Washington Research Council

Economic Profile

August 2012

The Economic Contribution of Washington State's Petroleum Refining Industry in 2011

Acknowledgements

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1. Report Overview

This report quantifies the impact of Washington's five major petroleum refiners on the state's economy in 2011.

In 2011, the refiners directly provided 1,986 full-time jobs, paying an annual average wage of $120,276. In addition, the refiners employed, at high wages, 2,919 contract workers on an average day, doing maintenance, capital repair and capital replacement. The refiners indirectly created additional Washington state jobs in industries from which they purchased goods and services, including transportation, construction, utilities and business services. Spending of the income earned in these direct and indirect jobs created even more jobs.

The sum of all these effects was more than 26,000 jobs and almost $1.7 billion in personal income for Washington State in 2011. From this activity, state and local government received $48.0 million in sales and use taxes and $120.5 million in business and occupation taxes.

Also, downstream industries, which distributed refined petroleum products, paid $416 million in wages to 16,214 workers in 2010. Excise taxes collected by the state from these industries exceeded $256 million in 2011.

Because of Washington's unique tax structure, a Washington refinery's state and local tax burden in 2008 was more than quadruple the state and local tax burden of a comparable refinery located in California.

The report updates the economic impact analyses of petroleum refining for 2003, 2005, 2007 and 2009 previously prepared by the Washington Research Council (WRC 2004, 2006, 2009 and 2011), drawing upon a survey of Washington refiners conducted by the Council in 2012 (Appendix A) and the WRC-REMI model of the Washington State economy (Appendix C).

2. Summary of Findings on Refiners

Washington's five refineries provide 3.5 percent of the United States' refining capacity. In 2011 they processed 536,000 barrels of crude oil per day. Gasoline, diesel oil, and jet fuel are the largest finished product categories, representing 43 percent, 23 percent, and 14 percent, respectively, of total production, with gasoline production averaging

Typo corrected 4/8/13

Table 2.1: Summary of Multipliers and Economic Impacts

Refining Jobs	Multiplier	Indirect and Induced Economic Effect	Major Petroleum Refiners Total Economic Impact
	13.23	24,288 jobs	26,274 jobs
1,986 jobs	$894,696	$1,403,093,400 personal income	$1,696,096,000 personal income
	$24,194	$54,149,800 sales and use taxes	$48,049,000 sales and use taxes
	$60,691	$15,419,000 B&O taxes	$120,532,000 B&O taxes

Source: 2012 Refiner Survey, WRC/REMI Model

246,200 barrels per day.

According to the refiners survey, the five major refineries employed 1,986 workers in 2011, paying them an average annual wage of $120,276—more than twice the Washington state average.

As illustrated in Table 2.1, these jobs have a total employment multiplier of 13.23, meaning that each direct refining job generates an additional 12.23 jobs in the state, for a total employment impact of 26,288 jobs resulting from the five refineries.

Petroleum refining's extraordinarily high capital intensivity, high wages and extensive use of highly paid contract labor are the major reasons for its high jobs multiplier. The WRC-REMI model, which is used here to determine the economic impact of the industry, calculates that each petroleum job adds $894,696 of state personal income, a total income contribution of nearly $1.7 billion to the state economy.

The industry is highly taxed and regulated, producing a bounty of tax and fee revenues for state and local government.

The five refiners paid $261.5 million in state and local taxes in 2011 (Table 7.2).

Each refining job directly resulted in $1,376 in sales and use collections and $52,927 in business and occupation (B&O) tax revenues, for a total of $107.6 million in sales and use taxes, and B&O receipts. In addition, the refiners paid $106.7 million in hazardous substance tax, $19.6 million in property tax, and $4.4 million in regulatory fees in 2011 (Table 7.3).

Including the indirect and induced effects, the refining industry generated $48.0 million in sales and use and $120.5 million in B&O taxes (Table 2.1)

Calculations of state and local taxes paid by hypothetical 160,000 barrels-per-day refineries located in Washington and California indicate that the tax burden on refineries in Washington is more than quadruple that in California (Table 8.1).

Finally, refiners contribute generously to the communities in which they are located. The five refiners and their employees contributed $1.6 million to various community causes in 2011. The firms themselves contributed about 48 percent of this, with the balance provided by firm-sponsored employee giving (Appendix A, Table 5).

3. Oil Refining in Washington State

Building and development of the industry. The oil refining industry in Washington state began in the mid-1950s with construction of refineries by Shell in Anacortes (Skagit County) and Mobil west of Ferndale on the Strait of Georgia (Whatcom County). Following closely in 1957, Texaco built in Anacortes, and U.S. Oil constructed its refinery on the Tacoma Tideflats. In the early 1970s, in anticipation of the crude oil that would begin flowing from Alaska's North Slope, Atlantic Richfield (Arco) built its refinery at Cherry Point. Now owned by BP, this plant remains one of the nation's newest refineries. Owner-

Table 3.1: Washington Refineries

Firm	Year Constructed	Location	Major Products	Capacity (barrels/day)
BP Cherry Point (formerly ARCO)	1971	Whatcom County, northwest of Ferndale	Gasoline, diesel oil, jet fuel, calcinated coke	234,000
Phillips 66 Ferndale (formerly ConocoPhillips Tosco, BP Oil and Mobil Oil)	Mid-1950s by General Petroleum (subsidiary of Socony-Mobil)	Whatcom County, west of Ferndale	Gasoline, diesel oil, jet fuel, liquid petroleum, residual fuel oil	107,500
Shell Oil (formerly Equilon Enterprises and Texaco)	1957	Skagit County, five miles east of Anacortes	Gasoline, diesel oil, jet fuel, propane, coke, sulfur	146,000
Tesoro (formerly Tesoro Northwest and Shell Oil)	1955	Skagit County, on March Point	Gasoline, diesel oil, turbine & jet fuel, liquid petroleum gas, residual fuel oil	125,000
U.S. Oil	1957	Pierce County, Tacoma Tideflats	Gasoline, diesel oil, jet fuel, marine fuel, gas oils, emulsified & road asphalt	42,000

ship of all these facilities has been fluid over the years, but today Washington's refining activity is concentrated at the four major plants in Whatcom and Skagit counties and the U.S. Oil plant in Tacoma. (See Table 3.1.)

Federal restrictions. Oil companies invest tremendous sums in their facilities in order to maintain their assets, to increase refining capacities, and to remain viable in a highly competitive global industry. In the 1970s, Washington's older oil refineries embarked on major plant modifications in anticipation of the Alaskan crude. Plans for new port facilities on Puget Sound to receive super-sized tankers and new pipelines to carry Alaskan oil on to the Midwest were debated. But in 1977, before these plans could be finalized, the Marine Mammal Protection Act came up for reauthorization in Congress. Washington's then-senior senator, Warren Magnuson, preempted these plans by attaching an amendment to the reauthorization bill prohibiting construction of new ports east of Port Angeles.

