

**Economic Impact of
Motiva Enterprises LLC Delaware City Refinery**

prepared for

Motiva Enterprises LLC

by

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TABLE OF CONTENTS

	Page
List of Figures	iv
Introduction	1
Executive Summary	2
Background	3
Methodology	5
Results	10
Additional Impacts	13
Observations	14
Appendix	15

LIST OF FIGURES

Figure		Page
1	The Concept of the Multiplier.....	6
2	Comparison of Final Demand Multipliers	8
3	Comparison Multipliers for Delaware	9
4	Economic Impact of Motiva Enterprises LLC Delaware City Refinery.....	10
5	Disaggregated Impact of Motiva Enterprises LLC Delaware City Refinery.....	11
6	Tax Liability of Motiva Enterprises LLC Delaware City Refinery	12
7	Retirees	13

Introduction

The purpose of this study is to measure the economic impacts of the Motiva Enterprises LLC Delaware City Refinery on the State of Delaware. The study was commissioned by Motiva Enterprises LLC. The study is not intended to be an audit of Motiva's operations, its management, or an assessment of the desirability of the refinery.

In the context of business, economic impact is defined as the net economic change in a local economy that results from the economic activity attributed to a firm. The purpose of an economic impact analysis is to measure the economic benefits that a community accrues. Benefits can be measured in terms of expenditures, output, or employment. For the purposes of this study, the economic impact of Motiva's operations will be measured by the increase in total employment, total gross state product, fiscal revenue, and personal income. No attempt is made to balance these benefits against any costs generated by the firm.

The report is organized in the following manner: first, an executive summary outlines the key findings. Second, a brief background of the Delaware City Refinery is presented. Third, the methodology is discussed, which includes an overview of multiplier analysis. The results of the study follow, then additional impacts. The report concludes with observations and an appendix.

Executive Summary

- The operation of Motiva Enterprises LLC's Delaware City Refinery (DCR hereafter) has an estimated total economic impact of \$379 million per year to Delaware. The DCR has a total employment impact of 3,227 within the state, and a wage and salary impact of \$186 million per year.
- Direct employment at the DCR includes 675 workers, plus an additional 155 Conectiv workers at the facility's power plant and a further 32 at the distribution center. A varying number of contractors are also employed at the refinery. The primary maintenance contractor, Washington Group, International, has a core of 250 building trades union contractors at the facility.
- The refinery's intermediate purchases, and the expenditures from the direct, indirect, and induced employment and income, generate additional employment for the state.
- Petroleum refining is a high productivity industry. Output per employee is over \$2 million.¹
- The refinery generates direct, indirect and induced state and local government fiscal revenues of \$50 million per year.
- The average salary at the refinery is \$65,813, which is 31% higher than the Delaware median income of \$50,359 (Census 1999 in 2002 dollars).
- The refinery supplies products to several manufacturers in the state, and supplies gasoline to 90% of the state's gas stations through exchange agreements with other petroleum companies.
- Retirees of the DCR received pensions from Motiva Enterprises LLC. Over 200 DCR retirees reside in the state.
- The DCR is a secure source of heating oil and propane for the agricultural industry in the state. In winter conditions, the DCR is a supplier of propane for the state's poultry farming (chicken coop heating) and grain farming (drying operations).

¹ Source: REMI, Inc derived from the Bureau of Economic Analysis.

Background

The Delaware City Refinery was established in 1956. Ownership has passed between a number of corporations since its creation. Presently Motiva Enterprises LLC, a joint venture of Shell Oil Company, and Saudi Refining, Inc., operates the DCR. The ownership is divided equally between Shell Oil Company and Saudi Refining, Inc.

The refinery's major products include: gasoline, heating oil, diesel, and propane. The refinery has the capacity to process an average of 175,000 barrels² of crude oil per calendar day. DCR gasoline accounts for approximately one-eighth of the East Coast supply.

All crude oil, the primary raw material, arrives at the refinery via ship. The refinery serves the Mid-Atlantic and North East markets. Final products are sent from the distribution center, either via pipeline, truck or barge to their destination. Finished products are shipped by barge to New York Harbor to be distributed along the East Coast. Pipeline shipments are bound for Western Pennsylvania, and trucked shipments are sent mainly to regional locations.

The DCR employs 675 workers directly, of whom 521 are Delaware residents. The total wage bill of refinery employees is \$48.5 million (including employment taxes). Adding the associated employment benefits (medical, pension, etc) brings the total wage bill to \$69 million. The average salary is \$65,813, which is above the median household income for the state.³

Additionally, there are 155 Conectiv workers employed at the DCR power plant, 32 workers at the distribution site, plus a varying number of contractors who perform a

² A barrel equates to 42 gallons.

