การเปลี่ยนแปลงและความผันผวนของราคาน้ำมันและผลกระทบต่อการว่างงานในสหรัฐอเมริกา

นาย แอ๊ดดี้ อดิศร วุฒิกุลเลิศ

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
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THE CHANGE AND FLUCTUATION IN THE PRICE OF OIL AND THEIR EFFECTS ON UNEMPLOYMENT IN THE UNITED STATES OF AMERICA

Mr. Addy Adisorn Vutikullird

A Thesis Submitted in Partial Fulfillment of the Requirements
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By	Mr. Addy Adisorn Vutikullird
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Thesis Advisor	Associate Professor Pornkamol Traiwittayanggoon, Ph.D.

Accepted by the Faculty of Economics, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

.....Dean of the Faculty of Economics
(Professor Teerana Bhongmakapat, Ph.D.)

THESIS COMMITTEE

.....Chairman
(Associate Professor Paitoon Wiboonchutikula, Ph.D.)

.....Thesis Advisor
(Associate Professor Pornkamol Traiwittayanggoon, Ph.D.)

.....Member
(Assistant Professor Worawet Suwanrada, Ph.D.)

..... Member
(Associate Professor Somchai Ratanakomut, Ph.D.)

แอ็ดดี้ อดิศร วุฒิกุลเลิศ: การเปลี่ยนแปลงและความผันผวนของราคาน้ำมันและผลกระทบต่อการว่างงานของประเทศสหรัฐอเมริกา (THE CHANGE AND FLUCTUATION IN THE PRICE OF OIL AND THEIR EFFECTS ON UNEMPLOYMENT IN THE UNITED STATES OF AMERICA) อ.ที่ปรึกษา: รศ.ดร.พรกมล ไตรวิทยางกูร, 203 หน้า

งานวิจัยฉบับนี้ศึกษาผลกระทบของ การเปลี่ยนแปลงและความผันผวนของราคาน้ำมัน ต่ออัตราการว่างงานในภาคธุรกิจต่างๆ โดยศึกษาจากข้อมูลวิกฤตราคาน้ำมันในปี1990 1999 และ 2003 และวิเคราะห์ข้อมูล โดยใช้การวิเคราะห์ถดถอยพหุคูณ (Multiple regression analysis) และวิธียกกำลังสองน้อยที่สุด (Ordinary least square) โดยใช้ข้อมูลตามลำดับเวลา โดยศึกษาผลิตภัณฑ์มวลรวม ในฐานะ ตัวแปรอิสระ ความผันผวนของราคาน้ำมัน คำนวน จากค่าความเบี่ยงเบนมาตรฐาน ของ ราคาน้ำมันในแต่ละวันของเดือน ขอบเขตการศึกษา คือประเทศสหรัฐอเมริกา ซึ่งอาจกล่าวได้ว่า น้ำมันมีความสำคัญและมีความสัมพันธ์พิเศษ สำหรับประเทศสหรัฐอเมริกา เพราะสหรัฐอเมริกา เป็นประเทศที่มีความต้องการ ใช้น้ำมัน เป็นลำดับต้นๆนอกจากนี้ยังเป็นผู้นำเข้าน้ำมันรายใหญ่ที่สุด และเป็นผู้ผลิตน้ำมันที่สำคัญอีกด้วย

ผลการวิจัยพบว่าในบางภาคธุรกิจ การเปลี่ยนแปลงและความผันผวนของราคาน้ำมัน ส่งผลกระทบต่ออัตราการว่างงาน ทั้งนี้ปัจจัยที่ส่งผลต่ออัตราว่างงานมากที่สุดคือตัวเลข ผลิตภัณฑ์มวลรวม ดังนั้นปัจจัยสำคัญในการควบคุมอัตราการว่างงานคือส่งเสริมให้เกิดความจำเริญเติบโตทางเศรษฐกิจคงที่ยั่งยืนช่วยส่งผลต่อการว่าจ้างทำงานในที่สุด มีแนวคิดที่ว่าภาคธุรกิจที่ใช้พลังงานหรือใช้ทุนสูงเป็นหลักจะได้รับผลกระทบจากความผันผวนของราคาน้ำมันแต่ผลการศึกษาครั้งนี้พบว่าไม่สอดคล้องกับแนวคิดดังกล่าว .

สาขาวิชาเศรษฐศาสตร์และการเงินระหว่างประเทศ ลายมือชื่อนิสิต.....

ปีการศึกษา 2550 ลายมือชื่ออาจารย์ที่ปรึกษา.....

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KEYWORD: UNEMPLOYMENT/OIL PRICE/OIL FLUCTUATION/AMERICA

ADDY ADISORN VUTIKULLIRD: THE CHANGE AND FLUCTUATION IN THE PRICE OF OIL AND THEIR EFFECTS IN THE UNITED STATES OF AMERICA. THESIS ADVISOR: PORNKAMOL MANAKIT, Ph.D, 204 pp.

This research studies the effect of the change and fluctuation in price of oil on unemployment rate divided into different sectors. The Oil Price Shock of 1990, Oil Price Shock of 1999, and the Oil Price Shock of 2003 are the three oil price shocks studied. Multiple regression analysis and ordinary least square is performed on time series data. GDP is also studied and is an independent variable. Oil Price fluctuation is defined as the standard deviation of the daily price of oil for the month. The area of study is America. Oil and America is described as having an important and special relationship. America is a top consumer of oil and not only that but America is a leader in importing of oil. However, America is a top producer of oil.

This research finds that in some sectors oil price change and/or fluctuation does have an effect on unemployment rate. What matters most to unemployment rate is GDP, not oil price change and/or fluctuation. To control unemployment rate the key will be to encourage and support GDP growth consistent with maintainable economic progress. It was thought that the more energy intensive or capital intensive a sector was the more it would be affected by oil price change and fluctuation but these were found to not be good measures.

Field of Study: International Economics and Finance Student's Signature:.....

Academic Year: 2007 Advisor's Signature:.....

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List of Abbreviations

ads : Advertisements

BLS : Bureau of Labor Statistics

BP : British Petroleum

CITGO : Cities Services Company Go

CPS : Current Population Survey

D.C. : District of Columbia

EIA : Energy Information Administration

FEMA : Federal Emergency Management Agency

GDP : Gross Domestic Product

GDP (in Chapter 5): percent change in Gross Domestic Product

MSNBC : Microsoft and National Broadcasting Company

NAICS : North American Industry Classification System

NBER : National Bureau of Economics Research

n.d. : no date

NYMEX : New York Mercantile Exchange

OECD : Organization for Economic Cooperation and Development

OF: Oil Price Fluctuation

OP: Percent Change In Oil Price

OPEC: Organization of Petroleum Exporting Countries

SIC : Standard Industrial Classification

U.S. : United States

VAR : Vector Autoregression

WTI : West Texas Intermediate

CHAPTER I

INTRODUCTION

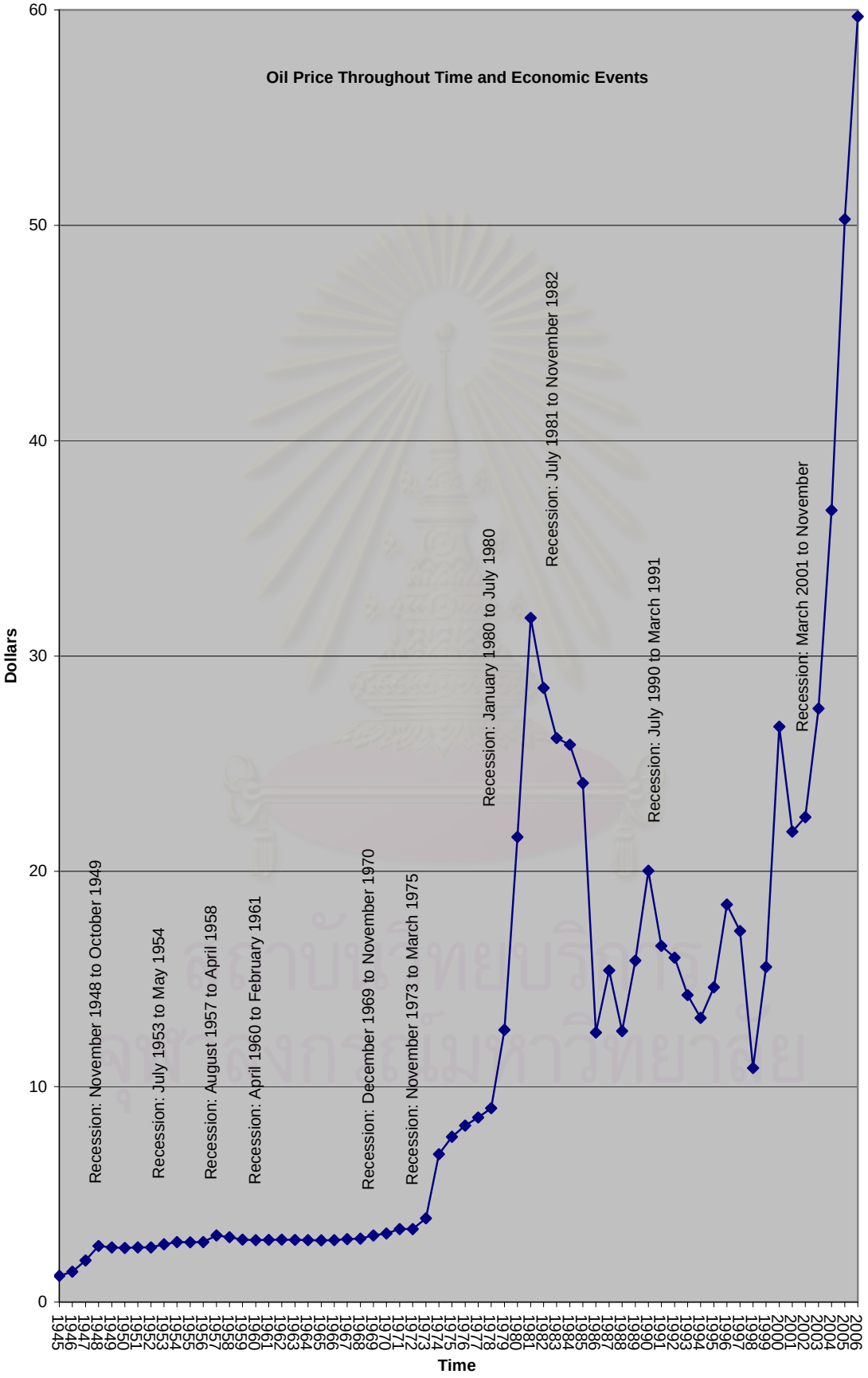
1.1 Background/ Rationale/ Problems

The price of oil has changed and fluctuated greatly in previous decades. When looking at the recessions that the United States has faced in the past six decades, the overwhelming majority have all occurred with a dramatic increase in the price of oil (Figure 1.1). It is therefore very important and interesting to study the price of oil and its effect on the American economy. Specifically, one of the most important economic variables is unemployment. It strikes at the heart of everyone because it deals with the basic right of livelihood.