Geographic isolation. This decision sealed Washington's isolation from the rest of the country's petroleum supplies by preempting pipeline construction to the upper Midwest that would have provided the Northwest with easier access to Eastern and Midwestern distribution systems.

Today, Washington's five refineries make up 3.5 percent of the nation's total refining capacity (EIA 2012b).With this state accounting for 2.0 percent of national petroleum consumption, in-state refineries produce quantities more than sufficient for Washington's needs (EIA

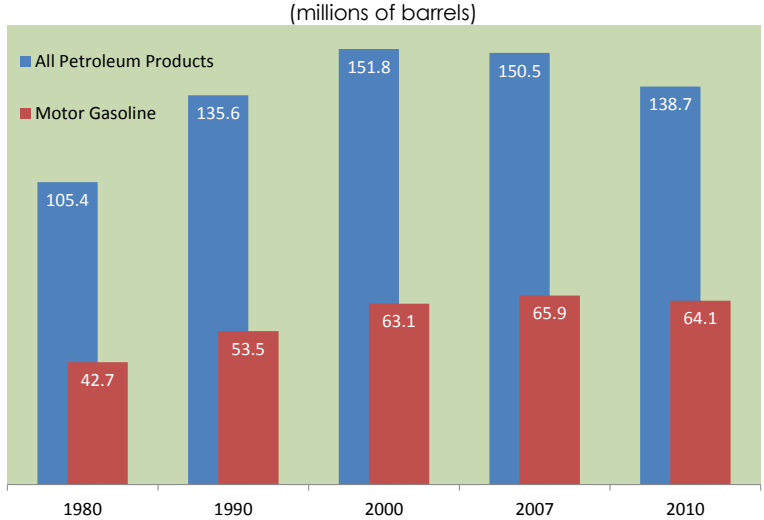
2012c).

Dependence on in-state refining. Other areas of the country—the Midwest and the East—are connected to a larger distribution system that allows their short-term petroleum supply disruptions to be accommodated more easily than those in the West or in Washington state, in particular. The West, which is not connected to the Midwest pipeline systems, gets its crude primarily from the Gulf of Mexico through pipelines from Texas to the California markets, and from Alaska's North Slope by tanker into Anacortes and Cherry Point. To a lesser extent, Washington refineries also receive crude from Alberta, Canada, by pipeline.

Nationally, plant obsolescence and federal and state regulations requiring cleaner products and production processes have resulted in a reduction in the number of operable U.S. petroleum refineries from 301 in 1982 to 144 at the beginning of 2012. Those refineries that remain, however, are more efficient, with nearly as much total refining capacity as was available in 1982. Over the decade prior to the 2001–03 recession, the increased demands of a growing population and economy and an increasing array of "boutique" fuels required by federal and state regulations strained capacities, with price effects felt throughout the country. The 2001–03 recession provided a respite, but capacity constraints returned at mid decade as the economy recovered. The situation was exacerbated by hurricane damage to refineries along the Gulf Coast. More recently, high crude oil prices and reduced demand due to the "great recession" have combined to squeeze refinery margins.

The constrained supply-demand relationship combines with the West Coast's isolation to produce an economy in Washington that is unusually dependent on its in-state refining capacity. It is this industry and its relationship with the larger Washington state economy that are described in the sections that follow.

Figure 5.1: Washington State Petroleum Product Consumption
(millions of barrels)



Source: EIA

4. Industry Impact Analysis

To quantify the impact of Washington State's refineries on its economy, we use the WRC-REMI model to simulate a permanent increase in refinery employment of roughly 15 percent and measure the resulting changes in total state employment, personal income, and gross product. Dividing these resulting changes by the change in refinery employment gives "multipliers" that are then applied to the industry's total employment to calculate total economic impact. For example, in 2011 the five refineries had 1,986 employees. With a multiplier of 13.23, the total impact of the refineries was 26,274 jobs. Similarly, the refinery activities resulted in $894,696 of state personal income for every direct job, or a total statewide of $1.7 million in personal income.

The economic impacts of petroleum refining in Washington, however, are broader than those of most other sectors of the economy. If petroleum prices go up, the effects are felt in the price of food and other essential consumer goods, the costs of commuting, and the cost of moving goods to market for businesses throughout the economy. And, unlike products from other sectors, alternative petroleum supplies or substitute products are not readily available in the

Figure 5.2: Washington Petroleum Consumption Trends

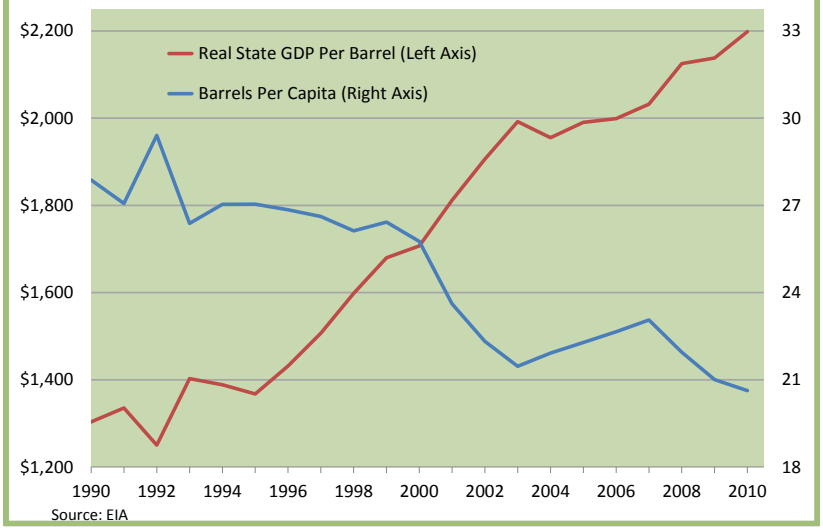
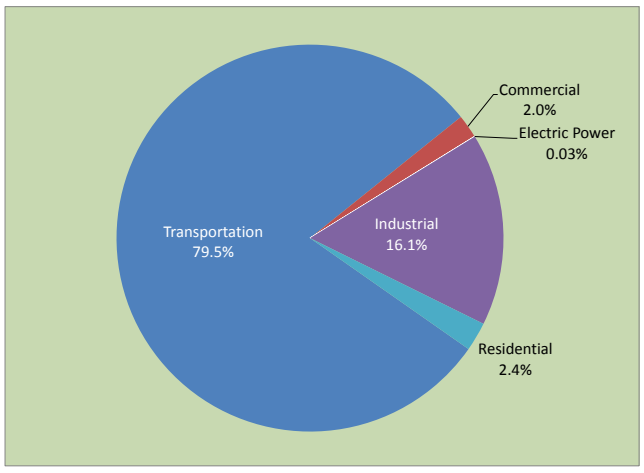


Figure 5.3: 2010 Consumption By Sector



case of an emergency. In order to fully appreciate the economic value of the petroleum refining industry in Washington, the dire economic consequences possible in a catastrophic scenario must be acknowledged. Foreign product would have to be imported, increased dock and terminal capability would be required, product prices would increase in response to diminished supply availability and stability, and these increases would be felt throughout the economy.