³ Median household income from Census 1999 is \$50,359 (2002 dollars).

variety of services. Washington Group, International is the primary maintenance contractor for the DCR and has a core 250 building trades union contractors at the plant.

The refinery is investing in its Delaware City facility. A \$360 million cogeneration power plant is now operational. This 150 megawatt power plant supplies the refinery.

The presence of the refinery also supports other manufacturers in the state. For example, the refinery is a source of CO₂ feedstock for an in-state manufacturer, which is refined and sold as food grade carbonation for soft drinks.

Additionally, the DCR supplies petroleum to 90% of the state's gas stations through exchange agreements with other energy companies. Under these agreements, the DCR provides petroleum to gas stations owned/operated by non-Motiva Enterprises LLC companies in exchange for reciprocal supply in areas where Motiva Enterprises LLC does not have a refining presence.

Since 1992, the DCR has spent over \$500 million in capital expenditures (excluding the construction of the new power plant). These capital expenditures upgrade the refinery. Approximately 70% of the refinery's capital expenditures are made with in-state suppliers.

Methodology

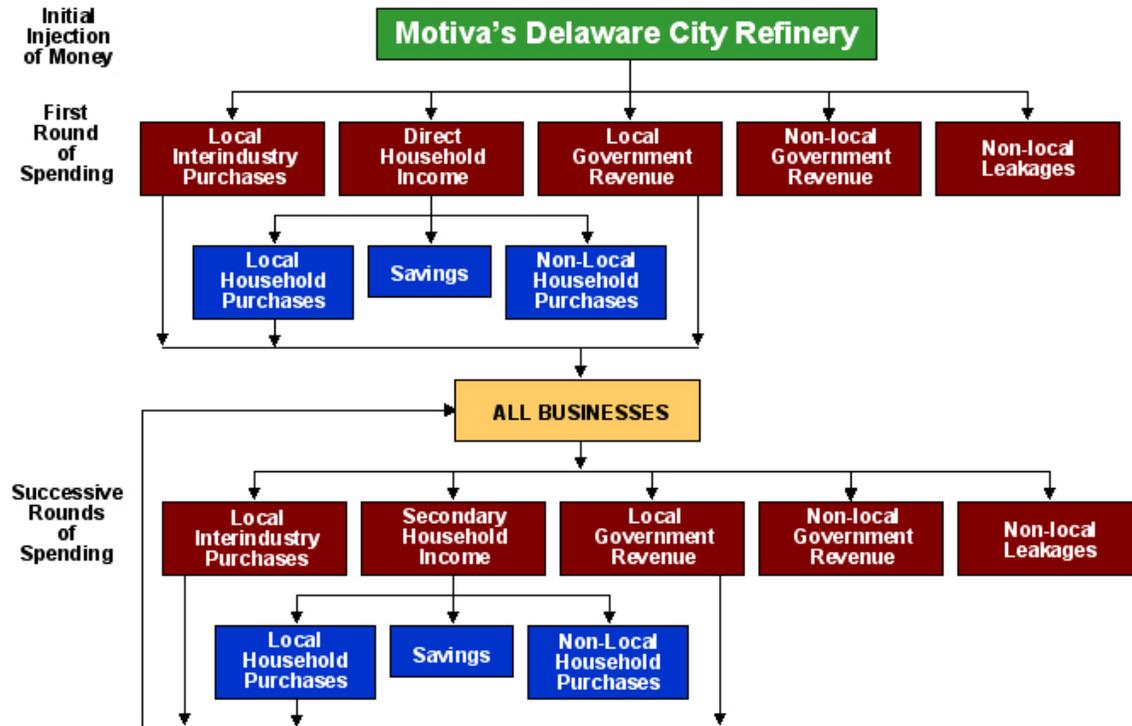
Motiva Enterprises LLC provided data covering employment, salaries, expenditures and revenues. These data serve as inputs into an econometric model of the Delaware economy, which is used to trace the impact of the DCR and all of its consequent effects. The econometric model employed in the research is developed by Regional Economic Models, Inc. (REMI). REMI is the leading software for modeling regional economies. The software may be applied to a wide variety of economic issues including economic impact studies, economic development, transportation, the environment, and tourism. An overview of the model is provided in the appendix of the report. A list of studies that have employed REMI is also contained in the appendix as a guide to the breadth of applications for the software.