A lot of literature such as that by Davis and Haltiwanger (2001), Labonte (2004), Carruth, Hooker, and Oswald (1998), Hamilton (1983), Hamilton (1996), Gisser and Goodwin (1986), and Uri (1996) show that the change and/or the fluctuation in the price of oil does increase unemployment (or have an effect on the economy). Burbidge and Harrison (1984) show mixed results in their study. They find that the Oil Shock of 1973-1974 has minimal effects on the economy but that the Oil Shocks of 1979 to 1980 have a considerable effect on the economy. Darby (1982) also has mixed results. However, research by Prakash Loungani (1996) find that oil price change has little or no effect on unemployment.

Surprisingly, Carruth, Hooker, and Oswald (1998) and Labonte (2004) tell us that a ten percent increase in oil price increases unemployment by 0.1 percentage points. Oil price shocks are sometimes very poignant, increasing by a hundred percent. If Carruth, Hooker, and Oswald (1998) are correct, then oil price shock should have a large effect on unemployment. Uri (1996) studied oil price fluctuation and its affect on unemployment and

Figure 1.1 Oil Price Throughout Time and Economic Events



Source: graph calculations done by author based on data from National Bureau of Economic Research (2003) and U.S. Department of Energy/ EIA's "Domestic Crude Oil First Purchase Prices" (2007)

find that oil price fluctuation does have an effect on unemployment. It is therefore important to see if fluctuation and change in oil prices has an effect on unemployment.

This study differs from those past researchers because it looks in depth at the three recent oil shocks. To current knowledge no significant published research has studied the two recent Oil Shocks of 1999 and 2003. This research differs from the other past research by either econometric method used, oil shocks studied, the frequency of the data used, or the examination of the impact of the increase in oil price on unemployment rate of various sectors. When there is a difference in impact amongst the different sectors, this study tries to explain why. The study of the different impact on different sectors is similar to the Davis and Haltiwanger (2001) study which breaks down unemployment in manufacturing into different sectors. However, this research not only concentrates on looking at the different sectors in manufacturing, but also many other sectors beyond and besides manufacturing, such as construction and mining. Many researchers have not also focused on the fluctuation of oil price. Different from many other studies, fluctuation of oil price (defined as the standard deviation of the month's oil prices) is one of the focuses of this research.

It is important to find if oil price change and fluctuation has an effect on aggregate unemployment rate and unemployment rate divided into different sectors.

1.2 Objectives

The objective is to determine the impact of large oil price increase and fluctuation on unemployment rate in different sectors and in total.

1.3 Scope

The time covered for the 2003 Oil Shock is from September 2002 to September 2006. For the 1999 Oil Shock, the time covered is from August of 1998 to October of 2002. For the 1990 Oil Shock, the time covered is from June of 1989 to March of 1992.

There are two sets of unemployment data from the U.S. Department of Labor. One set of unemployment data is from 1976 to 2002 which uses the Standard Industrial Classification (SIC). The other set is from 2000 to 2006 which uses the North American Industry Classification System (NAICS). The U.S. Department of Labor started changing the way they classify data in the year 2000 into the NAICS. The U.S. Department of Labor started to use the NAICS system. Yet from 2000 to 2002 the U.S. Department of Labor used both the NAICS and SIC system. So, they retained the use of SIC format/system for the years 2000 to 2002 and did not do away with the SIC format/system completely until 2002. From 2000 onwards it is possible to obtain data in the NAICS format. Thus, NAICS system is used for the Oil Price Shock of 2003 in this research. Whereas, the SIC format/system is used for the Oil Price Shock of 1999 and 1990.

The way SIC and NAICS breakdown the unemployment into sectors is different. Both sets of data may have the same name for a certain sector, but this does not mean that the name represents the exact same sector because the composition and how each sector (even with the same name) is measured may be different. Also, the SIC data for 1976 to 2002 have certain sector titles that the NAICS data for 2000 to 2006 does not have, and vice versa.

1.4 Research Methodology

1.4.1 Measurement and Data

Unemployment Data

Unemployment data is obtained from the United States Department of Labor. The unemployment data is the percent change in unemployment rate from one month to another. For the 2003 oil price shock, unemployment in the sectors that are looked at are: Total; Mining; Construction; Manufacturing; Manufacturing (durables); Nonmetallic Mineral Products; Primary And Fabricated Metal Products; Machinery Manufacturing; Computer And Electronic Products; Electrical Equipment And Appliances; Transportation Equipment; Wood Products; Furniture And Fixtures; Miscellaneous Manufacturing; Manufacturing (Nondurables); Food Manufacturing; Beverage And Tobacco Products; Textile, Apparel, And Leather; Paper And Printing; Petroleum and Coal Products; Chemicals; Plastic and Rubber Products; Wholesale And Retail Trade; Wholesale Trade; Retail Trade; Transportation And Utilities; Transportation And Warehousing; Utilities; Information; Publishing, Except Internet; Motion Picture And Sound Recording Industries; Broadcasting, Except Internet; Telecommunications; Internet Service Providers And Data Processing Services; Other Information Services; Financial Activities; Finance And Insurance; Finance; Insurance; Real Estate And Rental And Leasing; Real Estate; Rental And Leasing Services; Professional And Business Services; Professional And Technical Services; Management, Administrative, And Waste Services; Administrative And Support Services; Waste Management And Remediation Services; Education And Health Services; Educational Services; Health Care And Social Assistance; Hospitals; Health Services, Except Hospitals; Social Assistance; Leisure and Hospitality; Arts, Entertainment, And Recreation; Accommodation and Food Services;

Accommodation; Food Services And Drinking Places; Personal And Laundry Services; Membership Associations And Organizations; Government Workers.

For the 1999 oil price shock, the sectors in which unemployment are looked at are: Total; Goods-Producing Industries (Agriculture, Mining, Construction, Manufacturing); Service-Producing Industries (Nonagriculture Less Mining, Construction, & Manufacturing); Mining; Construction; Manufacturing; Manufacturing (Durables); Lumber And Wood Products (Except Furniture); Furniture And Fixtures; Stone, Clay, And Glass Products; Primary Metal Industries; Fabricated Metal Industries (Includes Ordinance); Machinery, Except Electrical; Electrical Machinery, Equipment, And Supplies; Transportation Equipment; Motor Vehicles And Equipment (Automobiles); Professional And Photographic Equipment And Watches; Manufacturing (Nondurables); Food And Kindred Products; Textile Mill Products; Apparel And Other Fabricated Textile Products; Paper And Allied Products; Printing, Publishing, And Allied Industries; Chemicals And Allied Products; Petroleum And Coal Products; Rubber And Miscellaneous Plastic Products; Leather And Not Specified Manufacturing; Transportation, Communication, And Other Public Utilities; Trade (Wholesale And Retail); Wholesale Trade (Other Industries Except Retail Trade); Retail Trade; Eating And Drinking; Finance, Insurance, And Real Estate; Professional Services; Hospitals; Educational Services; Forestry And Fisheries; Public Administration.

For the 1990 oil price shock, unemployment in the sectors that are looked at are: Total; Goods-Producing Industries (Agriculture, Mining, Construction, Manufacturing); Service-Producing Industries (Nonag Less Mining, Construction, & Manufacturing); Mining; Construction; Manufacturing; Manufacturing (Durables); Lumber And Wood Products (Except Furniture); Furniture And Fixtures; Stone, Clay, And Glass Products; Primary Metal; Fabricated Metal; Machinery, Except Electrical; Electrical Machinery, Equipment, And

Supplies; Transportation Equipment; Motor Vehicles And Equipment (Automobiles); Other Transportation Equipment Except Autos And Aircraft; Professional And Photographic Equipment And Watches; Manufacturing, Nondurables; Food And Kindred Products; Tobacco; Textile Mill Products; Apparel And Other Fabricated Textile Products; Paper And Allied Products; Printing, Publishing, And Allied Industries; Chemicals And Allied Products; Petroleum And Coal Products; Rubber And Miscellaneous Plastic Products; Leather And Not Specified Manufacturing; Transportation, Communication, And Other Public Utilities; Communications; Other Public Utilities Except Communications; Trade (Wholesale And Retail); Wholesale Trade (Other Industries Except Retail Trade); Retail Trade; Eating And Drinking; Finance, Insurance, And Real Estate; Banking And Other Financial Organizations; Insurance And Real Estate; Entertainment And Recreation Services; Professional Services; Hospitals; Medical, Except Hospital; Educational Services; Welfare And Religious Services; Other Professional Services (Not Medical, Hospital, Welfare And Education); Forestry And Fisheries; Public Administration.

Price of Oil Data

Oil price data is obtained from the United States Department of Energy. The price of oil is the averaged of the daily price of oil for the month. Then the percent change in the month's price of oil is found by taking the difference between the prior month and the current month divided by the prior month and multiplied by one hundred. The type of crude oil used in this study is the West Texas Intermediate crude oil. According to interview of Petroleum Expert Elizabeth Scott from the U.S. Department of Energy it was recommended to use West Texas Intermediate as the type of crude oil for use in this report. WTI crude oil "price is quoted in many sources," says Elizabeth Scott. WTI crude oil is a type of crude oil that is "traded themselves or whose prices are reflected in other types of crude oil." It is "an ideal

crude oil to be refined in the United States" and is "the major benchmark of crude oil in the Americas." The NYMEX futures price of crude oil is "reported in almost every major newspaper in the United States, represents (on a per-barrel basis) the market-determined value of a futures contract to either buy or sell 1,000 barrels of WTI or some other light, sweet crude oil at a specified time." "Typically the NYMEX futures prices tracks within pennies of the WTI spot prices" (U.S. Department of Energy/ EIA's "Pricing Differences Among Various Types of Crude Oil", 2006: 1).