In the sections that follow, Washington's petroleum refining industry is described under equilibrium conditions by summarizing consumption (Section 5), production (Section 6), and the direct purchases of the five major industry refiners (Section 7). Based on these data, the WRC-REMI model calculates the effect of the five refineries on jobs, income, retail sales and use, and B&O taxes statewide (Section 9).

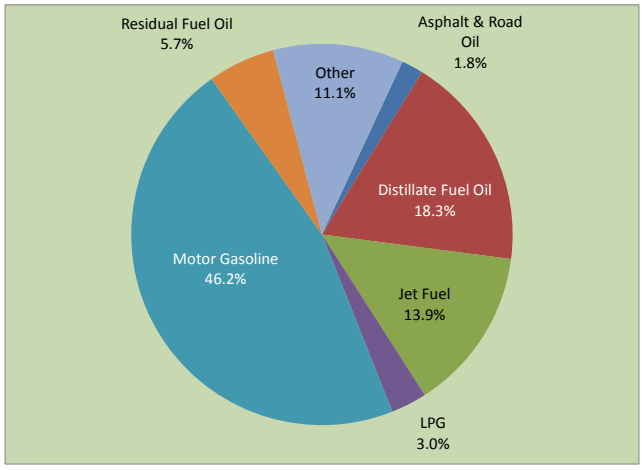
Section 8 presents a comparison of taxes paid by hypothetical 160,000 barrels-per-day refineries located in Washington and California.

Finally, in Section 10 we provide employment, wage, and tax contribution information on the portions of the transportation, wholesaling, and retailing sectors that operate downstream of the refining process. These petroleum-related activities combine to assure that petroleum products get to their markets in Washington state and beyond. Although they would exist regardless of the presence of in-state refining, their inclusion here helps to give a complete picture of the petroleum industry in Washington state.

5. Petroleum Product Consumption in Washington

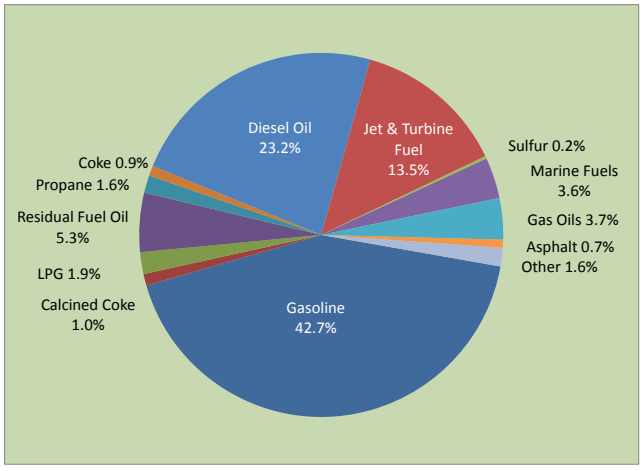
Washington households and businesses consumed nearly 139 million barrels of finished petroleum products in 2010, up 38 percent from 1980, according to the Energy Information Administration (EIA). (See Figure 5.1). Washington's 2010 consumption was 2.0 percent of the U.S. total and about 14 percent of EIA's western Petroleum Administration for Defense (PAD) District V, which

Figure 5.4: 2010 Consumption By Product
(Volume in Barrels)



Source: EIA

Figure 6.1: 2011 Washington Production By Product
(Volume in Barrels)



Source: 2012 Refiners Survey

encompasses Washington, Oregon, California, Nevada, Alaska, and Hawaii. PAD District V represented 14 percent of total U.S. consumption in 2010 (EIA 2012c).

As a result of increasing fuel efficiency, per-capita petroleum product consumption in Washington declined from 1990 to 2010, while gross state product per barrel of petroleum increased by 69 percent (See Figure 5.2).

The several broad classes of customers who purchase petroleum products help to explain the state's consumption patterns. Demand for petroleum products from residential and commercial customers increased over the twenty-year period by 1 percent and 14 percent, respectively. Industrial customer demand decreased by 21 percent, while transportation consumption increased by 8 percent over the period (EIA 2012c).

As shown in Figure 5.3, by 2010 transportation and industrial customers together accounted for 96 percent of Washington's total petroleum product consumption.

The Washington economy (as measured by real gross state product) grew at a faster rate than overall petroleum consumption. Therefore, even though petroleum consumption grew, the state economy required less petroleum product for every dollar of economic activity. This largely reflects the tremendous growth of software and other high-tech and information-based sectors of the economy, which produce significant economic wealth with relatively little petroleum product.

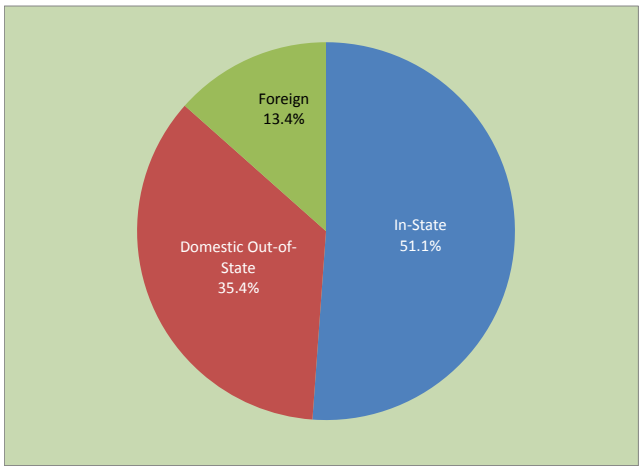
Figure 5.4 shows that motor gasoline was, by far, the largest category of product consumed, at 46.2 percent of the total.

6. Refinery Production in Washington

The data that follow in Sections 6, 7, and 8, unless otherwise indicated, are the aggregated results of a survey of Washington's five major refiners (Appendix A).

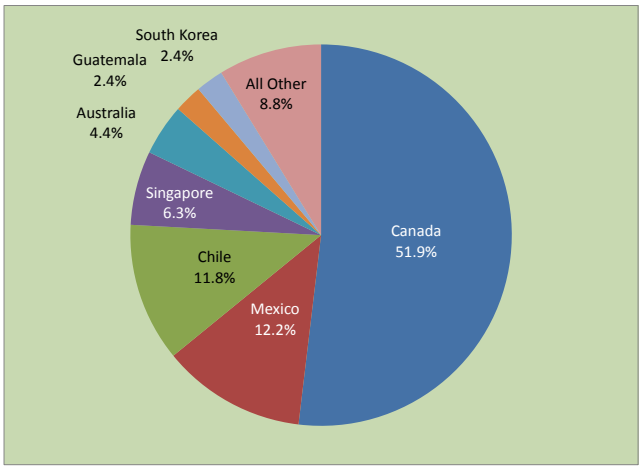
Finished products. Washington's refineries produced 576,000 barrels per day and more than a dozen different

Figure 6.2: 2011 Washington Production By Destination (Volume in Barrels)



Source: 2012 Refiners Survey

Figure 6.3: Top Export Markets in 2011



Source: WISER

products in 2011. Gasoline, at nearly 246,200 barrels per day in 2011, is by far the largest product category, accounting for 43 percent of the total. Diesel oil and jet fuel are the next largest at 23 percent and 14 percent, respectively (See Figure 6.1).

