

# Localized Economic Impact of Refineries on Fidalgo Island

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# Table of Contents

- Executive Summary..... 3
  - About the Authors ..... 4
- Introduction ..... 5
- Notes on Impact Estimates ..... 5
- Petroleum Refining – Employment and Wages ..... 6
- Larger Context – Employment and Wages ..... 7
- Multiplier effects..... 8
- Findings ..... 11
- Charitable Giving and Other Impacts..... 12
- Authors’ Note..... 13

## Executive Summary

Analyzing the economic impacts of the two petroleum refineries on Fidalgo Island may seem rather simple to the naked eye. However, it is much more complex and there are several factors to take into account when analyzing the data. For example, it is not easy to estimate economic impacts on small geographic areas. Economic activity typically spans large geographic areas. The refinery workers who live on Fidalgo Island make purchases on the island, but also off the island – and it is difficult to know exactly how much they purchase in different locations. Similarly, the refineries purchase goods and services from businesses on and off the island, with the amounts they purchase from different businesses changing over time. To add to this, any worker at the refineries may purchase things on Fidalgo Island whether they live there or not.

We also note that our impact analysis is based on data at the zip code level. The zip code used for the analysis (98221) is slightly greater than Fidalgo Island. It also includes Guemes, Cypress, Sinclair, Burrows, and Allan Islands. Given the sizes and demographics of these locations there is relatively little concern that their inclusion drives data significant implications.

The key idea in this sort of impact analysis is that a job in a given industry sector (e.g., petroleum refining) supports jobs in other sectors through business-to-business activities and through the spending of earned income. In the jargon of economic impact analysis, we begin by describing the direct effects – the change or event or job of interest. In this case we are asking the hypothetical question: what would happen if we added or subtracted jobs at the refineries (direct effect), knowing that this sort of change would have ripple effects in the locally defined economy. We refer to changes that occur due to changes in business-to-business activity as the indirect effects, and changes that occur due to changes in household spending at the induced effect.

Our Center utilizes the IMLAN software package to estimate the indirect and induced effects associated with a given direct effect (change in employment at the refineries). In short, the IMPLAN software package keeps track of the businesses that typically interact with refineries, as well as which businesses are found in the study area, and provides an estimate of the ripple – or multiplier effects.

Based on employment information provided by both refineries located on Fidalgo Island and using the IMPLAN software with data for zip code 98221, CEBR estimates that the refinery workers have an employment multiplier of 2, meaning that each of the 217 refinery workers who live on Fidalgo Island supports another position on the Island. That is, roughly 434 jobs on Fidalgo Island depend directly or indirectly on the refineries.

When considering this employment multiplier, it is critical to understand that a multiplier effect constrained to a small geographic area, such as Fidalgo Island, is typically very low. Smaller areas and smaller cities don't have the economic richness, so to speak, to capture a large portion of the ripple effects associated with jobs like those at the refineries. To confirm this theory, we calculated employment multipliers for other industry sectors, confining the study area to be Fidalgo Island. We found multipliers in the range of 1.1 to 1.4, with 1.4 for boat building. These findings show that while an employment multiplier of 2 may not seem large – it actually is large.

It may also be helpful to think about where the multiplier effects are captured in the area. That is, what other industries benefit the most from the refinery jobs? It appears from the impact data that the 217 workers at the refineries support roughly 45 other jobs in Maintenance & Repair, Construction, and Wholesale Trade located on Fidalgo Island. They also support approximately 24 restaurant workers. These impacts are based on average household spending and assume that each refinery worker corresponds to a unique household. This assumption overstates the impacts if refinery workers share a household, but also understates the impacts as the income earned by refinery workers is significantly above the average wage found on Fidalgo Island.

### About the Authors

This report has been prepared by the Center for Economic and Business Research (CEBR) located within the College of Business and Economics at Western Washington University. The Center works in partnership with businesses, government entities and non-profits to bridge the resources of Western students, faculty and staff from throughout the Western Community to create high quality analysis and proposed solutions to challenges. From answering the simple question, creating understandable and thorough analysis documents, creating internships, class projects, to faculty projects we assist in creating an informed path helping business owners and policy shapers make decisions to move forward.

CEBR provides opportunities for students to engage in research and to partner with faculty in preparing analytical reports for clients outside the university. Students played an instrumental role in the preparation of this report.

We are always seeking opportunities to bring the strengths of Western Washington University to fruition within our region. If you have a need for analysis work or comments on this report, we encourage you to contact us at 360-650-3909. To learn more about CEBR visit us online at <https://cbe.wvu.edu/cebr/center-economic-and-business-research>.