Oil Price Fluctuation

The standard deviation of daily price of oil for the month is the measure of oil price fluctuation.

GDP Data

The GDP percent change data is found from the U.S. Department of Commerce. Quarterly GDP percent change is converted to monthly percent change in GDP.

1.4.2 Research Methods

Multiple regression analysis and ordinary least square is performed on time series data. This study looks at the unemployment rates broken down in different sectors to see how various American sectors are affected by the change and fluctuation in the price of oil. GDP is also included as an independent variable. An easy example is the Motor Vehicles And Equipment (Automobiles) sector. This sector is shown to have a large impact from the increase in price of oil. Thus, one can look into this sector and find from Hinton et al (1999) that 45.7 percent of oil is made into motor gasoline. Also the transportation sector obtains 96 percent of energy from oil U.S. Department of Energy/ EIA's Annual Energy Review 2006: "U.S. Primary Energy Consumption By Source and Sector" (2007). This sector is thus concerned greatly with oil. Motor Vehicles And Equipment (Automobiles) sector is be

greatly affected by the rise in price of oil as people find alternative means of transportation or cut down on the use of automobiles. Analysis and Interpretation of the differing outcomes for the various sector is done.

There is a lag of time between oil price shock and a large decline in output and unemployment. Thus, each dependent variable has a lag factor added to it, if applicable, in every equation.

Following is a general form equation for the sector of Total. Please see Measurement and Data section for an extensive list of sectors covered.

$UN\ (Total)_t = \beta_1 + \beta_2 GDP_t + \beta_3 OP_t + \beta_4 OF_t + \varepsilon_t$

Definitions:

β_1 = y intercept, initial/natural rate of unemployment (percent change)

UN_t = UN = percent change in unemployment rate

β_2 =coefficient for percent change in Gross Domestic Product

GDP_t = percent change in Gross Domestic Product

β_3 =coefficient for percent change in oil price

OP_t = percent change in oil price

β_4 = coefficient for oil price fluctuation

OF_t = oil price fluctuation (standard deviation)

ε_t = residual

H_0 = no effect, $\beta_2 = 0$, $\beta_3 = 0$, $\beta_4 = 0$, $\beta_5 = 0$

Two tail test will be used.

$H_1 \neq 0$, $\beta_2 \neq 0$, $\beta_3 \neq 0$, $\beta_4 \neq 0$, $\beta_5 \neq 0$

1.5 The Way the American Government Gets Unemployment Rate Data and Specifically Unemployment Data by Sector

The program of the U.S. Department of Labor called the Current Population Survey (CPS) is whereby America obtains unemployment rate data. The Current Population Survey is "conducted" by the U.S. Department of Commerce/ Census Bureau "for" the US. Department of Labor/ Bureau of Labor Statistics (U.S. Department of Commerce/ Census Bureau's "ask.census.gov", 2006: 1). The Bureau of Labor Statistics announces the findings and analyzes the data U.S. Department of Labor/ BLS's "How the Government Measures Unemployment" (2001). "CPS data are used by government policymakers and legislators as important indicators of our nations's economic situation and for planning and evaluating many government programs. They are also used by the press, students, academics, and the general public" (U.S. Department of Commerce/ Census Bureau's "Current Population Survey", 2006: 1). The Current Population Survey has been done for over fifty years. Unemployment Rate Data is obtained by surveying approximately sixty thousand households in America every month. The Current Population Survey is conducted to be "representative of the entire population of the United States" (U.S. Department of Labor/ BLS's "How the Government Measures Unemployment", 2001: 1). Every month, 1,500 very experienced and trained Census Bureau employees interview people from a sample of sixty thousand households. The U.S. Census Bureau employees try to acquire information on the "labor force activities" (U.S. Department of Labor/ BLS's "How the Government Measures Unemployment", 2001: 1) of the people in the sixty thousand households. The interviewers try to obtain information about everyone in the sixty thousand households who is sixteen years old or older U.S. Department of Labor/ BLS's "How the Government Measures Unemployment" (2001).

The interview questions are very structured. There is a quality of double blindness in the interview. Questions that specifically ask the respondents whether they are unemployed, employed, or not in the labor force are not asked. They are not given the chance to determine their own labor force status. Many respondents do not know their labor force status after the interview is completed. Labor force status is not determined by the interviewers. Census Bureau interviewers ask questions in the set and prearranged way and record the answers given. The answers are recorded on the laptop computers of the interviewers. After each day's interviewing, the information is sent to U.S. Census Bureau's computer located in Washington, D.C. U.S. Department of Energy/ EIA's "How the Government Measures Unemployment" (2001). The Census Bureau's computer is the unit that determines the labor force status and characteristic of the people in the household sample "based on the information collected and the definitions programmed into the computer" (U.S. Department of Labor/ BLS's "How the Government Measures Unemployment", 2001: 1).

The training of the interviewers is very intense and the quality assurance of the program is very rigorous. This is because the "same procedures" must be adhered to procure reliable outcomes. U.S. Census Bureau interviewers go through "classroom lectures, discussion, practice, observation, home-study materials, and on-the-job training." At least once a year, a supervisor goes along with the interviewer for a whole day of interviewing. Interviewers must assemble once a year for "day-long training and review sessions" (U.S. Department of Labor/BLS's "How the Government Measures Unemployment", 2001: 1). Every month, some households are interviewed again to ascertain if the information obtained in the first interview was correct U.S. Department of Labor/ BLS's "How the Government Measures Unemployment" (2001).

People are classified as unemployed if they are jobless people that are looking for a job and are available for work. People are classified as employed if they have a job. People are classified as not in the labor force if they can neither be classified as employed or unemployed.

More specifically, people are assigned employed status if they "did any work at all for pay or profit during the survey week." This would include "all part-time and temporary work" and "regular full-time year-round employment." People who "have a job" but did not work during the survey week "because they were: On vacation; Ill; Experiencing child-care problems; Taking care of some other family or personal obligation; On maternity or paternity leave; Involved in an industrial dispute; or Prevented from working by bad Weather" (U.S. Department of Labor/BLS's "How the Government Measures Unemployment", 2001: 1) are still considered employed.

An example of how specific the Current Population Survey can be is the section of "unpaid family workers." These people are considered employed. People who work in a "family-operated enterprise" more than or equal to 15 hours in a week but do not receive pay are considered employed but part of a division named "unpaid family workers." This is because these people "contribute significantly" to America's "productive effort" (U.S. Department of Labor/BLS's "How the Government Measures Unemployment", 2001: 1). In retail trade and agriculture, they are especially important U.S. Department of Labor/BLS's "How the Government Measures Unemployment" (2001).

People are assigned unemployed status if they "do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work." However, activities considered as actively looking for work include "Contacting: An employer directly or having a job interview; A public or private employment agency; Friends or relatives; A

school or university employment center; Sending out resumes or filling out applications; Placing or answering advertisements; Checking union or professional registers; or Some other means of active job search" (U.S. Department of Labor/BLS's "How the Government Measures Unemployment", 2001: 1).

Apart from "active" means of job searching is the "passive" job searching which is "attending a job training program or course" or "merely reading the want ads." People participating in only passive means of job searching are not considered unemployed. They are considered as not in the labor force. This is because passive job searching usually do not result in "contacting potential employers" (U.S. Department of Labor/BLS's "How the Government Measures Unemployment", 2001: 1). Those not in the labor force are people that can not be defined as employed or unemployed. People who are inmates of institutions, on active duty in the military, and are fifteen years old or under, are considered not in the civilian labor force. Many who are not considered in the labor force are because they are attending school, retired, physically disabled, or mentally disabled U.S. Department of Labor/BLS's "How the Government Measures Unemployment" (2001).

Many people believe that unemployment rate data come from data obtained when people claim for unemployment. This is not true in America. The U.S. Department of Labor does not obtain the official unemployment data this way. There are many people who "unemployed workers who have not yet earned benefit rights (new entrants or reentrants to the labor force)," "exhausted their benefits," "Disqualified workers whose unemployment is considered to have resulted from their own actions rather than from economic conditions, for example, a worker discharged for misconduct on the job," and "eligible unemployed persons who do not file for benefits" (U.S. Department of Labor/BLS's "How the Government Measures Unemployment", 2001: 1).

To determine what sector to classify a person as belonging to, the interviewer asks questions to help ascertain this sector information. Respondents are assigned to the sector of the job that they most previously held or currently hold. Information is obtained by simply asking the respondent. For an example, if they are unemployed in the current month but was employed in the previous month, then the sector that they were employed in the previous month is the sector that they are classified as belonging to. This is according to interview of Teri Morisi of the U.S. Department of Labor.

CHAPTER II

OIL AND AMERICA

America is a leader in consumption of oil in the world. Developed nations consume more oil than developing nations. America is the leader in importing oil in the world. America has a Strategic Petroleum Reserve which is the largest "emergency oil stockpile in the world" (U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States", 2005: 1). Although America is a leader in consumption and importation of oil in the world, it also is the third largest producer of oil in the world. Also, America just discovered oil in September of 2006 which could increase its oil reserves by fifty percent. Oil is used for many different sectors from asphalt and road oil to medicinal salves and ointments. The transportation sector obtains 96 percent of energy from petroleum and the industrial sector obtains 43 percent of energy from the petroleum.