The relationship between the total impact of the DCR and its actual activity is termed “multiplier effects.” This section will discuss the choice and use of economic multipliers.

A multiplier is the numerical relationship between an original change in economic activity and the ultimate change in activity that results as the money is spent and re-spent through various sectors of the economy. There are several kinds of multipliers used to assess private sector economic impacts of new activity, including employment multipliers, income multipliers and output multipliers.

Figure 1 below illustrates the multiplier process. Motiva’s DCR operation equates with a certain level of economic activity. These expenditures are disbursed in five different ways. The three local recipients of the disbursement will continue to spend this money in the same five ways over successive rounds of spending. Money that flows to non-local government and non-local leakages (intermediate purchases from non-Delaware suppliers, and non-Delaware employees) is lost. The initial expenditure has a ripple effect through the economy as successive rounds of spending magnify its impact. This is the principle of the multiplier.

Figure 1
The Concept of the Multiplier.



Adapted from Crompton (1995).
Center for Applied Demography and Survey Research, University of Delaware.

The multiplier analysis used in this study captures the full effects (direct, indirect and induced) of the DCR on the economy. These effects are described below.

Direct Effects.

Direct economic impacts consist of the jobs and payroll created by the primary producers.

Indirect Effects.

Indirect impacts consist of the additional jobs and payroll created when the primary producing company purchases goods and services from the many diverse businesses that support it. These businesses include equipment suppliers, construction services, transportation services, management services, food services, and many other types of support businesses. The indirect impacts include both the payroll of the support

businesses themselves, and the additional payroll created when employees of the support businesses spend their wages throughout the local economy.

Induced Effects.

Induced effects consist of the additional payroll created throughout the economy when the employees of the primary producers spend their personal incomes on consumer goods, other property, services and taxes.

Economic impact may be measured in a number of ways: employment, income or output. This study will report the DCR's impact in terms of each of these measures.

An employment multiplier is the total change in full-time equivalent employment (F.T.E.) generated in the local economy for each change of one F.T.E. in an export sector⁴ of that economy. (Note that one F.T.E. can be a full-time job, or it can be two or three part-time positions with total hours worked equaling one full-time job.)

A household income (or earnings) multiplier is the total change in household income throughout the local economy from a \$1.00 change in household income payment by an export sector. An output (or business) multiplier is the total change in sales generated throughout the local economy by a \$1.00 change in export sales of a particular sector.

Multipliers are available for every industry classified by federal statistical agencies. Each industry is assigned a different multiplier based on several factors, including the residency of workforce, the average wages paid, and the degree of regional purchasing—the proportion of intermediate purchases that is satisfied locally.

⁴ In the context of economic impact studies, an export sector is defined as one whose product or service is sold to a non-local person.

Multipliers are also available by areas (county, state, region). Because the composition of each area's economy is different, there can be wide variation in multipliers across economies. Figure 2 presents a table of petroleum refining multipliers for different states to illustrate the variation that exists. There is a correlation between the size of state and its regional purchasing coefficient and the resultant multiplier. Typically, the larger the state, the more expenditures will fall within that state, which increases its impact.

Figure 2
Comparison of Final Demand Multipliers

PETROLEUM PRODUCTS	EMPLOYMENT
Delaware	2.9
Kansas	6.5
California	9.0
Michigan	13.5
Mississippi	6.3
Houston, Texas	11.3
Utah	8.0

Source: Minnesota IMPLAN Group, Inc. RIMS II Multipliers (BEA). REMI, Inc. Center for Applied Demography and Survey Research, University of Delaware.

Delaware has a low employment multiplier for petroleum producers relative to other states. This is in part reflective of Delaware’s size, geography and economy; these factors lend themselves to leakages from the state economy. Nevertheless, the employment multiplier is large relative to other industries in the state. This reflects the high labor productivity of the industry. A sample of comparison multipliers for Delaware is shown below. While petroleum products and refining are not the largest industry in the state, their associated multiplier is larger than many other industries. Therefore, their impact per worker is relatively large.

Figure 3
Comparison Multipliers for Delaware

INDUSTRY	EMPLOYMENT	WAGES
Banking	2.2	1.7
Computer and data processing services	1.8	1.3
Credit agencies	1.2	1.7
Drugs	2.7	1.7
Eating & drinking establishments	1.2	1.5
Inorganic chemicals	3.4	2.1
Motor vehicles	3.2	1.8
Motor vehicle parts and accessories	1.9	2.5
Organic fibers	3.1	1.7
Petroleum products	2.9	2.6
Poultry and eggs	2.4	2.1
Wholesale trade	1.7	1.6

Source: Minnesota IMPLAN Group, Inc. REMI, Inc.
Center for Applied Demography and Survey Research, University of Delaware.

