$48,620 per year, aluminum industry employees were among the best paid workers in the state.

3. COUNTY IMPACT

Note on Methodology

The ability of a region (e.g., a state or county) to export is a key determinant of its economic health. In the context of the Oregon economy, exports are broadly defined to include sales of

locally produced goods and services to foreign markets and customers in the rest of the United States (including the federal government). Without export activity, the regional economy would be small, inefficient, and poor. Since the lack of export income would preclude the purchase of imports, consumers would have access only to goods and services that could be produced within the region. For those products that were provided locally, markets would be of limited size and producers would be unable to take advantage of the efficiencies that accompany specialization and large-scale production. As a consequence, regional per capita income would be low and few people would choose to live and work in the region.

Of course, Oregon is far from a self-contained economy. Exports of aluminum, agricultural commodities and processed food, logs and lumber, pulp and paper, machinery, and professional services provide income that has led to a sizable, broad-based, and complex economy. Even the jobs of the grocery clerk, the carpenter, and school teacher depend upon export activity, although the links are not always apparent. Without the income from exports, there would be a smaller demand for groceries; without export-producing employees and their families, there would be less need for housing; and without the children of these families, there would be fewer schools.

As a major exporting industry, the aluminum industry not only manufactures aluminum for hundreds of products, ranging from airplanes to cans, but it also plays a significant role in the Oregon economy. The industry's employment impact extends well beyond the 2,240 people working in it, since its payroll and other operating expenditures create job opportunities in other businesses through the so-called multiplier (responding) process.

The county impact analyses are conducted with economic base models constructed specifically for this study. Models have been built for each of the two counties that are home to major aluminum plants. It should be pointed out that due to a paucity of data these county models are relatively simple and contain a limited number of variables (principally, employment, income, population, and taxes). Nevertheless, the models provide reasonable estimates of the local economic impact of the aluminum industry.

Economic Impact

The impact of the aluminum industry on the State of Oregon economy stems from its employment and labor income as well as its expenditures for goods and services that are produced in the state. Previous studies indicate that the Oregon aluminum industry's employment multiplier is about 3.5. This means that each aluminum employee indirectly supports 2.5 other jobs in the state economy. Since the aluminum industry employed 2,240 workers in 1998, its total impact on the Oregon economy amounted to approximately 7,800 jobs (wage and salary employees and proprietors). This represented 0.4 percent of total state employment in 1998. Virtually all of the jobs indirectly supported by the aluminum industry were in nonmanufacturing (wholesale and retail trade and services) and government.

The economic impact of the aluminum industry on the Oregon was significant, but its relative impact on Wasco County, one of the two counties with large aluminum plants, was much greater, as shown in Table 2.² Note that the two county employment impacts do not sum to the state impact. There are two reasons for this. First, the county impacts pertain only to the two major

²Economic data describing each of the counties in 1998 can be found in Appendix B.

Table 2

**ALUMINUM INDUSTRY IMPACT ON THE MULTNOMAH COUNTY
AND WASCO COUNTY ECONOMIES, 1998**

	Multnomah County	Wasco County
DIRECT IMPACT		
Employment	520	530
Labor income (mils. \$)	28.3	28.8
TOTAL IMPACT		
Employment	1,200	1,320
Proprietors	100	150
Wage and salary employment	1,100	1,170
Resources	0	0
Manufacturing	530	540
Primary metals	520	530
Other manufacturing	10	10
Nonmanufacturing	480	470
Construction	10	10
Transportation and public utilities	60	20
Wholesale and retail trade	150	220
Finance, insurance, and real estate	30	30
Services	230	190
Government	90	160
Personal income (mils. \$)	31.7	51.0
Per capita income (\$)	3	351
Population	1,020	2,010
State and local taxes (mils. \$)	2.5	3.4
PERCENT OF COUNTY TOTAL		
Employment	0.2	10.7
Proprietors	0.1	5.4
Wage and salary employment	0.2	12.3
Personal income (mils. \$)	0.2	10.2
Per capita income (\$)	0.0	1.6
Population	0.2	8.7
State and local taxes (mils. \$)	0.2	9.4

aluminum companies, which account for about one-half of total industry employment. Second, the impact of an aluminum plant located in one county tends to spill over into other counties.

The Reynolds' Troutdale aluminum facility is located in Multnomah County. With 520 employees earning \$28.3 million in labor income (wages, salaries, and non-wage benefits), Reynolds supported a total of 1,200 jobs in the county in 1998, according to the Multnomah County economic base model. The implicit employment multiplier was 2.3 ($=1,200/520$). As in the case of the state economic impact, the greatest number of jobs supporting the aluminum company and its employees were found in wholesale and retail trade (150), services (230), and government (90). The Reynolds plant accounted for 0.2 percent of total county employment. The personal income impact was an estimated \$31.7 million or 0.2 percent of county income. The income impact would have been substantially greater were it not for the fact that many people working in Multnomah County lived and spent their money in other counties. Aluminum operations raised county per capita income by \$3.