## Introduction

It seems a simple question: What are the economic impacts of the two petroleum refineries on the economy of Fidalgo Island. After all, the refineries are located on March Point, adjacent to Anacortes. Many of the workers employed at the refineries live in Anacortes and many businesses in Anacortes provide supplies and services to the refineries and employees.

However, it is difficult to view a single City, or even a small island such as Fidalgo, as an economic entity where impacts can be measured. A refinery worker living on Fidalgo may shop in or out of the City – on or off the island. A business in Anacortes that provides services to the refineries may buy supplies off the island and the owner of the business may also live off the island. In short, estimating economic impacts is a bit suspect when looking at small geographic areas that are integrated into a larger economic region. (It is much easier to imagine and to estimate the impacts of the refineries on the entire county – or better yet, the entire state.)

Of importance when looking at a localized multiplier is an understanding that a full national multiplier is much larger than when it is localized to a small geographic area. The reason for this is simple – a business relies on many different non-local components within its realm of economic influence. While the formulas assume services that may be purchased locally are the realities may vary. Localized multipliers are general quite low, below 1.2 for most sectors.

Such concerns notwithstanding, this report provides an overview of the economic impacts of the refineries on Fidalgo Island – much of it occurring within the City of Anacortes.

The jobs being added or taken away are referred to as a change in the direct jobs. The related impacts that arise due to changes in business activities are called the indirect effects, and those that arise due to changes in household spending are called the induced effects.

## Notes on Impact Estimates

When estimating the impacts of an event or change, we start by determining what businesses would be affected by the change in general and then noting which of those businesses are found in the study area. For example, we can document what businesses refineries interact with in general and then see which of those businesses are found on Fidalgo Island. This process implies two assumptions worth noting. The first is the assumption that the refineries in Skagit County behave like other refineries in the US. This assumption lets us use general descriptions about refinery purchasing behavior and other activities. The second assumption is that if a purchase

It is difficult to estimate the economic impacts of a change or event on a small geographic area, such as a city. When looking at the impacts of a refinery worker on Fidalgo Island, a key challenge is determining what portion of business-to-business activity and household spending occurs on the island and what portion occurs elsewhere.

**NOTE:** the zip code used for the analysis in this report covers an area that is slightly greater than Fidalgo Island. Zip code 98221 includes Guemes, Cypress, Sinclair, Burrows, & Allan Islands.

can be made in the study area (i.e., because a business that refineries typically interact with is present in the study area), it will be made in the study area.

In addition, it is also worth emphasizing that economic impact estimates start with a change, or event of some kind. In this case, we will consider what happens if we were to add (or subtract) a certain number of workers at the refineries. Using a software package that keeps track of the businesses refineries usually interact with and which businesses are found in the study area, we show the different impacts of adding or subtracting those workers. We use the IMPLAN software package for this project, as it allows us to consider the impacts at the zip code level.

As discussed in more detail below, the direct impacts – the change being studied – results in additional impacts. These additional impacts are often referred to as ripple or multiplier effects. For example, if we add 10 workers at one of the refineries, the refinery will increase its purchases and activities, thereby creating additional work for other businesses in the area. The new workers will also spend some portion of their income in the area, also creating additional demand for different goods and services in the area.

## Petroleum Refining – Employment and Wages

The Washington State Department of Employment Security reports there were 841 workers at the petroleum refineries in Skagit County in 2014. This number understates the actual employment at the refineries as they also have substantial and variable numbers of contract workers on site. When talking to the refineries for a report we previously prepared for the Economic Development Association of Skagit County, we were told that approximately 370 contract workers effectively work full-time at the refineries. In some years, depending on the projects, the number of contract workers can be much higher, with those workers classified in other sectors such as professional and technical services (which includes consulting engineers and other categories).

While the refineries reported an average wage of \$104,000 for all workers<sup>1</sup> and the Employment Security reports an overall average wage of \$126,634 per worker – the refineries estimate an average wage of \$140,000 per year for workers living on Fidalgo Island. The higher wage for those workers could be the result of the type of worker that lives on Fidalgo Island. For example, more senior and/or more management oriented employees with higher income might live on the island.

Of the 841 workers noted by Employment Security, the refineries estimate that approximately 217 live on Fidalgo Island / in the City of Anacortes.

By using the IMPLAN software package, we estimate the multiplier effects of having an additional refinery worker earning \$140,000 per year by determining how business activity in the City of Anacortes would increase if we added an additional refinery worker with that salary.

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<sup>1</sup> Estimate provided by the refineries when CEBR was preparing the report on the economic impacts of the refineries on Skagit County.