Results

The total impacts of Motiva Enterprises' Delaware City Refinery are significant. In total, the DCR generates 3,227 jobs in the state. This equates to a multiplier of 2.9.⁵ In terms of the total employment in Delaware, the DCR and its associated impact account for 0.8%.⁶

Motiva Enterprises activities generated a total of \$379 million (in 2002 dollars) in the State. This is approximately 1% of the state economy.⁷

During 2001, Motiva paid an estimated \$56.3 million in wages to state residents. The multiplier effect of the spending on these wages generated a total of \$186 million in wages and salaries for the state.

Figure 4
Economic Impact of Motiva Enterprises LLC Delaware City Refinery

	Direct	Total	Implied Multiplier	Total as % of State
Employment (#)	1,112	3,227	2.9	0.8%
Wages and Salaries (Nominal \$000)	\$72,204	\$185,850	2.6	1%

Note: Direct employment and wages and salaries include the Distribution Center, Power Plant, and core Washington Group, International building trades union contractors. Wages and salaries are gross numbers (pre-tax). Center for Applied Demography and Survey Research, University of Delaware.

Figure 5 disaggregates the employment and personal income effects. The DCR refinery makes the largest contribution to manufacturing employment. Among the largest beneficiaries is construction, with the DCR creating 643 jobs in the state. Services, which includes both business and personal services, gains over 690 jobs and retail trade

⁵ Total employment impact 3,227 / (DCR employment, Power Plant, Distribution Center, and core Washington Group, International building trades union contractors= 1,112).

⁶ Based on Bureau of Labor Statistics total establishment employment for Delaware in July 2002 of 417,000.

⁷ Based on estimated Bureau of Economic Analysis gross state product 2002: \$38.5 billion.

benefits with over 350 jobs. These industries gain from both direct expenditures of the DCR and also from the indirect and induced worker expenditures.

The transportation and utilities sectors are beneficiaries of the DCR for two primary reasons. First, the transportation sector is the next step downstream in moving the refined product to market. Second, refineries are prodigious users of electricity, which boosts the sales of utility corporations.

Figure 5

Disaggregated Impact of Motiva Enterprises LLC Delaware City Refinery

	Employment	Output (2002\$b)	Wages (2002\$b)	Value Added (2002\$b)
Manufacturing	664	1.511	0.057	0.252
Mining	24	0.003	0.000	0.001
Construction	643	0.059	0.033	0.026
Transportation and Public Utilities	337	0.112	0.024	0.063
Finance, Insurance, & Real Estate	119	0.041	0.007	0.030
Retail Trade	355	0.023	0.009	0.015
Wholesale Trade	121	0.025	0.007	0.018
Services	.692	0.053	0.036	0.033
Agriculture	15	0.000	0.000	0.000
Total	2,970	1.827	0.173	0.438

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Note: Columns may not sum to totals due to rounding. Private industry reported only.

Motiva is liable for property (ad valorem) taxes and Delaware Gross Receipts taxes.

New Castle County receives approximately \$900,000 in school/property taxes annually from Motiva, and the Town of Delaware City receives \$150,000 in annual property taxes.

Motiva is subject to five of the State's seventeen types of Gross Receipts taxes. The two largest are the Manufacturer's License tax and the Wholesaler of Petroleum Products tax.

The Manufacturer's License tax is based on the value of receipts received for goods manufactured in the state, irrespective of whether they are sold within the state. Motiva's

annual liability for this tax fluctuates with volume and prices to incur between \$2,500,000 and \$4,500,000 over the last seven years.

The Wholesaler of Petroleum Products Gross Receipts tax is based on total gross receipts received on products that are sold for resale in the state. The average annual liability for this tax has been between \$300,000 and \$600,000 over the last seven years. The other gross receipts taxes incurred are fairly small, and are not discussed here. For the purposes of the economic impact research, the mid-point tax amounts are utilized as being representative of a typical operating year.

Figure 6

Tax Liability of Motiva Enterprises LLC Delaware City Refinery

Direct state and local revenues:	Amount
School taxes to NCCo	\$593,471
Property taxes to NCCo	\$267,561
Property taxes to Delaware City	\$150,000
Manufacturers License Tax (average)	\$3,500,000
Wholesaler of Petroleum Products Gross Receipts tax (average)	\$450,000
Total excluding payroll taxes	\$4,961,032
Payroll taxes (\$000)	\$3,440,686
Total	\$8,410,718

Center for Applied Demography and Survey Research, University of Delaware.