Given the large size of the Multnomah County economy, accounting for one-quarter of the state's total employment, its dependency upon on the aluminum industry was relatively small. In contrast, the aluminum industry played a big role in the Wasco County economy. In 1998, Northwest Aluminum employed 530 workers, who earned \$28.8 million in labor income. Including the indirect impact, the company supported 1,320 jobs in the county, accounting for 10.7 percent of total employment or one out of every nine county jobs. The aluminum plant added \$51.0 million to Wasco County personal income, representing 10.2 percent of county income. The Northwest Aluminum facility raised per capita income in the county by an estimated \$351 (1.6 percent). Directly and indirectly, Northwest Aluminum supported 2,010 people living in Wasco County. This meant that one out of every eleven residents was economically dependent upon the aluminum industry.

In the two counties, the aluminum industry generated \$5.9 million in state and local taxes. These included income and property taxes paid to state and local governments. Three-fifths of the tax revenue came from personal and corporate income taxes. The aluminum industry and its employees paid \$3.4 million in state and local taxes. The remaining taxes resulted from the indirect impact of the aluminum companies and their employees on other businesses and households in the two counties.

Distressed Counties

The term "two Oregons," referring to the urban-rural split in the state economy, is an oversimplification, since Oregon is in fact composed of several economically diverse regions. This qualification notwithstanding, the state can be described as having two economies: a healthy urban economy found in most metropolitan areas and a struggling rural economy spread around the rest of the state. This dichotomy is in large part explained by the fact that employment growth in recent decades has occurred outside resource-based industries, such as farming and forest products, which have provided the economic foundations for many rural communities. In fact, virtually all of the new employment opportunities in Oregon since 1978 (the last major forest products employment peak) have been created in non-resource manufacturing, trade, services, and government. The geographical focus of these jobs has not been the state's rural counties but its larger metropolitan areas.

Table 3
OREGON STATE DISTRESSED COUNTIES, 1998

	Unemployment Rate (%)	Resource Employment (% of total)	Per Capita Income (\$)	1980-98 Employment Growth Rate (%/year)
Grant County	13.5	23.5	19,613	0.7
Lake County	11.8	25.2	20,663	-0.7
Wallowa County	10.5	24.0	20,342	0.9
Coos County	10.1	13.7	20,820	0.1
Crook County	9.5	28.0	19,316	2.1
Wasco County	7.8	14.2	21,667	0.7
Oregon State	5.6	9.5	25,912	2.2

Of particular concern is a group of rural counties that has not shared in the state's recent economic prosperity (Table 3). With high unemployment rates, depressed per capita incomes, and low rates of employment growth, these counties have clearly been left behind. Their poor economic performance is due largely to the fact that they have a high fraction of employment engaged in resource industries (agriculture, forestry, fishing, mining, food products, wood products, and paper products).

Despite the presence of the aluminum industry, Wasco County is among the distressed counties in the state. The county has had relatively little growth since the 1970s (Tables 4 and 5). In terms of wage and salary employment, the county expanded at a 0.7 percent annual rate between 1980 and 1998, compared to a 2.2 percent rate for the state. While Oregon added 530,000 wage and salary jobs, Wasco County added a little over 1,000. In fact, employment growth has had trouble keeping up with population growth. As a result, Wasco County has remained underemployed, as indicated by its high unemployment rate and low labor force participation rate (the ratio of labor force to population). In 1998, its unemployment rate stood at 7.8 percent, 2.2 percentage points above the state average, while its labor force participation rate was 52.3 percent, compared to 53.7 percent for the state. With a comparatively small fraction of its population gainfully employed, Wasco County per capita income was only \$21,667, leaving it 16.4 percent below the state average (\$25,912) and 26.2 percent below Multnomah County per capita income (\$29,368).