For this report – the driving question is what do these workers mean to the City (and/or Fidalgo Island)? What impacts can be attributed to these refinery workers? To answer that question, we estimate the multiplier effects of having an additional refinery worker earning \$140,000 per year. That is, we use the IMPLAN software package to determine how business activity on Fidalgo Island would increase if we added an additional refinery worker with that salary. Likewise, we use zip code level data and let the City of Anacortes be defined as the area covered by zip code 98221.

## Larger Context – Employment and Wages

When it comes to wages, petroleum refining serves as something of a benchmark in Skagit County. Less than 0.25 percent of the workers in the county are in industries with a higher average annual wage; 98 percent are in industries with a lower average wage.

It is also interesting to note that the average wage in the “management of companies and enterprises” was \$91,959 in 2014. That wage is the next highest average annual wage to petroleum refining, but is only 71 percent of the reported wage in the petroleum refining sector. (We used a slightly lower average wage when calculating the employment multipliers for petroleum refining. We show here the data as reported by the Washington State Department of Employment Security, for the 2014 calendar year. <https://fortress.wa.gov/esd/employmentdata/reports-publications>)

“Fishing, hunting, and trapping” is a rather curious industry sector, with a reported average annual wage of \$242,477. We do not fully understand this average wage as it is above what we think fishers, loggers, and others in this sector typically earn. We have made a data request to the state to try to learn more. Ignoring this outlier for the moment, we show the 10 industry sectors with the highest average annual wage.

98% of workers in Skagit County have a lower average wage than those found at the two refineries. Only .25% of workers in the County have higher average workers.

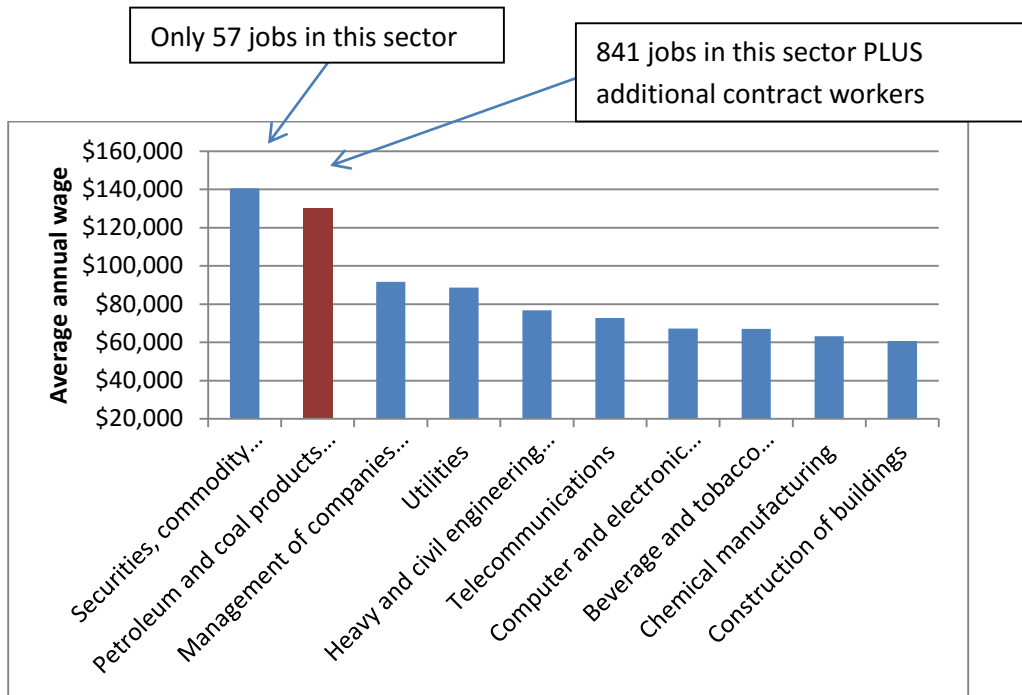


Figure 1: Average Annual Wages in Skagit County, Select Sectors

## Multiplier effects

The jobs in a given business, or in a given industry sector to be more precise, support jobs in other sectors through business-to-business activities and through spending by the employee on personal items. As noted, our task is to determine the impact of adding (or subtracting) jobs at a given business. The jobs being added or taken away are referred to as a change in the direct jobs. These are the jobs directly tied to a particular business or sector. They can also be viewed as the jobs directly affected by a given event. The related impacts that arise due to changes in business activities are called the indirect effects, and those that arise due to changes in household spending are called the induced effects.



The relationship between the direct effects and the indirect and induced effects is typically described in terms of multiplier effects. That is, the total change (direct, indirect, and induced combined) is a multiple of the direct change.