Gasoline accounted for about 45 percent of the refineries' total $24.2 billion in output value in 2011. Again, diesel oil and jet fuel are next, accounting for 26 percent and 14 percent, respectively.

Markets. In 2011, 51 percent of Washington refined product was used within the state; 35 percent of total product was sold domestically outside Washington; and the remaining 13 percent was delivered to foreign buyers (See Figure 6.2).

The World Institute for Strategic Economic Research (WISER) provides data on the destination of foreign exports of petroleum products from Washington. In 2011, the $3.6 billion of petroleum products exported from the state amounted to 5.6 percent of Washington's foreign exports. Almost 52 percent of the dollar value of petroleum product exports went to Canada. Mexico was the second most important export market, followed by Chile, Singapore, Australia, Guatemala and South Korea (See Figure 6.3). Appendix Table B-1 provides a complete listing of exports for 2010 and 2011.

Product transport. Finally, 49.1 percent of all products refined in Washington is shipped by pipeline, primarily to Seattle and Tacoma markets and on to Portland. Of the remaining product, 39.7 percent is shipped by water, to Portland and other destinations along the Columbia River as well as to foreign customers, with the balance (11.7 percent) going out by truck or rail.

7. Washington Refiners: Inputs

Washington refiners spent $22.9 billion on inputs in 2011. This section describes their main areas of expenditure.

Feedstock. Washington's petroleum refineries received nearly 562,000 barrels per day of crude oil and other feedstock inputs (e.g., butane, isobutene, and cat feed) in 2011. The total volume of feedstock in 2011 was 8 percent greater

Table 7.1: Quantity and Value of Feedstock Inputs

	2010	2011
Total Feedstock Inputs (thousands of barrels/day)	519.9	561.6
Crude Oil	501.8	535.6
Other	18.1	26.0
Total Value of Feedstock Inputs (millions of dollars)	14,833.6	21,140.9
Crude Oil	14,518.7	20,476.7
Other	314.9	664.3

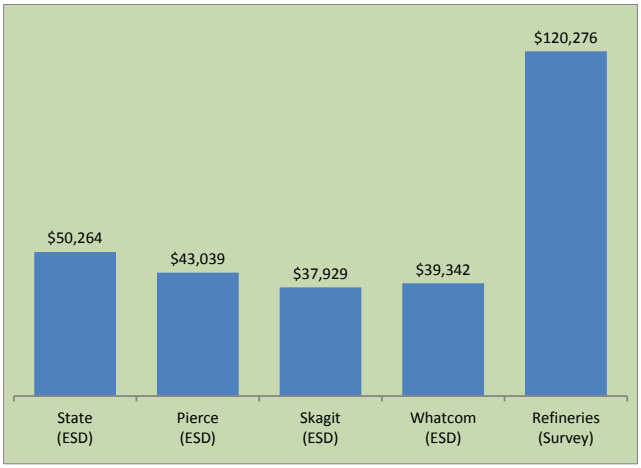
Source: 2012 Refiners Survey

than 2010, when the Tesoro refinery was shut down for 6 months following the April 2 fire. Feedstock costs, however, grew by a much greater 43 percent from $14.83 billion in 2010 to $21.14 billion in 2011 (See Table 7.1). The cost per barrel of crude explains most of this increase, as it increased significantly over the period.

In 2011, 73 percent of crude oil came into the refineries by water; the majority of this (55 percent of the crude oil total) came from Alaska. Other origins of waterborne crude oil included Russia, Oman, California and Canada. Almost all of the remaining 27 percent came through pipeline from Alberta, Canada. Of the Canadian crude oil, 27 percent was derived from oil sands, while 73 percent was conventional.

Labor. Washington's five oil refiners employed 1,986 workers in 2011 and paid them extraordinarily well. The refiner survey puts the 2011 average annual refinery wage at $120,276. According to the state Employment Security Department (ESD), the overall statewide average wage was 50,264 in 2011, less than half of the refinery average wage (See Figure 7.1).

Figure 7.1: Average Annual wages



Source: ESD and 2012 Refiners Survey

This contrast is even more pronounced when comparing refining wages with average annual wages in Whatcom and Skagit counties where the four largest refineries are located. The average annual wage in Whatcom County in 2010 was $39,342 while in Skagit County it was $37,929 (ESD 2012).

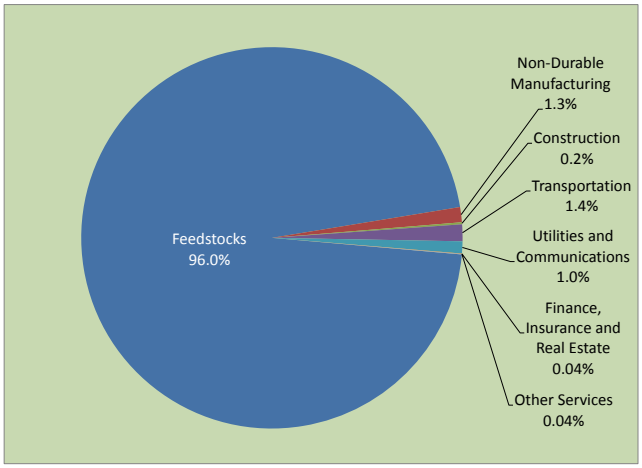
Refinery payrolls totaled nearly $239 million in 2011. Worker benefits totaled $85 million, and average total compensation per employee was $163,112.

Contract labor. Washington's petroleum refiners regularly rely on contract workers to clean and service various parts of their plant facilities and equipment, as well as to conduct scheduled major repairs and upgrades. The number of workers varies from year to year—2,861 in 2010 and 2,919 in 2011—and represents a significant part of the employment base, especially in Whatcom and Skagit counties.

In 2011 refiners paid $366 million for contract workers, an average of $125,497 per worker.

About 65 percent of contract workers in 2011 (1,900 workers) were engaged in capital repair and replacement, at a cost of $181 million. In addition, the refiners made $247 million in non-labor

Figure 7.2: 2011 Non-Labor Operating Expenses



Source: 2012 Refiners Survey

operating expenditures. Purposes included safety and environmental compliance, efficiency improvements and capacity expansion.

Non-labor operating expenditures. Non-labor operating expenditures are mostly for feedstocks—crude oil—and intermediate processed crude (which will be refined further into higher grade products) and chemicals and catalysts to be applied to the crude to produce various final products. These purchases show up in two categories: feedstocks and nondurable manufactured goods (primarily intermediate petroleum products and chemicals). Combined, these two categories account for more than 97 percent of all non-labor operating expenditures.