The loss of a high-wage aluminum plant in an economically distressed rural county would be nothing short of disastrous. In Wasco County, for example, the immediate impact of a plant closure would be to drive up its already high unemployment rate to 15 percent. The shutdown would cause near-term jobs losses in trade, services, and government, but the full repercussions would not be felt for two or three years. Unemployment compensation, welfare payments, and spending out of savings would cushion the economy's fall, at least for a while. But, when the unemployment checks ran out and savings dried up, the economy would sink further. Based on the economic impact estimates in Table 2, the long-run losses in Wasco County would amount

Table 4
WASCO COUNTY AND OREGON STATE ECONOMIES, 1970-1998

	1970	1980	1990	1998
WASCO COUNTY				
Wage and salary employment	6,270	8,360	8,180	9,510
Unemployment rate (%)	na	7.3*	6.9	7.8
Personal income (mils. \$98)	304.6	439.1	417.0	499.6
Per capita income (\$98)	15,110	20,005	19,146	21,667
Population	20,160	21,950	21,780	23,060
OREGON STATE				
Wage and salary employment	767,670	1,105,670	1,322,620	1,635,210
Unemployment rate (%)	na	8.3	5.5	5.6
Personal income (mils. \$98)	31,425.6	50,729.8	60,412.5	85,043.5
Per capita income (\$98)	14,962	19,207	21,134	25,912
Population	2,100,390	2,641,220	2,858,520	3,282,060

*With Sherman County.

Table 5
WASCO COUNTY AND OREGON STATE GROWTH RATES

Average Annual Percent Change

	1970-80	1980-90	1990-98
WASCO COUNTY			
Wage and salary employment	2.9	-0.2	1.9
Personal income (\$98)	3.7	-0.5	2.3
Population	0.9	-0.1	0.7
OREGON STATE			
Wage and salary employment	3.7	1.8	2.7
Personal income (\$98)	4.9	1.8	4.4
Population	2.3	0.8	1.7

to about 1,300 jobs, \$50 million in personal income, and \$3 million in state and local taxes. Recognizing that there would be no replacement for the aluminum industry, Wasco County would stand to lose one-tenth of its economy. The only positive development in the long run would be an eventual decline in the unemployment rate. But that would come about only because many people would have moved out.

4. CONCLUSION

The aluminum industry plays many roles our economy. Foremost, it is a producer of a strong and light-weight material that is used in thousands of products, including airplanes, automobiles, and packaging.

In the State of Oregon, the industry is also a provider of more than two thousand high-wage jobs. When the first aluminum plant opened sixty years ago, it helped pull the Pacific Northwest out of the Great Depression. Since then it has been a fixture in the state economy, despite rising energy costs and growing competition overseas.

Perhaps the aluminum industry's most important role in the state economy takes place in the "other Oregon." Historically, the industry tended to put its plants close to the dams that provided the hydroelectric power needed to produce aluminum. As a consequence, several aluminum facilities in the Pacific Northwest were built in small rural counties. In recent decades, not only have these counties struggled with the ups and downs of their resource industries, but they also have not benefited from the rapid growth of the region's high-technology sector. This has left many of them with stagnating economies, high unemployment rates, and low per capita incomes. In such circumstances, the loss of the aluminum industry (its employees and payroll as well as its impact on other businesses and households) would be economically disastrous.

Appendix A

TECHNICAL NOTES

TECHNICAL NOTES

A-1. DEFINITIONS AND CONVENTIONS

Employment

Adopting the concept used by the U.S. Bureau of Economic Analysis, employment is the annual average number of full and part-time wage and salary employees and self-employed workers (proprietors). In a given year, total employment is greater than the total number of persons employed, as measured by the U.S. Bureau of Labor Statistics, because of workers holding more than one job.

Personal Income

The components of personal income are labor income, property income (dividends, interest, and rent), transfer payments, contributions to social insurance, and the residence adjustment. Labor income includes wages, salaries, proprietors' income, and other labor income earned by job-holders working in the state or county. Note that labor income is measured by place of work, whereas personal income is measured by place of residence. The adjustment for residence, which may be positive or negative, takes into account the income of people who work in one state or county but live in another. Personal income is valued in 1998 dollars. Following standard conventions, the U.S. implicit price deflator for personal consumption expenditures (1998=1.000) is used to convert current-dollar personal income estimates into 1998 dollars.

A-2. IMPACT ANALYSIS METHODOLOGY

County Impacts

Two Oregon counties, Multnomah County and Wasco County, have major aluminum plants. Estimating the economic impact of the aluminum industry on each county is basically a three-step procedure:

1. Estimate the direct employment and income impacts on the county.
2. Using an economic base model of the county, estimate the aluminum industry's indirect employment and income impacts.
3. Given the estimate of the total employment impact, estimate the population impact.

Each county economic base model identifies fourteen employment categories, including nine major sectors: resources (agriculture, forestry, fishing, and mining); primary metals; other manufacturing; construction; transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; services; and government.