It can be important to note that the multiplier effects for a given change depend on the sector in which the change occurs, the geographic location, and when the change occurs. The multiplier effects differ depending on whether a job is added or taken away from a clothing store rather than an engineering firm or business in another sector because the firms in different industry sectors interact differently with the firms in other industry sectors. Moreover, the level of pay varies across firms or sectors. In addition, the interactions between businesses and the patterns in household spending change over time. As such, it does not make sense to talk about multipliers without specifying the industry sector and time when the data behind the multiplier were collected.

Our role at CEBR is to do more than simply create reports. We make an overt attempt to offer full explanations and educate the readers of our reports on the topics we research and analyze. It is with this intention we offer then following about multipliers.

There are different multipliers for different measures of economic activity. It does not make sense to talk about the multiplier for, say, petroleum refining. There is a multiplier for changes in employment; a different multiplier for change in income; and a different multiplier for changes in output. To be sure, the different multipliers are all related. You can describe an event in terms of changes in employment, income, and/or output. The point here is simply to highlight the fact that there is not a single multiplier or single way of describing the ripple effects associated with a given event, despite media and promotional coverage. An industry has different multipliers for each of these factors. A challenge within economics analysis is that there is often disagreement on what the multiplier effects really are, even if you focus on a particular industry and multiplier type because different models and assumptions may be being made.

Not surprisingly, there is a tendency for advocates to hope for the largest possible multiplier. For example, economic development specialists might want a large multiplier to make a particular project look attractive - noting that job creation offers political appeal, so a large employment multiplier can help make a project attractive. Similarly, an industry trade group may want a large employment or income multiplier for the industry they support to show the importance of the industry to a community or region. Part of our job at CEBR and in this report is to provide as plausible an estimate as possible for the relevant multipliers.

Multipliers are based on the economic or employment impacts of a sector nationally. When confined to a distinct location multipliers are often significantly reduced.

There are different multipliers for different measures of economic activity such as changes in employment, changes in income and even changes for output. That is, there are different ways of describing the ripple effects associated with a given event.

CEBR generally relies on two different sources for identifying multipliers: The revised Washington State Input-Output Model and IMPLAN. Using the IMPLAN software package we estimate an employment multiplier of 2 for petroleum refinery workers for zip code 98221. The IMPLAN software package gives an employment multiplier of 8.08 for the industry within Washington. For reference or comparison, using the revised Washington State Input-Output Model, we estimate an employment multiplier of 6.70 for petroleum refining in Washington State. The Washington State I-O model gives an employment multiplier of 5.7 for Skagit County and the IMPLAN model gives an employment multiplier of 3.87 for Skagit County. The multipliers from the different software packages differ because of different data and internal structure. We think such differences highlight an important fact: these multiplier estimates depend on assumptions and model structure. Estimates from different models will differ. Having said as much, the differences should be relatively small. Models can be used incorrectly and/or there can be errors in the data. If a multiplier does not appear reasonable or plausible – it should be questioned.

The multipliers from the different software packages (Washington State Input-Output Model and IMPLAN) differ because of different data and internal structure. We think such differences highlight an important fact: these multiplier estimates depend on assumptions and model structure. Assumptions should be clearly stated and plausible, and the results should also appear reasonable.

The multiplier is smaller for Fidalgo Island, a bit larger for Skagit County, and larger still for the State as a whole because more impacts are captured if you broaden the study area to the county level, and again to the state level.

To put this into context CEBR evaluated a number of other sectors to create comparison points specific to Fidalgo Island.

Sector	Employment Multiplier	Number of jobs in sector to create 1 additional localized job	Number of positions needed to create similar impact as refinery jobs
Legal Services	1.1	10.0	2170
Full Service Restaurants	1.1	10.0	2170
Limited Service Restaurants	1.14	7.1	1550
Food and Beverage Stores	1.16	6.3	1367
Hotel / Motel	1.18	5.6	1206
Other Health Care Practitioners	1.2	5.0	1085
Veterinarian Services	1.25	4.0	868
Hospitals	1.35	2.9	620
Boat Building	1.4	2.5	543
Source: Implan			

Table 1: Multipliers of select sectors on Fidalgo Island

Table 1 shows that an employment multiplier of 2 is relatively large. In particular, it shows that the refineries have a large measurable effect, presumably larger than any other industry on the island. This finding is not necessarily surprising. But it is still helpful to know how significant the refinery jobs are to other businesses on Fidalgo Island and how the influence of those jobs compares to the influence of other jobs.