State and local government fiscal revenue arising directly and indirectly from the DCR is estimated at \$50 million based on average taxation rates. The model estimates the average tax incidence stemming from the refinery's operation including the tax on direct, indirect, and induced income.

Additional Impacts

As stated earlier, there are additional economic impacts associated with the DCR. These additional factors, which lie beyond the scope of the econometric model, are detailed below.

Retirees

Motiva Enterprises LLC pays pensions of Delaware City Refinery retirees. Two hundred and thirty five DCR retirees residing in Delaware receive income from Motiva.

Figure 7
Delaware City Refinery Retirees

	DE	NJ MD PA	Other
Retirees - Delaware City Refinery	235	55	52

Center for Applied Demography and Survey Research, University of Delaware.

Secure energy supply

The DCR is a source of secure heating fuel and propane for the downstate markets. For example, in winter, DCR will provide heating fuel for the poultry industry.

Observations

The purpose of this report is to measure the economic impact of Motiva Enterprises LLC Delaware City Refinery to the State of Delaware. The study is not intended to be an audit of Motiva's operations, its management, or an assessment of the desirability of the refinery.

Economic impact studies are used across the nation to measure the impact of various projects, events and industries. Such studies are used to understand the benefits that flow from a particular project, event or industry.

There are a number of findings that are worth reiterating.

- The DCR supports 3,227 jobs in the state through direct, indirect, and induced employment effects. This equates with 0.8% of total employment in the state.
- The DCR generates \$186 million in wages and salaries for the state in total economic impact, or 1% of total wages and salaries.
- Total state output resulting from the DCR and its indirect and induced effects is \$379 million. This equates to 1% of the state economy.
- State and local revenues are increased \$50 million by the operation of the refinery.
- Petroleum refining is a high multiplier industry. Therefore, the economic impact flowing from the industry is large relative to its size.
- The DCR is a supplier to several manufacturers in the state.
- The average salary of the DCR is 31% higher than the median household income for Delaware.

Appendix

Economic Impact of Motiva Enterprises LLC Delaware City Refinery

Economic Impact of Motiva Enterprises LLC Delaware City Refinery:

168 Industry Detail

	Employment (Private Nonfarm, thous)	Output (2002\$b)
Logging	0.000	0.000008
Sawmills and planing mills	0.000	0.000015
Millwork, plywood, and structural members	0.000	0.000023
Wood containers and misc. wood products	0.000	-0.000016
Wood buildings and mobile homes	0.000	0.000000
Household furniture	-0.002	-0.000228
Partitions and fixtures	0.000	-0.000015
Office and misc. furniture and fixtures	0.000	0.000004
Glass and glass products	0.001	0.000118
Hydraulic cement	0.000	0.000000
Stone, clay, and misc. mineral products	0.002	0.000390
Concrete, gypsum, & plaster products	0.008	0.001402
Blast furnaces and basic steel products	-0.001	-0.000422
Iron and steel foundries	0.000	-0.000021
Primary nonferrous smelting & refining	0.000	-0.000001
All other primary metals	0.000	-0.000007
Nonferrous rolling and drawing	-0.001	-0.000226
Nonferrous foundries	0.000	0.000000
Metal cans and shipping containers	0.000	0.000000
Cutlery, hand tools, and hardware	0.000	-0.000037
Plumbing and nonelectric heating equipment	-0.001	-0.000067
Fabricated structural metal products	-0.003	-0.000310
Screw machine products, bolts, rivets, etc.	0.000	-0.000027
Metal forgings and stampings	0.000	0.000001
Metal coating, engraving, and allied services	0.000	-0.000052
Ordnance and ammunition	0.000	0.000000
Miscellaneous fabricated metal products	-0.001	-0.000141
Engines and turbines	0.000	0.000000
Farm and garden machinery and equipment	0.000	0.000000
Construction and related machinery	0.000	0.000019
Metalworking machinery and equipment	0.000	-0.000001
Special industry machinery	0.000	-0.000002
General industrial machinery and equipment	0.000	0.000008
Computer and office equipment	-0.001	-0.000965
Refrigeration and service industry machinery	0.001	0.000582
Industrial machinery, nec	0.000	0.000093