2.1 What is Oil?

Oil is the remains of "tiny sea plants and animal" (U.S. Department of Energy/ EIA's "Petroleum (Oil)", 2006: 1) that is buried on the ocean floor. Silt and sand covered these remains continuously for millions of years. Extremely large amounts of heat and pressure turned these remains of "tiny sea plants and animal" remains into oil and gas U.S. Department of Energy/ EIA's "Petroleum (Oil)" (2006). Oil along with coal and natural gas are called fossil fuels because they are the result of remains of dead plants and animals. Oil is also called a nonrenewable energy source because it is being used up and "can not recreate in a short period of time." While energy sources such as wind and hydropower are called renewable energy sources since they can be "replenished in a short period of time" (U.S. Department of Energy/EIA's What is Energy?", n.d: pg. 1). In current time, to get oil,

engineers drill below to the remains of the animals and plants which is now “oil and gas deposits.” They must drill pass the layers of “sand, silt, and rock” (U.S. Department of Energy/ EIA’s “Petroleum (Oil)”, 2006: 1).

2.2 America’s Consumption of Oil

“Oil is the lifeblood of America’s economy.” It “supplies more than 40 percent of our total energy demands” (U.S. Department of Energy’s “Oil”, n.d.: 1). America consumes more than one fourth of the petroleum that is consumed throughout the world U.S. Department of Energy/ EIA’s “Energy Infocard” (2006). America consumes a lot of oil per day per capita. This can be seen from the following comparison and illustration. Developed nations consume more oil per day per capita than developing nations.

Table 2.1 Comparison Between OECD and non-OECD Nations Daily Consumption of Oil Per Capita

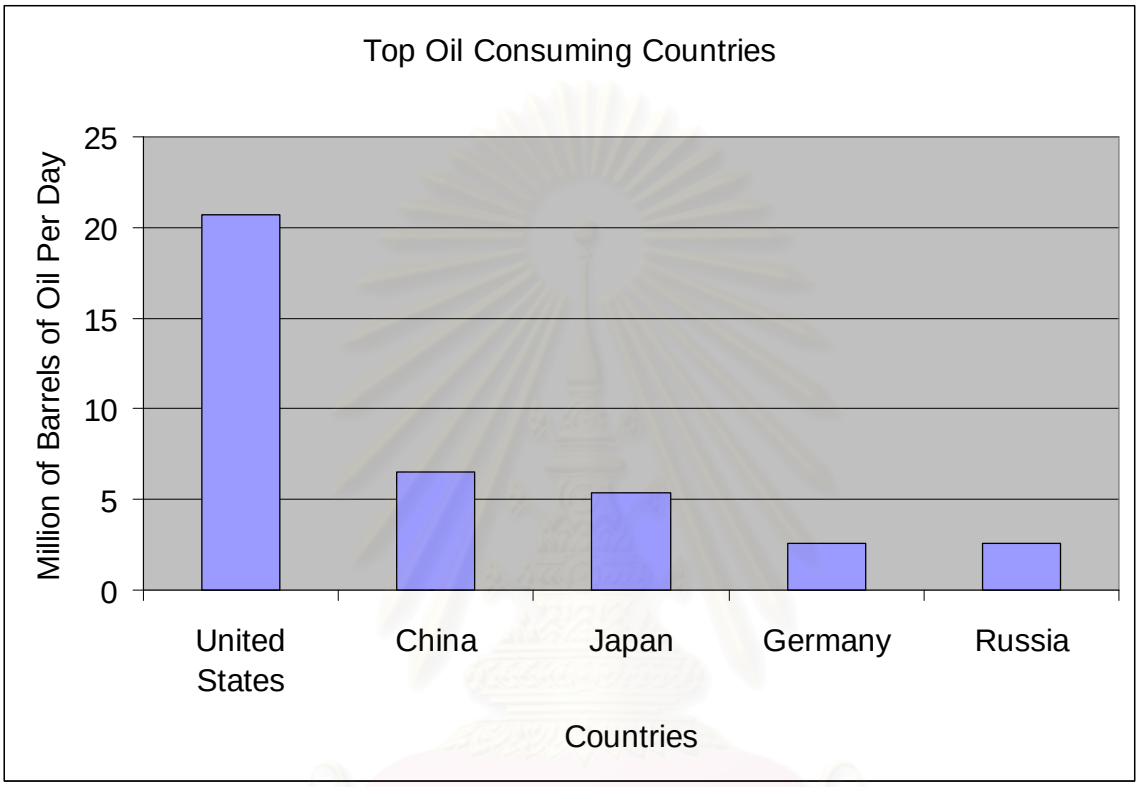
Entities	Daily Consumption of Oil
United States and Canada	3 Gallons Per Capita
Other OECD Countries	1.4 Gallons Per Capita
Countries Not in OECD	0.2 Gallons Per Capita

Source: U.S. Department of Energy/ EIA’s “Demand” (n.d.)

Nations that are members of the Organization for Economic Cooperation and Development (OECD) consumed nearly 2/3 of the world daily oil consumption. America and Canada are at the top of the list of OECD countries that consume the most oil per day per capita. America and Canada consume 3 gallons of oil per day per capita. While, other OECD countries consume only 1.4 gallons of oil per day per capita. “The difference is these countries’ transportation sectors, with their dependence on private vehicles to travel relatively long distances” (U.S. Department of Energy/ EIA’s “Demand”, n.d.: 1).

Of the countries that are not part of OECD, these countries consume only 0.2 gallons of oil per day per capita U.S. Department of Energy/ EIA's "Demand" (n.d.).

Figure 2.1 Top Oil Consuming Countries



Source: U.S. Department of Energy/ EIA's "Top World Oil Consumers" (2005)

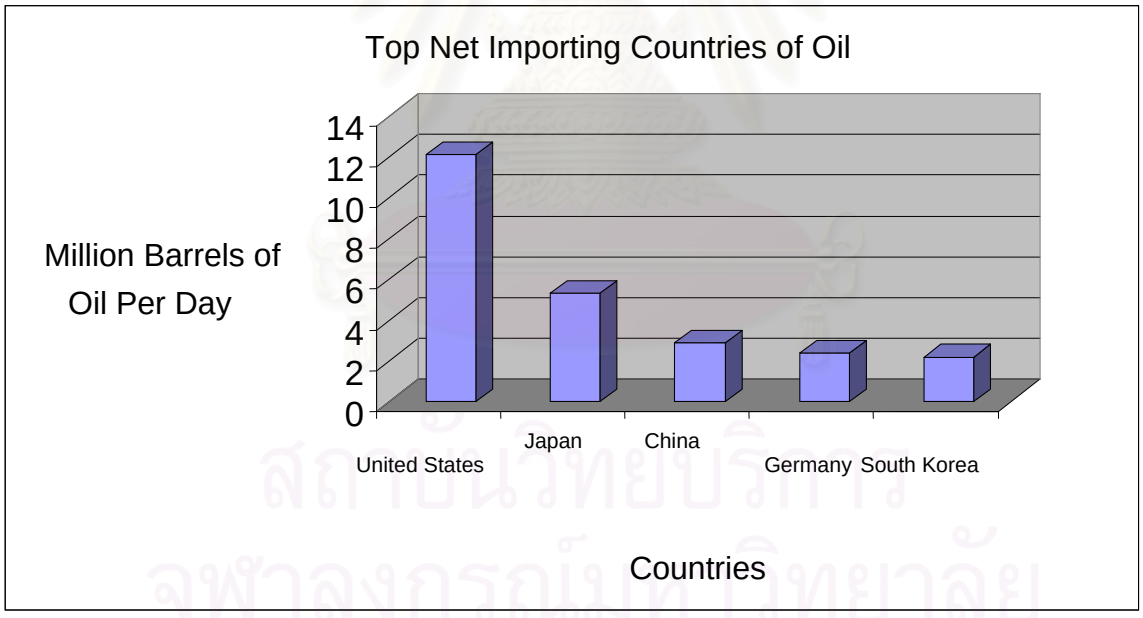
The United States, China, Japan, Germany, and Russia are the top five countries in consuming crude oil. The United States is the leader in consumption of oil with 20.7 million barrels consumed per day in 2004. China consumed 6.5 million barrels per day, Japan consumed 5.4 million barrels per day, Germany consumed 2.6 million barrels per day, and Russia consumed 2.6 million barrels per day U.S. Department of Energy/ EIA's "Top World Oil Consumers" (2005). The U.S. Department of Energy forecasts that petroleum consumption in the United States is to increase about 1.5 percent per year and in the year

2025, petroleum consumption is estimated to be 27.9 million barrels per day U.S. Department of Energy/ EIA's "Petroleum Products Information Sheets" (2006).

In 2005, the consumption of petroleum in the United States of America as a percentage of GDP was 2.346 percent. This is calculated from U.S. Department of Energy/EIA's "Petroleum Overview" (2006) "Crude Oil Domestic First Purchase Prices" (2006) and "Population, U.S. Gross Domestic Product, and Implicit Price Deflator" (2006). Thus, the consumption of petroleum as a percentage of America's GDP is a significant amount.

2.3 America As an Importer of Oil

Figure 2.2 Top Net Importing Countries of Oil



Source: U.S. Department of Energy/ EIA's "Top World Oil Net Importers" (2005).

Not only is the United States, the leader in oil consumption in the world, it is also the leader in net importing of oil. America imported 12.1 million barrels of oil per day in 2004 U.S. Department of Energy/ EIA's "Top World Oil Net Importers" (2005). During the last week of September 2006, America imported 13,216,000 barrels of crude oil and petroleum

products per day. During the last week of September 2006, America exported 1,289,000 barrels of crude oil and petroleum products per day. The net crude oil and petroleum products imported was 11,927,000 U.S. Department of Energy/ EIA's "Petroleum Navigator: Weekly Imports and Exports" (2007). Thus, the situation of oil and America is complex because the United States consumes a lot of crude oil, but this consumption is mostly of imported oil which makes America reliant on foreign oil. However, America produces a lot of crude oil. America is the third in the world in production of oil and America exports a lot of crude oil. More will be explained and seen about this in section 2.10 America as a Producer of Oil.

2.4 A Perspective on American Dependence and Possible Reductions

Feinstein (2003) provided a perspective on America's dependence on oil that says America use of petroleum by automobiles and light trucks constitutes only 40 percent of the total petroleum use. The commercial and residential sector's heating uses only 6 percent of the total petroleum use. While electricity only uses 1.5 percent. It is the industrial sector that uses a lot of petroleum; it uses 50 percent. Most of the use of petroleum by industry is for inputs for making petrochemical products such as plastics. This type of use of petroleum will be difficult to reduce.