Significant amounts are also spent on utilities and transportation, which together accounted for $539 million in 2011. Utilities expenditures, including electricity, gas and communications, totaled $225 million in 2011, and transportation totaled $314 million. Transportation expenditures were primarily for waterborne transport of inbound and outbound product (Appendix A, Table 3).

Taxes. The five refiners contributed $261.5 million in state and local taxes in 2011 (See Table 7.2).

The state hazardous substance tax—$106.9 million—comprised the largest share of total taxes paid, 40.9 percent of the total. The rate on this tax is 0.7 percent of wholesale value. Petroleum products constitute a large portion of the products subject to the tax.

Ranking a close second was the business and occupation tax, $105.1 million, 40.2 percent of the total. Refineries are subject to this tax under either the manufacturing or wholesaling categories, at the rate of 0.484 percent.

Next in line was the property tax, $19.6 million and 7.5 percent of the total tax bill.

The fourth most costly tax in 2011, $15.8 million, was the oil tax spill tax . It is a tax of 5 cents per barrel on crude oil or petroleum products that are transported by ship or barge in Washington waters and offloaded at an in-state marine terminal. Of the proceeds, 4 cents

Table 7.2: Taxes Paid by Refiners in 2011

	(Millions)	% of Total
Retail sales and use tax	$5.3	2.0%
Business and occupation tax	$105.1	39.9%
Property tax	$19.6	7.5%
Unemployment compensation tax (state only)	$1.2	0.5%
Hazardous substance tax	$106.9	40.6%
Oil spill tax	$15.8	6.0%
Petroleum Products Tax	-	-
Motor vehicle fuel tax	$7.0	2.7%
Other	$2.3	0.9%
Total	$263.2	

Source: 2012 Refiners Survey

Table 7.3: Regulatory Fees Paid by Refiners in 2011 (dollars)

Air operating registration and permit fees	1,765,124	40.6%
Waste disposal fees	1,549,844	35.6%
Wastewater discharge fees	728,870	16.8%
Building permit fees	306,705	7.0%
Other	77,561	1.8%
Total	4,428,104	

Source: 2012 Refiners Survey

are paid into the oil spill administration account and 1 cent into the oil spill response account. When (as is currently the case) the oil spill response account is fully funded, the 1 cent tax is suspended; when the account is short of funds, the tax is resumed. The 1 cent response tax was last collected during the 18-month period from April 1, 2008 to September 30, 2009. Through a credit, the tax is effectively eliminated for crude oil or petroleum products exported from the state.

The petroleum products tax—$7.0 million reportedly paid in 2011 and 2 percent of the total—is another tax unique to the petroleum industries. Revenues from this tax are dedicated to the pollution liability insurance program, which assists owners of underground storage tanks in obtaining insurance for upgrading and replacing tanks and preventing leaks. This tax is suspended when the pollution liability insurance program account balance exceeds a trigger value. The trust fund balance reached the trigger in the first quarter of 2010. The tax was suspended on April 1 of that year and remains suspended today.

The refineries reported paying $5.3 million in sales and use taxes in 2011. Currently the sales and use tax rate paid by the two Skagit County refineries is 8.2 percent; the rate paid by the two Whatcom County refineries is 8.5 percent; and the rate paid by the Tacoma refinery is 9.5 percent.

Fees. In addition, the refiners paid $4.4 million in regulatory fees in 2011. These included their air operating registration and permit fees ($1.8 million, 41 percent), waste disposal fees ($1.5 million, 36 percent), and wastewater discharge fees ($728,870, 17 percent). See Table 7.3.

8. Comparison with Taxation of a California Refinery

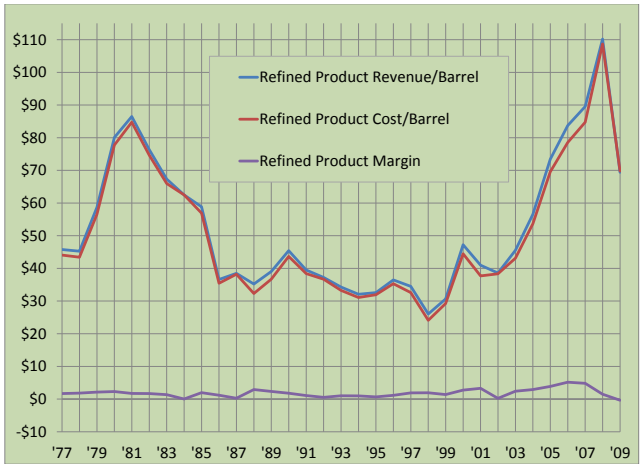
Table 8.1 compares the taxation of hypothetical 160,000 barrels-per-day refineries in Washington and California in 2008. These calculations are based in part on revenue and cost data from the EIA's Financial Reporting System, which provides financial data on refining for the years 1977 through 2009. We

Table 8.1: Taxes on a 160,000 Barrels per Day Refinery, 2008
(millions of dollars)

	Washington	California
Corporate Profits Tax		$ 4.1
Business & Occupation Tax	$ 30.9	
Hazardous Substance Tax	$ 36.2	
Property Tax	$ 6.1	$ 8.8
Sales & Use Tax	$ 1.7	$ 1.7
Oil Spill Tax	$ 1.5	$ 2.9
	$ 76.4	$ 17.5

Source: WRC calculations

Figure 8.1: National Average Refined Product Margins
(2009 dollars)



Source: EIA

have chosen 2008, rather than 2009, as the comparison year because refineries were unprofitable in 2009 (EIA 2011, Table T 19).

We focus on six major taxes. One of these taxes—the corporate income tax—is levied in California but not in Washington. Two of these taxes—the business and occupation tax and the hazardous substance tax—are levied in Washington but not in California. The remaining three taxes—the sales and use tax, the property tax and the oil spill tax—are levied in both states.

The overall 2008 tax burden in Washington, $76.4 million, is more than four times the burden in California, $17.5 million. This is largely due to the fact that the Washington refinery pays considerably more in B&O and hazardous substance taxes than the California refinery pays in corporate income tax.

Corporate income tax. California's primary business tax is a corporate income tax. To avoid the complications inherent in state-level income taxation of multi-state businesses, we assume that the corporation owning the refinery does business only in California. California's corporate income tax rate is 8.84 percent. Based on EIA data for 2008, we estimate the taxable income for a 160,000 barrels-per-day refinery to be $46.0 million and the corporate income tax due to be $4.1 million.