## Findings

Based on employment information provided by both refineries located on Fidalgo Island CEBR constructed an economic impact model utilizing IMPLAN software at a zip code level. Our modelling indicates that the refinery workers have an employment multiplier of 2, which means that each of the 217 refinery workers who live on Fidalgo Island supports another position on the Island. This is a significant localized multiplier.

Our research indicates that 217 jobs on Fidalgo Island are effectively dependent upon the refinery workers who also live on the island. Overall, 434 jobs located on Fidalgo Island are due to the refineries – either because the jobs are at the refineries or because they depend indirectly on the refineries. In looking at reports compiled by ESRI and the IMPLAN analysis as they relate to overall household budget expenditures and retail goods and service expenditures within the study area, we note several observations of the impacts of these 217 direct jobs. For instance, the 217 workers at the refineries support roughly 45 other jobs in Maintenance & Repair, Construction, and Wholesale Trade based on Fidalgo Island. These are key sectors for the City of Anacortes given that these are overwhelmingly located there, and it is important to know that the refineries have a large impact on these sectors. Furthermore, the 217 workers also support approximately 24 restaurant jobs and other industry sectors such as real estate, services to building, and landscape from either a direct or indirect support.

Adding significance to this finding is the considerably higher wages within this industry (see Figure 1). High relative wages coupled with a high multiplier creates a scenario where a particular industry is capable of generating and sustaining a substantial portion of the local and regional economy.

It is crucial to note the following table shows average household spending for Fidalgo Island, and the amount of spending, by category for 217 households. We are assuming that each refinery worker corresponds to a single household. It is possible that multiple refinery workers share a household, but also possible that refinery worker household spends more than average in the various categories (due to the fact that they have above average income).

The refinery workers have an employment multiplier of 2, which means that each of the 217 refinery workers who live on Fidalgo Island supports another position on the Island.

This is a significantly higher employment multiplier effect than other industries.

	Average Household Spend	Projected Value
Dining/Drinking	\$3,946	\$856,208
Club Memberships	\$184	\$39,928
TV/Cable/Satellite	\$1,120	\$242,968
Pets	\$639	\$138,663
Food at Home	\$5,980	\$1,297,660
Prescriptions/OTC	\$733	\$159,061
Home Maintenance/Remodel Services	\$2,320	\$503,440
Utilities	\$5,439	\$1,180,263
Lawn Services	\$518	\$112,406
	<b>TOTAL</b>	<b>\$4,530,598</b>
Source: Combined data from ESRI forecasts, Consumer Expenditure Surveys and the Bureau of Labor Statistics		

Table 2: Average impacts of consumer spending by refinery employees

Assuming half of the above expenditures are considered taxable retail sales at a city tax rate of .85% equates an annual revenue rate of \$177 per household within these specific expenditure line items or \$38,511 total for those directly employed. If we assume the indirect employment also resides on Fidalgo Island the total impact would be \$77,023 in city sales tax revenue. Note that the State of Washington receives revenue at a rate of 6.5% which a substantial amount is allocated to schools and other programs within the island.

The US Census Bureau's *On the Map* tool reports there were 7,973 jobs in zip code 98221 and 6,142 jobs in the City of Anacortes in 2013.<sup>2</sup> The 434 jobs tied directly or indirectly to the refineries represent 7 percent of the jobs in the City. Even though these are relatively high paying jobs, the income effect is not as large as the employment effect. This suggests that some of the larger expenditures from these respected households occur outside of Fidalgo Island.

## Charitable Giving and Other Impacts

The refineries in Skagit County actively support a variety of nonprofits in the area and partner with various organizations in ways that help everyone in the county. While these impacts may be substantial, they are not included in the analysis conducted. The employment impacts from these contributions are likely to be very low but the economic impacts may have substantial impact depending on how those contributions are physically spent.

Spending tied to jobs directly and/or indirectly related to the refineries results in sales tax revenues for the City. We estimate the sales tax impact could be \$77,023 per year, not including tax revenue that flows back to the City from the state.

Seven percent of jobs on Fidalgo Island are connected to the employment at the refineries. This is a substantial portion of jobs to be tied to a single industry.

<sup>2</sup> <http://onthemap.ces.census.gov/>

## Authors' Note

No attempt was made in the study to consider certain benefits, including health care and the opportunity for overtime pay, or costs, such as the risks or hazards inherent to moving and refining oil products. The study presented here does not examine the net, or triple net, benefits of refinery operations, but rather a simple impact assessment that shows the impact the refineries have on Fidalgo Island, with an emphasis on employment impacts.

Our previous research based on the County level data is available online at <https://cbe.wvu.edu/cebr/topics-and-reports>. A copy of that report is also included in delivery of this zip code level analysis.