Nevertheless, Feinstein (2003) says the use of oil as a gasoline can be reduced. If America reduces its consumption of oil as gasoline, it can become less dependent on oil. Oil's use in commercial and residential heating can also be reduced. These things combined can help America reduce its need for oil.

2.5 Places That America Imports Oil From and America's Dependence on Foreign Sources of Oil

America is dependent on oil and therefore oil is important to America. The recessions in the past 40 years have occurred after a large increase in the price of oil. It will be difficult to eliminate America's dependence on oil, especially foreign oil. Even if America eliminated its need for foreign oil, America would still be vulnerable to the world oil price. This is because America exports oil. "A rise in the world oil price would induce an increase in U.S. oil exports until domestic and global oil exports were equal." America's energy outlook is that America will need oil imports for the "indefinite future" (Feinstein, 2003: 1). However, if America were to cut oil imports by half, America's vulnerability to world oil price increases or swings would be greatly reduced Feinstein (2003).

Table 2.2 Top Countries Where America Imports Oil From

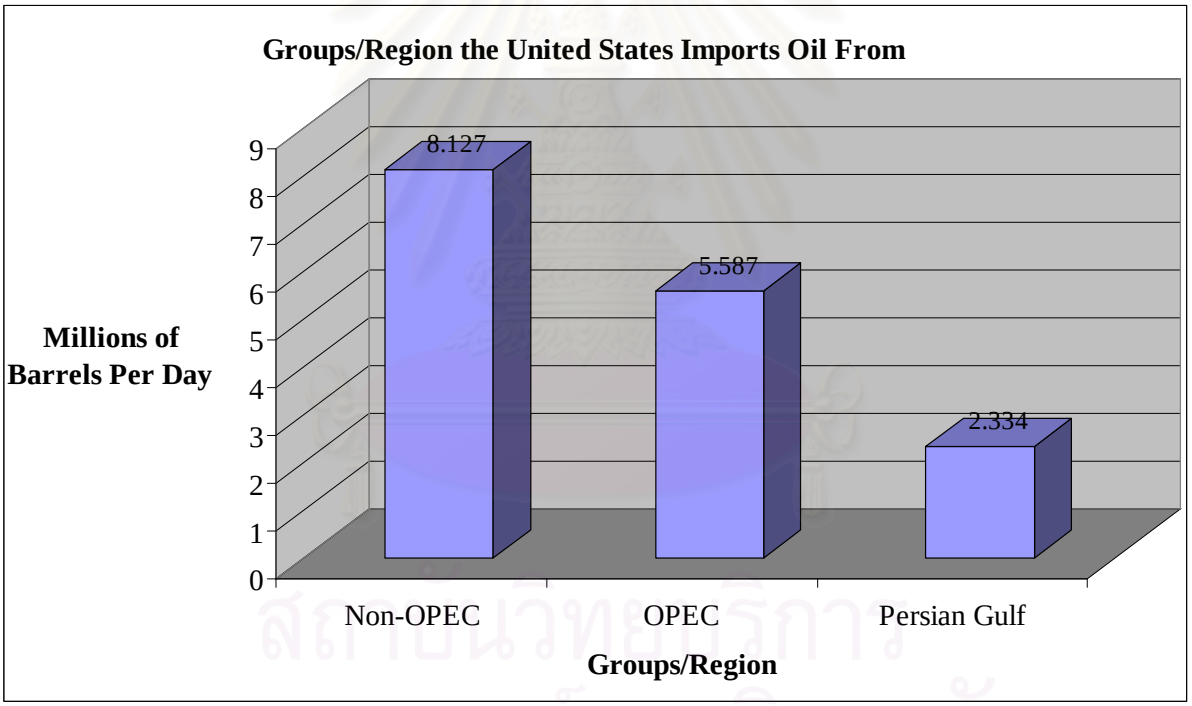
Rank	Country	Million of Barrels Per Day Imported
1.	Canada	2.172
2.	Mexico	1.646
3.	Saudi Arabia	1.523
4.	Venezuela	1.506
5.	Nigeria	1.147

Source: U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005) and U.S. Department of Energy/ EIA's "Petroleum Navigator: U.S. Imports by Country of Origin" (2007)

The top countries that America imports the largest amount of oil from are Canada, Mexico, Saudi Arabia, Venezuela, and Nigeria U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005). According to OPEC (2007) of the top five countries America imports oil from, three are members of OPEC. The three members include Saudi

Arabia, from which America imported 1.523 million barrels of oil per day, Venezuela, from which America imported 1.506 million barrels of oil per day, and Nigeria, from which America imported 1.147 million barrels of oil per day. America imported 13.527 million barrels per day in the year 2005 U.S. Department of Energy/ EIA's "Petroleum Navigator: U.S. Imports by Country of Origin (2007). It is a problem because "With U.S. production declining and demand increasing, U.S. net oil imports are climbing steadily" U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005).

Figure 2.3 Groups/Region the United States Imports Oil From



Source: U.S. Department of Energy/ EIA's "Petroleum Navigator: Weekly Imports and Exports" (2007)

America imports lots of oil from nations in OPEC and the Persian Gulf compared to imports from other countries U.S. Department of Energy/ EIA's "Petroleum Navigator: Weekly Imports and Exports" (2007). For the last week of the year 2005, The United States consumed 21.619 million barrels per day U.S. Department of Energy/ EIA's "Petroleum

Navigator: Consumption/Sales" (2006). It can be seen that America imports a lot of petroleum from OPEC and the Persian Gulf compared to total oil it consumes.

From the above information, it can be seen that America can not completely control the price of oil. America must import a lot of oil. America needs oil. It is thus affected by changes in the world price of oil. It can also be seen that America is dependent on OPEC cartel oil and Middle East oil. Countries that export oil to America can cut down production of oil as a political tool. This causes oil prices to rise and can hurt the American economy. Akan, Goldstein, Huang (1997) say, "Oil price movements not only link directly to shifts in consumption in the industrialized regions, and to exports from the Middle East, but also correlate with changes in GDP growth-the entire pace of world economic activity…energy trade…in the 1970s and 1980s it fluctuated in a complex pattern relating to both economics (supply, demand, expectations) and politics (wars and revolutions)." America's foreign policy is influenced by political situations that occur in the World. Especially, political situations in countries that export oil to America Akan, Goldstein, and Huang (1997).

Political unrest in Countries such as Venezuela, with examples such as the strike of the workers of PdVSA (Venezuelan state oil company) or the overthrow of Venezuelan President Hugo Chavez by the military affect oil price which in turn affects America, and the American economy. U.S. Department of Energy/EIA's "Annual Oil Market Chronology" (2006). American foreign policy is shaped through its dependence on foreign oil.

2.6 America's Strategic Petroleum Reserve

As stated before, oil is so important to America that the United States of America has a Strategic Petroleum Reserve. It is the largest "emergency oil stockpile in the world" (U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States", 2005: 1). It was

created by the Energy Policy and Conservation Act in December of 1975. The storage capacity of the Strategic Petroleum Reserve is 700 million barrels U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005).

In November of 2001, President George W. Bush ordered the Department of Energy to fill the Strategic Petroleum Reserve up to its limit U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005). The President decides when to use the Strategic Petroleum Reserve. It is to be used during "a severe energy supply interruption." This is when a situation "1) is, or is likely to be of significant scope and duration, and of an emergency nature; 2) may cause major adverse impact on national safety or the national economy (including an oil price spike); and 3) results, or is likely to result, from an interruption in the supply of imported petroleum products, or from sabotage or an act of God" (U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States", 2005: 1). From the above quote, it can be seen that the American government sees that an "oil price spike" as directly affecting the American "national economy." By August 17, 2005, the Strategic Petroleum Reserve was filled up to its limit of 700 million barrels. However, two weeks later, Hurricane Katrina occurred. President Bush then ordered that 30 million barrels from the Strategic Petroleum Reserve be sold to "maintain supplies and calm markets" and that oil be loaned to assist refineries affected by Hurricane Katrina U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005).

2.7 Katrina

Hurricane Katrina was an important event in America's history. "Hurricane Katrina was the most catastrophic natural disaster in our nation's history…" said U.S. Department of Homeland Security's Federal Emergency Management Agency Director David Paulson

(Department of Homeland Security/ Federal Emergency Management Agency's "Hurricane Katrina – One Year Later", 2006: 1). It destroyed a ninety thousand square mile area, this is approximately the size of Great Britain Department of Homeland Security/ Federal Emergency Management Agency's "By the Numbers – One Year Later: FEMA Recovery Update for Hurricane Katrina" (2006). Hurricane Katrina lead to "loss of life and property damage of immense proportions" (Brown, Knabb, and Rhome, 2006: 12). At least 1833 people died. The resulting structural damage amounted to at least 81,000,000,000 dollars. It was the "costliest hurricane in United States history" (Brown, Knabb, and Rhome, 2006: 12). The Hurricane reached a Category Five on the Staffir-Simpson scale which means that it had winds greater than 155 mph and places lower than 20 feet above mean sea level will be flooded MSNBC's "Katrina, The long Road Back: Hurricane Briefing" (2007). Parts of Mississippi had storm surges of over thirty feet U.S. Department of Commerce/National Oceanic and Atmospheric Administration/National Climate Data Center's "Climate of 2005: Summary of Hurricane Katrina" (2005).

"Hurricane Katrina was particularly damaging to the nation's oil and natural gas industry, which is based mainly in the Gulf of Mexico. At the time of the storm hit, the Gulf of Mexico represented approximately 29 percent of all domestic oil production and 47 percent of the nation's 17 million barrels a day refining capacity" (ABC NEWS' "Katrina's Economic Impact: One Year Later", 2006: 1).