Economic Impact of Motiva Enterprises LLC Delaware City Refinery

	Employment (Private Nonfarm, thous)	Output (2002\$b)
Electric distribution equipment	0.000	0.000000
Electrical industrial apparatus	0.000	0.000000
Household appliances	0.000	0.000000
Electric lighting and wiring equipment	0.000	0.000000
Household audio and video equipment	0.000	0.000000
Communications equipment	0.000	0.000000
Electronic components and accessories	0.000	0.000005
Miscellaneous electrical equipment	0.000	0.000002
Motor vehicles and equipment	0.004	0.004298
Aerospace	-0.001	-0.000118
Ship and boat building and repairing	0.000	-0.000023
Railroad equipment	0.000	0.000000
Miscellaneous transportation equipment	0.000	0.000000
Search and navigation equipment	0.000	-0.000087
Measuring and controlling devices	-0.005	-0.004246
Medical equipment, instruments and supplies	-0.001	-0.000627
Ophthalmic goods	0.000	-0.000008
Photographic equipment and supplies	0.000	0.000004
Watches, clocks, and parts	0.000	0.000000
Jewelry, silverware, and plated ware	0.000	0.000003
Toys and sporting goods	0.000	0.000013
Manufactured products, nec	0.000	0.000046
Meat products	0.000	-0.000077
Dairy products	0.000	-0.000051
Preserved fruits and vegetables	0.000	-0.000013
Grain mill products and fats and oils	0.000	-0.000046
Bakery products	0.000	-0.000017
Sugar and confectionery products	0.000	-0.000003
Beverages	0.000	-0.000122
Miscellaneous food and kindred products	0.000	-0.000057
Tobacco products	0.000	0.000000
Weaving, finishing, yarn, and thread mills	-0.001	-0.000204
Knitting mills	0.000	0.000000
Carpets and rugs	0.000	0.000000
Miscellaneous textile goods	0.000	-0.000148
Apparel	0.000	-0.000005
Miscellaneous fabricated textile products	0.000	0.000114
Pulp, paper, and paperboard mills	0.000	-0.000074
Paperboard containers and boxes	-0.001	-0.000218
Converted paper products except containers	-0.001	-0.000191
Newspapers	0.002	0.000139
Periodicals	0.000	0.000027

Economic Impact of Motiva Enterprises LLC Delaware City Refinery

	Employment (Private Nonfarm, thous)	Output (2002\$b)
Books	0.000	0.000013
Miscellaneous publishing	0.000	0.000044
Commercial printing and business forms	0.002	0.000228
Greeting cards	0.000	0.000000
Blankbooks and bookbinding	0.000	0.000004
Service industries for the printing trade	0.000	0.000006
Industrial chemicals	-0.039	-0.014916
Plastics materials and synthetics	-0.006	-0.004081
Drugs	-0.023	-0.008991
Soap, cleaners, and toilet goods	-0.026	-0.009897
Paints and allied products	0.000	-0.000093
Agricultural chemicals	0.000	-0.000025
Miscellaneous chemical products	0.000	-0.000143
Petroleum refining	0.675	1.513018
Miscellaneous petroleum and coal products	0.088	0.039384
Tires and inner tubes	0.000	0.000000
Rubber products and plastic hose and footwear	-0.001	-0.000163
Miscellaneous plastics products, nec	-0.003	-0.001050
Footwear, except rubber and plastic	0.000	0.000000
Luggage, handbags, and leather products, nec	0.000	-0.000007
Metal mining	0.000	0.000000
Coal mining	0.000	0.000000
Crude petroleum, natural gas and gas liquids	0.005	0.001697
Oil and gas field services	0.001	0.000021
Nonmetallic minerals, except fuels	0.019	0.001076
Construction	0.643	0.058918
Railroad transportation	0.006	0.001431
Trucking and warehousing	0.050	0.011635
Local and interurban passenger transit	0.008	0.000301
Air transportation	0.006	0.000861
Water transportation	0.009	0.001198
Pipelines, except natural gas	0.000	0.000021
Passenger transportation arrangement	0.011	0.000671
Miscellaneous transportation services	0.004	0.000231
Communications	0.011	0.001406
Electric utilities	0.116	0.082806
Gas utilities	0.000	0.000122
Water and sanitation	0.116	0.011232
Depository institutions	0.007	0.009211
Insurance carriers	0.016	0.002449
Insurance agents, brokers, and services	0.010	0.000521
Nondepository; holding and investment offices	0.029	0.001077