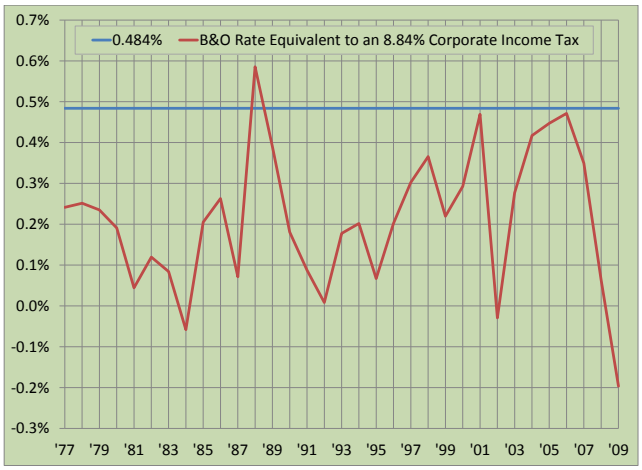
B&O tax. The B&O tax is Washington's primary business tax. It is a tax on a business's gross receipts. Our 160,000 barrel per day refinery has refined product sales of $6.4 billion. This results in a B&O tax obligation of $30.9 million at the manufacturing/wholesaling rate of 0.484 percent. This is seven times the corresponding obligation under the California income tax.

The B&O tax is a tax on gross income, without any deductions for the costs of producing the goods or services sold, while the corporate income tax is a tax on net income, after deduction of these costs. The B&O tax tends to be burdensome, compared to a corporate income tax, on low margin businesses. Refining is a low margin business. The EIA data show that over the period 1977–2009 the margin on refined products averaged 3.7 percent of revenues. In 2008 the margin was 1.4 percent; in 2009 it was negative 0.5 percent (See Figure 8.1).

For each year 1977–2009, we have calculated the B&O tax rate that would generate the same tax obligation for our 160,000 barrel refinery as generated by the 8.84 percent California corporate income tax. These rates are graphed on Figure 8.2. As can be seen, the revenue-equivalent B&O rate varies considerably from year to year as the profitability of the industry varies. For three years (1984, 2002 and 2009) the refinery actually loses money and the equivalent B&O rate is negative. For only one year (1988) is the refinery so profitable that the California corporate income tax would raise more revenue than the 0.484 percent B&O. Over the 31 years the average revenue-equivalent B&O rate is 0.212 percent, a bit less than one-half the 0.484 percent that Washington refineries pay.

Hazardous substance tax. Returning to the taxes listed in Table 8.1, the haz-

Figure 8.2: B&O Rate Equivalent to an 8.84% Corporate Income Tax



Source: WRC Calculation

ardous substance tax is a second gross receipts tax levied by Washington state. Applying an effective rate of 0.57 percent to gross receipts of $6.377 billion gives a $36.2 million hazardous substance tax obligation for the 160,000 barrel per day Washington refinery. (Based on our survey, we use the 0.57 percent effective rate rather than the statutory 0.7 percent rate to account for various deductions and credits including the credit for product shipped out-of-state in vehicle fuel tanks.)

Property tax. Comparing property tax burdens is complicated by the variation of effective property tax rates from location to location, due to variations in assessment practices and statutory tax rates. The most careful study of the variation across states in effective property tax rates is conducted by the Massachusetts Taxpayers Association (MTA), which compares effective tax rates for the largest city in each state. Our estimate of the property tax paid by the Washington refinery is based on our survey. We derive our estimate of the property tax paid by the California refinery by multiplying the Washington tax amount by the ratio of the effective tax rates in Los Angeles and Seattle. The property tax burdens are thus $6.1 million for the Washington refinery and $8.8 million for the California refinery.

Sales and use tax. In Washington, the state sales and use tax rate is 6.5 percent; local rates vary from 0.5 percent to 3.0 percent. The California state sales tax rate is 6.25 percent. Local rates in California vary from 1.0 percent to 3.5 percent. Our calculations use the 2008 rates for Ferndale, Washington and Long Beach, California (8.4 percent and 8.25 percent, respectively). We estimate the value of transactions subject to sales and use tax to be $20 million. The Washington sales and use tax burden is thus $1.68 million, while the California burden is $1.65 million.

Oil spill tax. Both states impose an oil spill tax of 5 cents per barrel. As we noted above, in Washington, 1 cent of the 5 cents is sometimes suspended. The full 5 cents were assessed in 2008. We assume an effective rate of 2.5 percent to account for the credit for product exported from the state. We assume that for both refineries, 58.4 million barrels are subject to the tax. The oil spill tax burden is $1.5 million in Washington and $2.9 million in California.

9. Petroleum Refining Industry, Indirect and Induced Economic Impacts

The economic impact of refineries on the state's economy can be divided into three primary categories: direct, indirect, and induced effects:

- The **direct** effects are those in the industry itself—the refinery jobs and payroll, and the taxes paid by the refiners.
- The **indirect** economic effects include the jobs, wages, and taxes of upstream suppliers of the refineries—not only the suppliers of crude oil, but also the construction companies and contract workers used for plant maintenance and repair and the office product and equipment suppliers, for example. These figures

were captured in the survey completed by the five refiners. The indirect economic effects also include the jobs, wages, and taxes of suppliers' suppliers; of the suppliers' suppliers' suppliers; and so on up the supply chain.

- Finally, the **induced** effects are the jobs, income, and taxes contributed by firms in industries that supply daily consumables and services—e.g., food, dry cleaning, banking—to workers holding the direct and indirect jobs.

The relationship between the direct jobs, income, and tax effects in an industry and their indirect and induced effects are captured by multipliers, which are calculated using the WRC-REMI model of the Washington state economy.

The employment multiplier for the petroleum refining industry is 13.23. Applying this multiplier to the 1,986 direct refinery jobs in 2011 gives a total state employment impact of 26,274 jobs.

This is an unusually large employment multiplier. In comparison, the 2002 Washington state Input-Output Study (2008) calculates that the employment multiplier for manufacturing/ construction overall is 2.52. Part of this difference arises because the WRC-REMI is more comprehensive than the simple input-output model. Foremost among the impact channels omitted from the simple input-output model are in-migration and investment. When we run the WRC-REMI model with these channels turned off, the employment multiplier for petroleum refining is reduced to 6.74. When we run such a WRC-REMI simulation for the larger petroleum and coal products manufacturing sector (the "three-digit" sub-sector of manufacturing that contains the petroleum refining industry) the employment multiplier is 4.46. This is actually less than the 9.56 multiplier that the Washington Input-Output Model gives for petroleum and coal products manufacturing. (This 9.56 is the highest employment multiplier found by the 2002 Input-Output Study.)

Several additional factors contribute to the industry's large multiplier. First, petroleum refiners pay high wages. As a result, the employment induced by refinery employee spending is relatively great. Second, the petroleum industry ranks high in the ratio of in-state supplied intermediate inputs (including contract labor) to employee income. For this reason, indirect employment is relatively high. And some of these indirect jobs (contract labor, in particular) pay unusually high wages.

The WRC-REMI model calculates that each refining job results in an additional $894,696 of state personal income. At 2011 employment levels, the industry adds $1.8 billion to state personal income.

In 2011 state and local sales and use taxes averaged $0.0270 for each dollar of state personal income. With the income multiplier of $894,696, each petroleum refining job results in $24,194 in state and local sales taxes or a total of $48.0 million.