2.8 States and Oil

Table 2.3 Lead States in Oil Reserves, Their Percentage of U.S. Oil Reserves

Rank	State	Percent of U.S. Oil Reserves
1.	Texas	22
2.	Louisiana	20
3.	Alaska	20
4.	California	18

Source: U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005)

Table 2.4 Lead States in Oil Production and Amount of Oil Produced Per Year (2006)

	State	Amount of Oil Produced in Thousands of Barrels
1.	Texas	397677
2.	Alaska	368230
3.	California	238526
4.	Louisiana	81521

Source: U.S. Department of Energy/EIA's "Petroleum Basics 101" (2006) and U.S. Department of Energy/EIA's "Crude Oil Production" (2007) (calculations done by author)

Louisiana was the state most severely hit by Hurricane Katrina. Louisiana ranks as the state with the second largest proved oil reserves. Louisiana is only behind Texas by two percent in its part of U.S. Oil Reserves U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2006). It is the fourth largest state in producing crude oil U.S. Department of Energy/EIA's "Petroleum Basics 101" (2006).

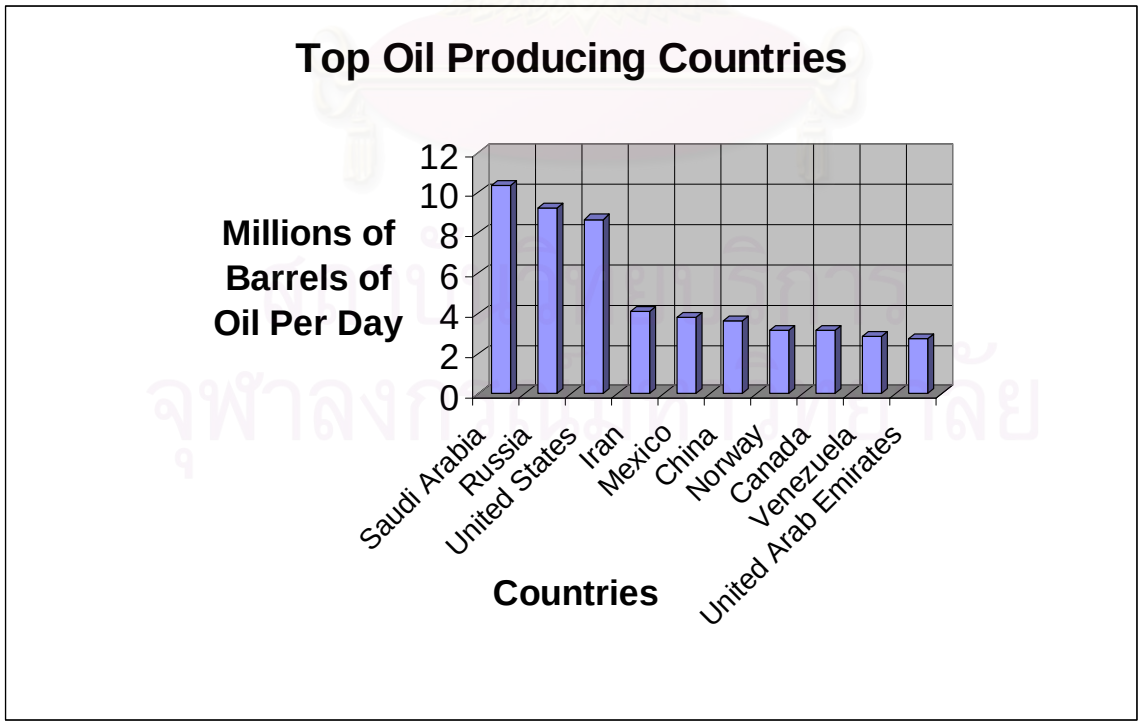
The opportunity to look at the states that have the most proved oil reserved and the states that produce the most crude oil can be taken. Texas leads in having the most proved oil reserves and production of crude oil. The top four states that lead in having the most proved oil reserves are the same top four states that produce the most crude oil.

2.9 Another Example of the Emergency Use of the Strategic Petroleum Reserve

Another example of the use of the Strategic Petroleum Reserve is when the Strategic Petroleum Reserve was ordered to be used during the same day as start of the First Persian Gulf War in January of 1991. This day is within the time frame as the oil price shock of 1990 which is covered in this thesis. Though not officially stated, the Strategic Petroleum Reserve was used because of war. It can be seen how important oil is to the United States. After this use of the Strategic Petroleum Reserve, crude oil price dropped between nine and ten dollars per barrel in one day's time. This is after the price of crude oil had increased between three and five dollars in the first half of January U.S. Department of Energy/EIA's "Annual Oil Market Chronology" (2006).

2.10 America As a Producer of Oil

Figure 2.4 Top Oil Producing Countries



Source: U.S. Department of Energy/ EIA's "Top World Oil Producers" (2005) and U.S. Department of Energy/ EIA's "Petroleum (Oil)" (2006)

Although the United States imports a lot of oil, the United States is among the world's top ten oil producing nations. The United States ranks third in the production of oil. The top ten oil producing nations include: Saudi Arabia, Russia, United States, Iran, Mexico, China, Norway, Canada, Venezuela, and United Arab Emirates U.S. Department of Energy/ EIA's "Petroleum (Oil)" (2006) and U.S. Department of Energy/ EIA's "Top World Oil Producers" (2005).

America has the eleventh largest proved oil reserves in the world. America has approximately 21.4 billion barrels of proved oil reserves U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005). In 2004, OPEC, United States, and Russia produced 61 percent of the world's crude oil. United States produced 7.4 percent of the world crude oil and Russia produced 12 percent of the world crude oil U.S. Department of Energy/EIA's "Energy Information Sheet: Crude Oil Production" (2006).

Although the United States has a lot of proved oil reserves and produces a lot of oil, the United States uses more oil than it can produce. The United States must then import oil. Of the oil that the United States uses, it imports about 58 percent U.S. Department of Energy/ EIA's "Petroleum (Oil)" (2006). After looking at the large percentage of oil that America must import from foreign nations, especially from OPEC and the Persian Gulf as shown in a part of section 2.5 Places That America Imports Oil From and America's Dependence on Foreign Sources of Oil. America is shown to be dependent on foreign oil even if it is the third largest producer of oil in the world U.S. Department of Energy/ EIA's "Top World Oil Producers" (2005). Thus, the situation is complex because America is a large producer of oil and a large importer of oil.

The top oil companies in the United States are ExxonMobil, ChevronTexaco, Unocal, Shell, CITGO, Williams, Valero, Sunoco, Marathon, Occidental, Amerada Hess, Anadarko,

ConocoPhillips, Apache, and BP U.S. Department of Energy/ EIA's "Country Analysis Briefs: United States" (2005).

2.11 America Recently Discovered Oil

A recent development in America's oil situation is the discovery of a large oil field in America during September of 2006. It is said that this discovery could increase America's oil reserves by fifty percent. This occurrence could be the largest discovery in America since the discovery of oil in Alaska's Prudhoe Bay MSNBC and Associated Press' "Oil Companies See Big Gulf Of Mexico Discovery" (2006). Alaska's Prudhoe Bay is the oil field with the most proved liquid reserves in America from "estimated 2005 field level data" and the largest oil field in America since Decmber 31, 1979. Liquid reserves are crude oil reserves and lease condensate U.S. Department of Energy/ EIA's "U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2005 Annual Report" (2005). This discovery led by Chevron is estimated to have between 3 billion to 15 billion barrels of oil and natural gas liquids.

The problem for America is that America still uses a lot of oil per year. America uses approximately 5.7 billion barrels of crude oil per year. America's current reserves are more than 29 billion barrels of oil. When compared to Saudi Arabia's reserves which are more than 250 billion barrels, America's current reserves are small. It has been said that it will take years and billions of dollars to bring this new discovery of oil to the market. Chevron, an American company owns 50 percent of the field, while Devon Energy Corporation, also an America company, owns 25 percent, and Statoil ASA, a Norwegian company, owns the remaining 25 percent MSNBC and Associated Press' "Oil Companies See Big Gulf Of Mexico Discovery" (2006).

2.12 Oil and Some Products

Table 2.5 Products Made From Petroleum in the U.S.
and Percent Distribution

Product	Product Example(s)	Percent
Motor Gasoline		45.7
Distillate Fuel Oil	Home Heating Oil Diesel Fuel Refinery Fuel Industrial Fuel	22.5
Kerosene - Type Jet Fuel		10.3
Residual Fuel Oil	Boiler Fuel Refinery Fuel Bunker Fuel Wood Representative	4.7
Petroleum Coke	Carbon Electrodes Fuel Coke Electric Switches	4.6
Liquefied Refinery Gases	Petrochemical Feedstocks Spaces Heating Cooking Synthetic Rubber	4.6
Still Gas Refinery Fuel		4.4
Asphalt and Road Oil	Paving Roofing Waterproofing	3.2
Petrochemical Feedstocks	Alcohol Resins Ethers Fiber Medicines Cosmetics	2.9
Lubricants	Lubricating Oils Greases Transmission Oils Household Oils Textile Spindle Oil	1.2

Kerosene	Illumination Space Heating Cooking Tractor Fuel	0.4
Special Naphthas	Solvents Paint Thinner	0.3
Waxes	Fruits Vegetables Candy Chewing Gum Candles Matches Crayons Pencils Sealing Wax Canning Wax	0.2
Aviation Gasoline		0.2
Miscellaneous Products	Absorber Oil White Machinery Oils Cutting Oils Candy Making Baking Oils Technical Oil Medicinal Salves Ointments Petroleum Jelly Acetic Acid Sulfuric Acid Fertilizers	0.3

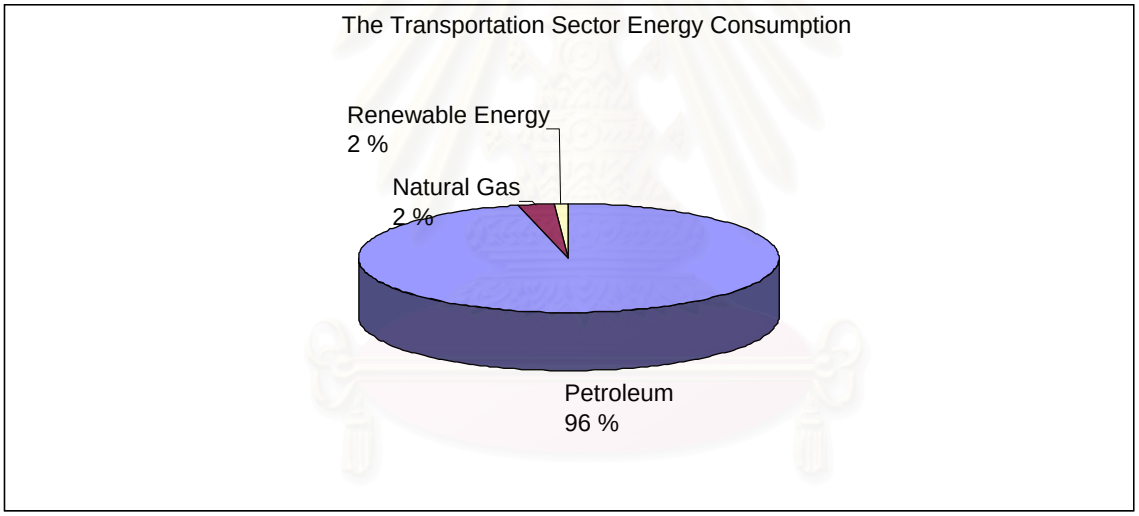
Source: Hinton et al. (1999)

According to Hinton et al (1999), Petroleum is made into many different products. 45.7 percent is made into motor gasoline, 22.5 percent is made into distillate fuel oil (home heating oil, diesel fuel, refinery fuel, industrial fuel), and 10.3 percent is made into kerosene-type jet fuel. Hence, it can be seen that petroleum has many uses, is used in many different products, and is important to many different sectors. It is important in different degrees. Petroleum has many uses from motor gasoline and home heating oil to use in medicine as a petrochemical feedstock and use in chewing gum as a wax.