Economic Impact of Motiva Enterprises LLC Delaware City Refinery

	Employment (Private Nonfarm, thous)	Output (2002\$b)
Security and commodity brokers	0.007	0.000672
Real estate	0.050	0.026954
Eating and drinking places	0.107	0.004510
Retail trade, exc. eating and drinking places	0.248	0.018285
Wholesale trade	0.121	0.025112
Hotels and other lodging places	-0.007	-0.000360
Laundry, cleaning, and shoe repair	0.013	0.000732
Personal services, nec	0.010	0.000944
Beauty and barber shops	0.036	0.001177
Funeral service and crematories	0.002	0.000227
Electrical repair shops	0.004	0.000445
Watch, jewelry, & furniture repair	0.001	0.000049
Miscellaneous repair services	0.009	0.000509
Private households	0.007	0.000106
Automotive rentals, without drivers	0.001	0.001241
Automobile parking, repair, and services	0.023	0.003174
Advertising	0.008	0.001260
Services to buildings	0.041	0.001701
Miscellaneous equipment rental and leasing	0.005	0.000707
Personnel supply services	0.074	0.002278
Computer and data processing services	0.045	0.007987
Miscellaneous business services	0.089	0.006090
Producers, orchestras, and entertainers	0.003	0.000146
Bowling centers	0.001	0.000016
Commercial sports	0.008	0.000277
Amusement and recreation services, nec	0.012	0.000372
Motion pictures	0.002	0.000071
Video tape rental	0.002	0.000028
Offices of health practitioners	0.003	0.000494
Nursing and personal care facilities	0.001	0.000082
Hospitals	0.003	0.000512
Health services, nec	0.002	0.000154
Legal services	0.073	0.007106
Engineering and architectural services	0.041	0.004393
Research and testing services	0.015	0.001646
Management and public relations	0.067	0.005034
Accounting, auditing, and other services	0.040	0.001977
Educational services	0.025	0.001245
Individual and miscellaneous social services	0.005	0.000324
Job training and related services	0.003	0.000116
Child day care services	0.009	0.000204
Residential care	0.006	0.000183
Museums, botanical, zoological gardens	0.001	0.000060

Economic Impact of Motiva Enterprises LLC Delaware City Refinery

	Employment (Private Nonfarm, thous)	Output (2002\$b)
Membership organizations	0.012	0.000632
Agricultural services	0.015	0.000293
Forestry, fishing, hunting, & trapping	0.000	0.000014
Total	2.970	1.828

Note: totals may differ from aggregate numbers due to rounding.

REMI Policy Insight

REMI Policy Insight™ is the leading regional economic forecasting and policy analysis model. For this study, the REMI Policy Insight™ model for Delaware is employed. The model was built using the REMI model building system, which consists of hundreds of programs developed over the last two decades. The system assembled the Delaware model using data from the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Department of Energy, the Bureau of Census, and other public sources.

REMI Policy Insight™ is a structural model, meaning that it clearly includes cause-and-effect relationships. The model is based on two key underlying assumptions from mainstream economic theory: households maximize utility and producers maximize profits. Since these assumptions make sense to most people, lay people as well as trained economists can understand the model.

In the model, businesses produce goods to sell to other firms, consumers, investors, governments and purchasers outside the region. The output is produced using labor, capital, fuel, and intermediate inputs. The demand for labor, capital and fuel per unit of output depends on their relative costs, since an increase in the price of any one of these inputs leads to substitution away from that input to other inputs. The supply of labor in the model depends on the number of people in the population and the proportion of those people who participate in the labor force. Economic migration affects the population size. People will move into an area if the real after-tax wage rates or the likelihood of being employed increases in a region.

Supply and demand for labor in the model determine the wage rates. These wage rates, along with other prices and productivity, determine the cost of doing business for every industry in the model. An increase in the cost of doing business causes either an increase in prices or a cut in profits, depending on the market for the product. In either case, an increase in costs would decrease the share of the local and U.S. market supplied by local firms. This market share combined with the demand described above determines the

Economic Impact of Motiva Enterprises LLC Delaware City Refinery amount of local output. Of course, the model has many other feedbacks. For example, changes in wages and employment impact income and consumption, while economic expansion changes investment and population growth impacts government spending. Figure A is a pictorial representation of REMI Policy Insight. The Output block shows a business that sells to all the sectors of final demand as well as to other industries. The Labor and Capital Demand block shows how labor and capital requirements depend both on output and their relative costs. Population and Labor Supply contribute to demand and to wage determination. Economic migrants in turn respond to wages and other labor market conditions. Supply and demand interact in the Wage, Price and Profit block. Prices and profits determine market shares. Output depends on market shares and the components of demand.