The refiners directly paid $105.1 million in B&O taxes in 2011. In 2009 state B&O taxes averaged $0.00106 for each dollar of personal income. Multiplying this rate into $1,452.9 million—the increase in state personal income we ascribe to the 1,986 refinery jobs net of the wages and benefits of the refinery workers—gives $15.4 million additional induced and indirect B&O tax revenue, for a total of $120.5 million, or $60,691 per direct job.

These impacts can be expressed in terms of the hypothetical Washington refinery producing 160,000 barrels of product a day that was analyzed in Section 8. In 2011, this refinery would have provided 552 jobs, and these workers would have received $66.4 million in wages and salaries and $23.6 million in benefits. In addition to the direct jobs and income, the refinery would generate 6,747 jobs and $389.9 million in personal income elsewhere in the state's economy. The refinery itself would pay $72.6 million in state and local taxes. In addition to these direct taxes, the indirect and induced activities generated by

Figure 9.1: Impact of a 160,000 Barrel Per Day Refinery

565 Direct Jobs
+6,915 Additional Jobs Elsewhere in the State Economy
$92.2 Million Direct Compensation
+$399.5 Million Additional Personal Income Elsewhere in the Economy
$73.7 Million Direct Taxes
+$4.3 Million Additional Sales, Use and B&O Taxes Elsewhere in the Economy

Source: WRC

the refinery would provide $4.2 million in sales, use and B&O tax revenue. (See Table 9.1.)

10. Washington Petroleum Industry: Downstream Activities

Washington's petroleum refiners rely on a number of industries to distribute their product to consumers. These include transportation (pipelines, barges, trucks, and rail) and transportation support facilities (terminals, stockyards, and bulk stations), wholesalers, and retailers (gasoline stations and fuel oil dealers).

These downstream industries exist as a result of petroleum product consumption in our economy, not as a result of petroleum refining. Presumably, if the refineries were gone or if they had never existed in Washington, finished petroleum products would be imported to terminal and stockyard facilities, transported to retail destinations within the state, and sold to consumers through systems much like those that currently exist, together with similar job, wage, and tax effects. Even so, their direct economic contribution is substantial and their role in the larger petroleum industry is crucial. This section describes the employment, wages, and taxes associated with these industries.

Of the total finished products produced by Washington's refineries, 53 percent leaves through pipeline to markets in Seattle and Tacoma and beyond. Another 35 percent goes by water to Seattle, Portland, or elsewhere with the remaining 12 percent of product shipped by rail or truck. About 51 percent of product is delivered to retailers for consumer sales within the state of Washington (Appendix A).

Jobs and wages. According to detailed data reported to the state ESD for 2010, the most recent year for which such data are available, there were about 1,600 employers in these downstream industries. Together, they paid $417 million in wages to 16,248 workers. These are all workers covered by ESD's unemployment insurance program for these industries, so the number includes both full-time and part-time workers. Table 10.1 shows these data for each industrial classification with their corresponding North American Industrial Classification Sys-

Figure 10.1: Employment and Wages by Industry, 2011

Industry (NAICS Code)	Firms	Total Wages Paid	Average Employment	Average Annual Wage
Petroleum Bulk Stations and Terminals (424710)	24	$41,083,288	705	$58,274
Other Petroleum Merchant Wholesalers (424720)	80	$63,041,902	1,202	$52,448
Gasoline Stations With Convenience Store (447110)	1,341	$216,037,269	11,985	$18,026
Other Gasoline Stations (447190)	98	$25,335,049	1,004	$25,234
Heating Oil Dealers (454311)	32	$23,546,106	479	$49,157
LPG and Bottled Gas Dealers (454312)	27	$27,168,406	641	$42,384
Pipeline Transportation (486)	6	$19,883,330	198	$100,421

Source: ESD

tem (NAICS) codes.

Among the downstream industries there are three broad tiers of employment and pay:

- Pipeline transport employs a few highly paid workers—198 workers make about $100,421 per year on average.
- Bulk stations and terminals, wholesalers, and fuel oil dealers employ about 3,027 workers and pay an average of nearly $51,200 per worker per year.
- Gasoline stations generate a large wage bill with a lot of lower-wage and part-time jobs. In 2011, this industry's 1,439 employers paid total wages of $241.42 million to 12,989 workers.

Taxes. The state Department of Revenue (DOR) reports excise tax data on these same industries (DOR 2012a, 2012b).

As shown in Table 10.2, total excise taxes due from the downstream industries equaled $256.0 million in 2011. Gasoline stations paid $149.7 million in excise taxes. Wholesalers paid $80.5 million; fuel dealers, $25.8 million.

Figure 10.2: Taxable Income and Taxes Due by Industry, 2011
(millions of dollars)

Industry (NAICS Code)	Gross	Taxable	B&O Tax	Other Excise	Total
Petroleum Products Wholesaling (4247)	10,171.5	8,975.7	43.8	36.7	80.5
Gasoline Stations (4471)	12,340.7	10,086.8	48.8	100.9	149.7
Fuel Dealers (45431)	691.8	638.9	3.1	22.7	25.8
Pipeline Transportation (486)	D	D	D	D	D

Source: DOR

D: Value not disclosed by DOR

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Appendix A

A.1: Quantity and Value of Feedstock Inputs	2010	2011
Feedstock Quantity (KBBLS/Day)		
Crude Oil	502	536
Other	18	26
Total	520	562
Feedstock Value ($K)		
Crude Oil	14,518,743	20,476,653
Other	314,879	664,272
Total	14,833,622	21,140,925

A.2: Quantity and Value of Output	2010	2011
Output Quantity (KBBLS/Day)		
Gasoline	236.990	246.156
Diesel Oil	110.651	133.400
Jet and Turbine Fuel	83.119	77.874
Calcined Coke	6.461	5.930
LPG	11.631	11.170
Residual Fuel Oil	26.340	30.253
Propane	7.822	8.937
Coke	4.773	5.211
Sulfur	1.251	1.397
Marine Fuels	8.592	20.890
Gas Oils	22.300	21.127
Emulsified and Road Asphalt	4.000	4.148
Other	12.838	9.473
Total	536.768	575.967
Output Value ($K)		
Gasoline	8,057,434	10,843,097
Diesel Oil	3,797,914	6,256,672
Jet and Turbine Fuel	2,752,239	3,295,117
Calcined Coke	295,608	364,563
LPG	245,934	308,866
Residual Fuel Oil	703,298	1,003,324
Propane	129,553	194,968
Coke	34,783	61,362
Sulfur	27,782	29,937
Marine Fuels	243,350	755,903
Gas Oils	470,002	726,427
Emulsified and Road Asphalt	114,939	122,943
Other	228,843	230,455
Total	17,101,677	24,193,635

A.3: Origin of Inputs 2011 (KBBLS/Day)	Crude Oil	Other
Alaska	295	-
Canada (Conventional)	107	-
Canada (Oil Sands)	39	-
All Other Origins	94	26