Sectors may be affected by crude oil prices increases in different directions and/or to different degrees. For instance, if oil price increases, the Motor Vehicles And Equipment (Automobiles) sector may suffer and have to lay off workers, but the Oil and Gas Extraction sector may flourish and hire more employees and expand. However, the effects may be mitigated because the United States does not only lose by higher oil prices, but gains from it also since it exports oil. The sectors which produces and/or exports oil may therefore benefit.

2.13 Where the American Transportation, Industrial, Residential, and Commercial Sectors Obtain Energy

Figure 2.5 The Transportation Sector Energy Consumption

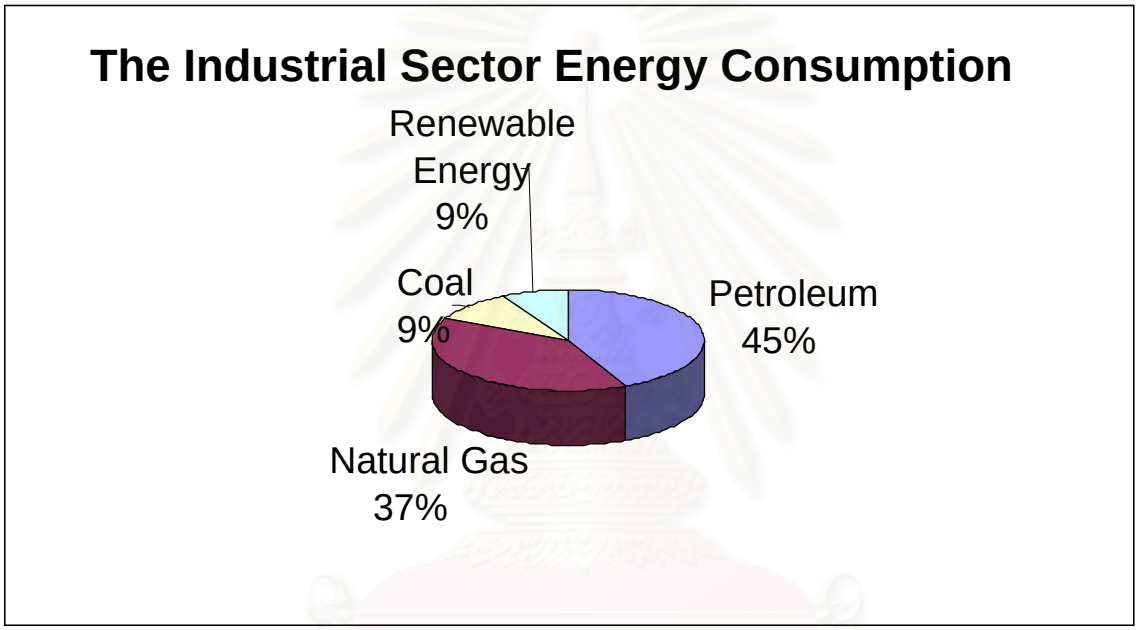


Source: U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007)

The sector that uses petroleum the most is the transportation sector. At least 96 percent of the energy for the transportation sector comes from petroleum. Examples of renewable energy are conventional hydroelectric power, wood, waste, alcohol, geothermal, solar, and wind U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007).

The Transportation sector includes all vehicles used to move products or people from one point to another point. Vehicles include “automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles” (U.S. Department of Energy/EIA’s “Monthly Energy Review: May 2006”, 2006: 36).

Figure 2.6 The Industrial Sector Energy Consumption



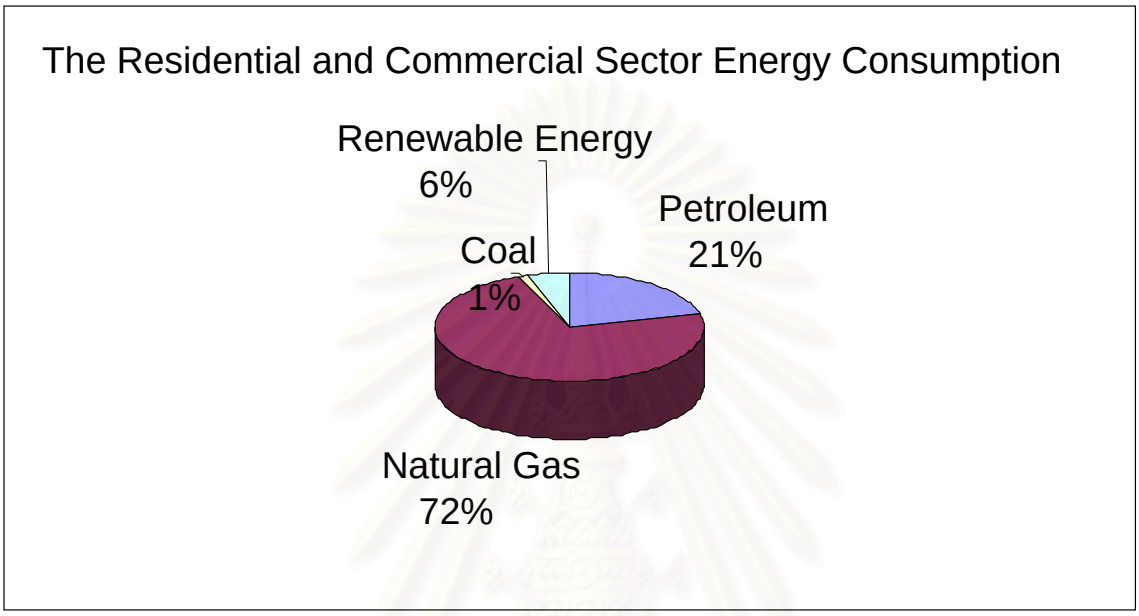
Source: U.S. Department of Energy/ EIA’s “Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector” (2007)

In the industrial sector, petroleum is the largest source of energy. However, energy that the industrial sector obtains from petroleum is less than that the transportation sector, 45 percent compared to 96 percent. The second largest source that the industrial sector obtains energy from is natural gas. The industrial sector obtains 37 percent of its energy from natural gas U.S. Department of Energy/ EIA’s “Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector” (2007).

The energy used in industry is mainly “for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting.

Fossil fuels are also used as raw material inputs to manufactured products" (U.S. Department of Energy/EIA's "Monthly Energy Review: May 2006", 2006: 36).

Figure 2.7 The Residential and Commercial Sector Energy Consumption



Source: U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007)

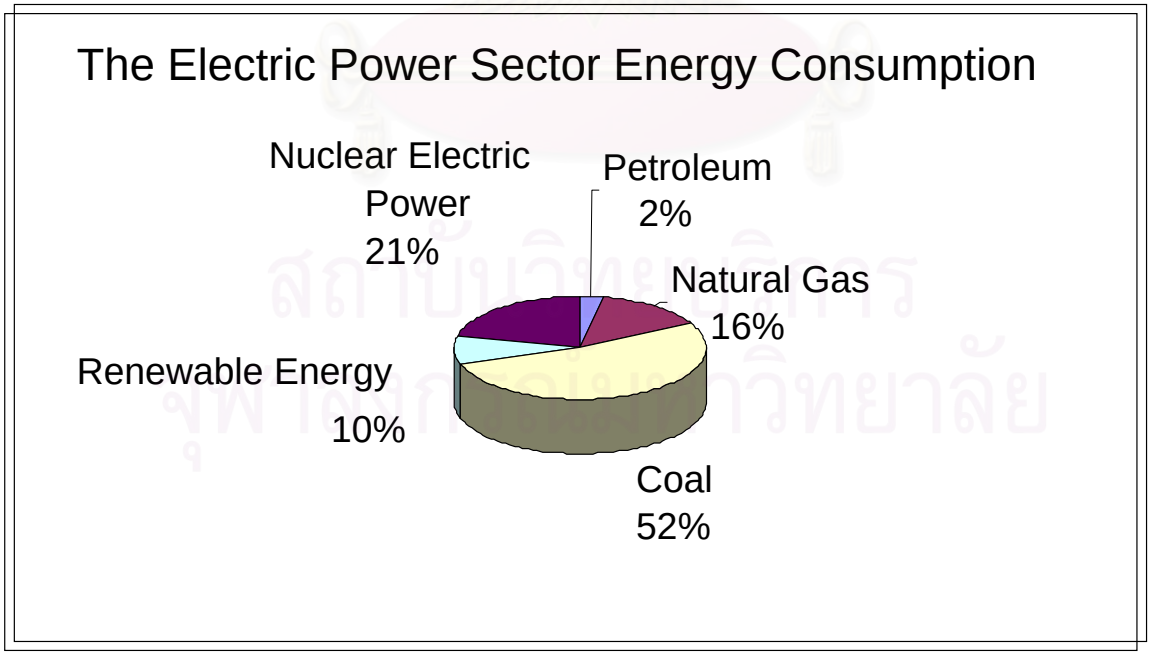
The residential and commercial sector obtains 21 percent of its energy from petroleum. The top source that the residential and commercial sector obtains energy is from natural gas. The residential and commercial sector obtains 72 percent of energy from natural gas U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007).