The economic base model is specified in terms of income. Thus, following standard procedures for building economic base models, a single income multiplier is estimated for the county. This multiplier, combined with the estimate of the aluminum industry's labor income (after deducting the income of aluminum workers who live outside the county), leads to an estimate of the

county's total personal income impact. Employment-income ratios (i.e., the number of nonbasic jobs in wholesale and retail trade, for example, supported per dollar of personal income in the county) are then used to estimate the indirect employment impact.

The size of the aluminum industry's impact on a county essentially depends upon three things: (1) the size of the aluminum facility (the number of workers and the amount of payroll); (2) the percent of county jobs held by people who live in the county; and (3) the degree to which the county economy is self-sufficient. The first factor determines the size of the direct impact of the aluminum industry on the county, while the next two factors determine the size of the aluminum industry's multiplier.

Since the economic base model is a relatively simple model, at least compared to other models, such as an interindustry econometric model, it is subject to appreciable measurement error. Nevertheless, the results obtained from the economic base models constructed for this study constitute reasonable estimates of the aluminum industry's impact on the two Oregon counties.

Employment Multiplier

Employment multipliers are one means of standardizing the measurements of economic impacts for purposes of comparison. The employment multiplier for an industry is defined as the ratio of its total employment impact to its direct employment impact. In 1998, for example, the aluminum industry employed 530 jobs (rounded to the nearest ten) in Wasco County and indirectly supported 790 jobs in other Wasco County industries, according to estimates with the county economic base model. In this case, the aluminum industry's county employment multiplier is 2.5 ($=[530+790]/530=1,320/530$). The multiplier can be interpreted to mean that, on average, each aluminum industry job indirectly supports 1.5 other jobs in the county economy. The aluminum industry's wage and salary employment multiplier, which excludes proprietors, is 2.2 ($=1,170/530$).

Tax Impact

State and local tax impacts are estimated for each of the two counties that have major aluminum plants.

There are three steps to the analysis:

1. Estimate the taxes paid by the aluminum industry.
2. Estimate the taxes paid by the aluminum industry employees.
3. Estimate the taxes paid by all businesses and employees indirectly supported by the aluminum industry.

Two types of taxes are estimated: income taxes, both personal and corporate, and property taxes. Taxes paid by the aluminum industry are estimated from surveys of the two major aluminum companies in Oregon. Taxes paid by aluminum industry employees and other businesses and employees indirectly supported by the aluminum industry are estimated by multiplying various tax coefficients (e.g., the income tax-personal income ratio) by the relevant economic impact (e.g., the personal income of the aluminum industry employees).

A-3. ALUMINUM INDUSTRY DATA

The direct economic impact of the aluminum industry on Multnomah and Wasco Counties is the industry's employment, labor income, and taxes. Information on these variables for 1998, the year of the impact analysis, was provided by the two major aluminum companies in the state. The information obtained from the aluminum companies was cross-checked and supplemented with data from the Oregon Employment Department (2000) and the U.S. Bureau of Economic Analysis (1999).

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Appendix B

ECONOMIC CHARACTERISTICS OF OREGON STATE, MULTNOMAH COUNTY, AND WASCO COUNTY, 1998

Table B-1

ECONOMIC CHARACTERISTICS OF OREGON STATE, MULTNOMAH COUNTY, AND WASCO COUNTY, 1998

	Oregon State	Multnomah County	Wasco County
Civilian labor force	1,762,000	370,100	12,060
Persons employed	1,664,000	352,300	11,120
Persons unemployed	98,000	17,800	940
Unemployment rate (%)	5.6	4.8	7.8
Employment	2,032,940	544,740	12,350
Proprietors	397,730	71,920	2,840
Wage and salary employees	1,635,210	472,820	9,510
Resources	35,120	1,240	460
Manufacturing	248,650	53,320	1,230
Primary metals	12,220	5,760	530
Other manufacturing	236,430	47,560	700
Nonmanufacturing	1,093,330	351,070	5,840
Construction	85,780	21,200	270
Transportation and public utilities	77,120	35,850	170
Wholesale and retail trade	393,210	106,770	2,550
Finance, insurance, and real estate	85,540	38,100	270
Services	451,680	149,150	2,580
Government	258,110	67,190	1,980
State and local government	214,760	52,790	1,560
Federal government, civilian	29,920	11,700	330
Federal government, military	13,430	2,700	90
Personal income (mils. \$)	85,043.5	18,533.4	499.6
Labor income	60,103.6	18,871.7	306.0
Property income	19,260.3	3,301.2	92.4
Transfer payments	11,140.4	2,736.4	105.3
Contributions to social insurance (-)	3,735.3	1,333.5	21.4
Residence adjustment	-1,725.5	-5,042.4	17.3
Per capita income (\$)	25,912	29,368	21,667
Population	3,282,060	631,080	23,060