A.4: Destination of Output 2011 (KBBLS/Day)	Washington	Other U.S.	Foreign	Total
Gasoline	132	93	20	246
Diesel Oil	66	49	19	133
Jet and Turbine Fuel	33	25	19	77
Calcined Coke	0	-	6	6
LPG	8	3	-	11
Residual Fuel Oil	13	4	12	30
Propane	6	2	1	9
Coke	3	2	0	5
Sulfur	1	1	-	1
Marine Fuels	19	2	-	21
Gas Oils	8	14	-	22
Emulsified and Road Asphalt	2	2	-	4
Other	3	6	1	9

A.5: Mode of Transport 2011	Pipeline	Water	Truck	Rail	Other
Feedstocks (KBBLS/Day)					
Crude Oil	142	390	-	0	2
Other	8	15	0	10	-
Outputs (KBBLS/Day)					
Gasoline	153	72	22	-	-
Diesel Oil	82	38	12	0	-
Jet and Turbine Fuel	38	34	5	-	-
Calcined Coke	-	-	-	6	-
LPG	7	-	-	4	-
Residual Fuel Oil	-	30	-	-	-
Propane	-	-	5	4	-
Coke	-	3	1	1	-
Sulfur	-	-	1	0	-
Marine Fuels	-	21	-	-	-
Gas Oils	-	21	-	-	-
Emulsified and Road Asphalt	-	-	2	2	-
Other	2	6	-	2	-

A.6: Employment and Contract Labor	2010	2011
On-Site Employment		
Number of FTE Employees	2,006	1,986
Total Payroll ($K)	212,739	238,869
Total Employee Benefits ($K)	84,407	85,072
Contract Labor		323,941
Expenditure ($K)		
Service and Maintenance	170,635	185,021
Capital Repair and Replacement	156,372	181,309
Total	327,007	366,330
Number of Contract Workers (FTE)		
Service and Maintenance	1,183	1,019
Capital Repair and Replacement	1,677	1,900
Total	2,861	2,919
% of Contract Labor from Outside WA State		
Service and Maintenance	45%	45%
Capital Repair and Replacement	65%	65%

A.7: Operating Expenditures Other than Labor or Feedstock ($K)	2010	2011
Non-Durable Manufactured Goods		
Petroleum Products	189,461	228,943
Other Non-Durable Goods	47,247	53,041
Total	236,708	281,984
Durable Manufacturing	-	-
Construction	31,950	37,532
Transportation		
Rail	23,622	28,942
Trucking	7,232	7,531
Automobiles	3,262	13,047
Waterborne	200,189	245,326
Air	-	-
Other	18,003	18,778
Total Transportation	252,309	313,624
Utilities and Communications		
Electricity	63,042	56,398
Gas	151,024	158,534
Other	9,127	10,385
Total U&C	223,193	225,318
Finance, Insurance and Real Estate	8,458	8,906
Business Services	5,242	5,204
Other Services	2,714	2,621

A.8:. Non-Labor Capital Expenditures		
Equipment ($K)	139,667	84,088
Materials and Supplies ($K)	138,237	162,952
Total	277,904	247,040
A.9: Taxes and Fees		
Taxes ($K)		
Retail Sales and Use tax	4,697	5,298
Business and Occupancy Tax	65,885	105,113
Property Tax	22,886	19,649
Unemployment Compensation Tax	1,253	1,199
Hazardous Substance Tax	75,156	106,914
Oil Spill Tax	13,323	15,776
Petroleum Products Tax	8,720	6,980
Motor Vehicle Fuel Tax	583	578
Special Fuel Tax	26	15
Other	1,348	1,754
Regulatory Fees ($K)		
Air Operating Registration and Permit Fees	1,671	1,765
Waste Disposal Fees	1,578	1,550
Wastewater Discharge Fees	710	729
Building Inspection Fees	5	4
Building Permit Fees	296	307
Other	71	73
Industrial Insurance Premium ($K)	3,137	10,117
A.10: Estimated Services and Retail Trade		
Food Services ($K)		
Associated with Contract Labor	325	313
Associated with Business Visitors	556	540
Total	881	853
Hotel and Motels ($K)		
Associated with Contract Labor	540	528
Associated with Business Visitors	647	646
Total	1,187	1,174
Other Trade and Services ($K)		
Associated with Contract Labor	25	25
Associated with Business Visitors	51	58
Total	76	83
A.11: Contributions ($K)		
Corporate	750	787
Firm-Sponsored Employee Giving	823	853
A.12:. Other ($K)		
Estimated Business visitors from outside Washington	2,700	2,000

Appendix B

Petroleum Product Exports from Washington State
2011

Canada	$1,882,435,007
Mexico	$443,120,733
Chile	$426,556,294
Singapore	$228,075,319
Australia	$158,083,410
Guatemala	$86,002,183
Republic of Korea	$85,287,508
New Zealand	$61,435,595
Brazil	$49,508,380
Republic of South Africa	$38,025,000
Netherlands	$37,414,294
Ecuador	$33,475,403
China	$26,044,412
Peru	$25,893,750
Mozambique	$15,830,000
Bahamas	$14,841,104
Taiwan	$6,110,985
Japan	$5,987,351
Russia	$785,803
Malaysia	$673,693
Philippines	$533,044
Panama	$323,178
Indonesia	$307,324
Thailand	$220,183
Dominican Republic	$181,712
Colombia	$136,860
Vietnam	$128,152
Costa Rica	$119,497
India	$49,862
France	$46,700
Kazakhstan	$45,086
Serbia	$15,000
Italy	$12,922
Uruguay	$8,455
French Polynesia	$7,766
Belgium	$6,960
United Kingdom	$6,693
Hong Kong	$4,092
Germany	$4,062
Aruba	$3,118
United Arab Emirates	$2,700
Total all Countries	$3,627,749,590

Source: WISERTrade

Appendix C

The Washington Research Council uses a model of the Washington State economy constructed especially for WRC by Regional Economic Models, Inc. Because it allows supply and demand to respond to changes in prices and wages, and permits substitution among factors of production, the WRC-REMI model is more elaborate than the standard input-output models commonly employed to estimate regional economic impacts (Treyz 1993).

The standard input-output model fails to model the numerous capacity constraints within the economy, the processes that set prices for goods and services and the responses of consumers and producers to changes in these prices. In the input-output model, industry and labor supply are perfectly elastic—so prices and wage rates do not matter.

Prices and wages do matter in the WRC-REMI model. The model divides the state into two subregions: The Seattle Metropolitan District (King, and Snohomish Counties) and the balance of the state. There are 66 private industrial sectors within each subregion, as well as four governmental sectors. Within each subregion the model tracks inter-industry transactions, much as an input output model would.

Unlike an input-output model, however, the WRC-REMI model incorporates a number of significant behavioral responses to changes in prices and costs: The wage rate depends on the supply and demand for labor, migration and labor force participation rates respond to changes in wage rates, and consumer purchases of specific goods and services respond to changes in relative prices and personal income. In addition, producers substitute among production factors in response to changes in relative factor costs, market shares respond to changes in regional production costs, and investment rises in response to increases in output.

This report uses version PI+ 1.3.56 of the WRC-REMI model.

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