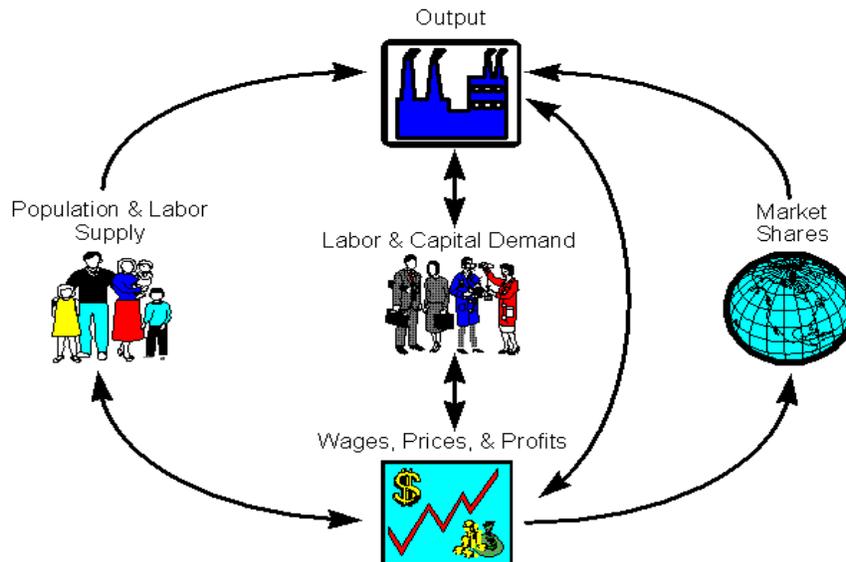


Figure A REMI Policy Insight™ overview

The REMI model brings together all of the above elements to determine the value of each of the variables in the model for each year in the baseline forecast. The model includes all the inter-industry interactions that are included in input-output models in the Output block, but goes well beyond an input-output model by including the linkages among all of the other blocks shown in Figure A.

In order to broaden the model in this way, it was necessary to estimate key relationships. This was accomplished by using extensive data sets covering all areas in the country. These large data sets and two decades of research effort have enabled REMI to

Economic Impact of Motiva Enterprises LLC Delaware City Refinery
simultaneously maintain a theoretically sound model structure and build a model based on all the relevant data available.

Figure B shows the policy simulation process for a scenario called Policy X. The effects of a scenario are determined by comparing the baseline REMI forecast with an alternative forecast that incorporates the assumptions for the scenario. The baseline REMI forecast uses recent data and thousands of equations to generate projected economic activity for a particular region. The policy variables in the model are set equal to their baseline value (typically zero for additive variables and one for multiplicative variables) when solving for the baseline forecast. To show the effects of a given scenario, these policy variables are given values that represent the direct effects of the scenario. The alternative forecast is generated using these policy variable inputs. Figure B shows how this process would work for a policy change called Policy X.

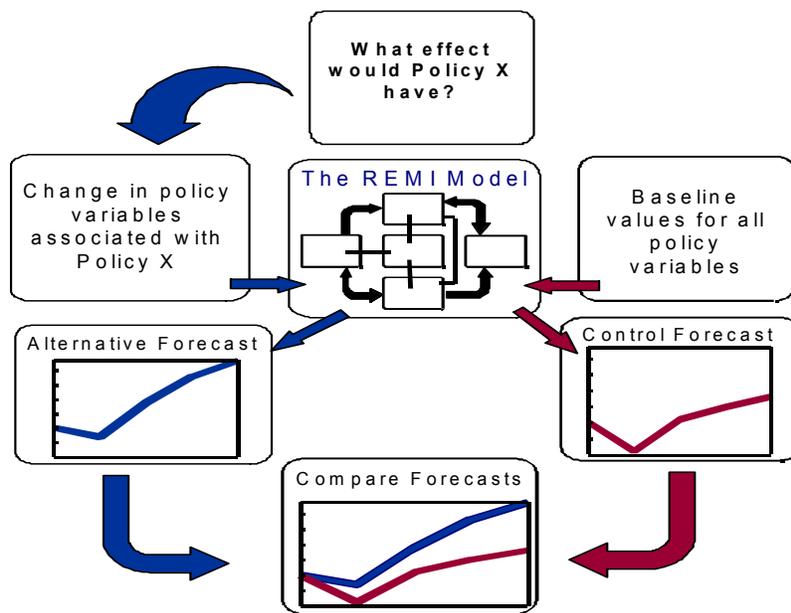


Figure B Policy X scenario

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