The residential sector includes living area for households. Main uses for energy in the residential sector are heating, water heating, lighting, refrigeration, cooking, air conditioning, and appliances. The commercial sector includes "service-providing facilities and equipment of: businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups; The commercial sector includes institutional living quarters" (U.S. Department of Energy/EIA's "Monthly Energy Review:

May 2006", 2006: 36). Main uses for energy in the commercial sector include "space heating, water heating, air conditioning, lighting, refrigeration, cooking, and use of equipment" (U.S. Department of Energy/EIA's "Monthly Energy Review: May 2006", 2006: 36). The commercial sector energy use also includes generators to make electricity and thermal output U.S. Department of Energy/EIA's "Monthly Energy Review: May 2006" (2006).

More than half of energy for the commercial buildings is used for heating and lighting U.S. Department of Energy/ EIA's "Commercial Energy Use" (2006). In the home, "almost half of average home's energy consumption is used for heating." "Almost one-fourth of energy used in homes is used for lighting and appliances." "Another 17 percent is used for water heating, 6 percent for cooling rooms, and 5 percent for refrigeration" (U.S. Department of Energy/ EIA's "Residential Energy Use", 2004: 1).

Figure 2.8 The Electric Power Sector Energy Consumption



Source: U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007)

Electric Power Sector is defined as “Electricity-only and combined-heat-and-power (CHP) plants” (U.S. Department of Energy/EIA’s “Monthly Energy Review: May 2006”, 2006: 36). It obtains 3 percent of energy from petroleum, 14 percent of energy from natural gas, 52 percent of energy from coal, 9 percent of energy from renewable energy, and 21 percent of energy from nuclear electric power U.S. Department of Energy/ EIA’s “Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector” (2007).

Electric power sector includes “electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public” U.S. Department of Energy/EIA’s “Monthly Energy Review: May 2006” (2006).

What is seen is that the transportation and the industrial sector obtain a very significant portion of its energy from petroleum. The transportation and industrial sector is thus, very dependent on petroleum. The transportation and industrial sector should be most sensitive to oil price change and fluctuation.

America is seen as a leader in consuming and importing oil, yet America is also a leader in producing and exporting oil. The United States just recently discovered a large oil field which could give it 15 billion barrels of oil. Oil is used in many different sectors from distillate fuel oil in industrial fuels to lubricants in transmission oils. Crude oil is important throughout many sectors but in different proportions since it is needed and used by sectors in different proportions. An increase in oil price should have a different range of affect throughout various sectors.

CHAPTER III

THEORETICAL FRAMEWORK/REVIEW OF LITERATURE

3.1 Theoretical Framework

There is not one theory that can accurately and completely explain the relationship between oil price and unemployment. Instead there are many economists who have studied the relationship between oil price and unemployment and have tried to explain the seen relationship.

Uri (1996) finds that the price of oil, especially the volatility in the price of oil, has a relationship to the unemployment rate and the gross national product. "Rising energy prices, for example, increase the cost of production, thereby decreasing aggregate supply and hence the aggregate output of goods and services, all other things given. A reduction in aggregate output is coupled with a fall in demand for labor and, hence, a rise in the unemployment rate. Beyond this, changing relative prices for the factors of production, e.g., the price of energy relative to the price of labor, will result in sectoral shifts. Thus, substantial changes in the relative factor prices, as occurred in the early 1970s between the price of energy and the price of labor and capital (between 1974 and 1980, the nominal price of energy rose at annual rate of 21.7% while the price of capital rose at an annual rate of 9.2% and the price of labor rose at an annual rate of 8.6%) might have required reallocating labor and capital between more and less energy intensive sectors" (Uri, 1996: 29).

A channel by which oil price shock may cause increase in unemployment is through the difficulty in shifting "specialized labor and capital" (Ferderer, 1996: 3) between sectors. What occurs when there is an oil price increase is that different sectors suffer differently. Certain sectors may profit such as the oil producers, and the group of sectors that take loss

will take loss in different proportions. There should be a transfer of labor and capital to various sectors from different sectors. It is very costly to move this "specialization of labor and capital" (Hamilton, 1988: 593) from sector to sector. This is because of the high cost of retraining and labor mobility. Some of the unemployed in the affected sectors then wait for the situation to improve in their sector instead of moving to sectors that are better affected by the increase in oil price. Workers do not move to different sectors especially if it may appear that the situation in their sector will get better. This may be especially true if oil prices fluctuate greatly. There is uncertainty as to the direction and status of oil price. People can not be sure if moving to another sector will be better for them or staying in the same sector will be better. So, they may wait for the situation to become better in the same sector. This then causes increase in unemployment rate. This movement mechanism is found from Hamilton (1988) and Ferderer (1996). The unemployed workers may then survive through unemployment benefits or other social programs. This may be how some of these unemployed workers can survive while the unemployment rate suffers. Many workers can not move to the sectors that prosper or suffer less from oil price increases. They lack the training and ability.

The transition between sectors after an oil shock can also be very difficult even if employees would like to move to another sector where the oil price increase has caused a better effect on employment than in the current sector. Labor does not move smoothly between one sector to another. This causes unemployment to increase. If movement was quite smooth then it is possible that the output loss by one sector would be quickly regained by another sector Hamilton (1988). There would then be little loss in output. This is a mechanism where oil price increase may cause unemployment increase.

Large oil price increases affect employment by “substantial wage declines in virtually all sectors of the economy” (Keane and Prasad, 1996: 389). However, the wage declines “varies considerably” (Keane and Prasad, 1996: 389) when looking at different skill levels and sectors. The “relative wage of skilled workers tend to rise” (Keane and Prasad, 1996: 390). The mechanism for this effect is skilled workers are a substitute for energy in sectors’ production. “Skilled labor is a much better net substitute for energy than unskilled labor” (Keane and Prasad, 1996: 398). Skilled workers have “higher employment probabilities” (Keane and Prasad, 1996: 398) than unskilled workers. What may be seen then is oil price increase may result in more employment in sectors that is composed of more skilled workers, but less employment in sectors that have more unskilled workers. There is a change in composition in employment between sectors. These findings are found from Keane and Prasad (1996) and Jones, Leiby, and Paik (2004).

Oil price increases “reduce aggregate employment in the short run and shift industry employment shares in the long run” (Keane and Prasad, 1996: 390). A mechanism is oil price increases causes people to look for employment in places where workers need a low level of skills. Examples of these places are at retail trade and services. What may be seen is a struggle for employment opportunities in places where there is need for little skills, such as services and retail trade. This may cause an increase in unemployment rate in services and retail trade, and places where there is a need for less skilled workers. Findings are found from Keane and Prasad (1996) and Jones, Leiby, and Paik (2004).

Oil price shock is also postulated to affect macroeconomic variables through a “surprise” (Lee, Ni, and Ratti, 1995: 50) mechanism. If oil price is relatively stable before, when oil price increases, it catches people by surprise since they do not expect an increase or an increase of that size. It is this “surprise” mechanism that causes so much

disturbance on the economy when oil price increases. People may not know what the best thing to do is and what else will be affected by the oil price increase. They do not know how long the oil price will keep increasing and the magnitude by which it will increase. Since oil price increase, firms have less oil so output will decrease and unemployment rate must increase. Even a small increase in oil price can cause a large effect if before the oil price increase, the price of oil is stable. The "uncertainty" (Lee, Ni, and Ratti, 1995: 50) that result from oil price volatility causes investment to stop and be postponed. Even when oil price decreases, there is this "uncertainty" which causes investment to stop. There may then be an economic slowdown and unemployment may increase. This "surprise" mechanism by which oil price increase, decreases output and increases unemployment is found through Lee, Ni, and Ratti (1995) and Jones, Leiby, and Paik (1996).

"Uncertainty" (Bernanke, 1983: 85) may cause firms to stop their "irreversible investment" (Bernanke, 1983: 87). Bernanke's (1980) assumptions are investment is irreversible and waiting causes more useful information to arrive. Bernanke uses the "energy cartel" (Bernanke, 1983: 96) as an example for when situation of "uncertainty", "irreversible investment," and "pause" (Bernanke, 1983: 83) in investment may occur. When there is "uncertainty", investors will wait for more information. Investors do not know what will happen to the price of oil in the future so they do not know if they should invest in energy-efficient or energy-inefficient capital. Firms are unclear about what to invest in. They do not know what option will most benefit them. They then wait and see what will happen. The more uncertain oil price is, the more the choice to wait increases in value. However, laborers may lose and therefore unemployment rate increases because investors do not invest in projects which may create jobs. This uncertain "irreversible investment" mechanism causes cessation and/or decrease in output is found by Bernanke (1980, 1983) and Ferderer (1996).

How the stock market is affected by oil price increase is very important. It is possibly one important mechanism by which to gauge what will happen to the economy. The stock market is a significant "information collection and processing institution" (Jones, Leiby, and Paik, 2004: 8). Information regarding present conditions and "future prospects" (Jones, Leiby, and Paik, 2004: 8) determine the stock market's asset prices. It can be said that the stock market is "using all publicly and privately available information" (Jones, Leiby, and Paik, 2004: 8) in determining the stock price and "rate-of-return forecasts" (Jones, Leiby, and Paik, 2004: 8). The stock market "absorbs" (Jones, Leiby, and Paik, 2004: 8) and "incorporates" (Jones, Leiby, and Paik, 2004: 8) information about oil price change fast. This is found from Jones, Leiby, and Paik (2004). When oil price increases significantly, the stock prices of firms in certain sectors may go down sharply. It can be said that this forebodes in an increase in unemployment rates in those sectors. If oil price increases substantially and stock of firms in certain sectors whose stock prices goes up sharply also, this may forebode or correspond to a decrease in unemployment rate or increase in job creation.

Oil price increases rationally affect the stock prices on the stock market. What is found is that the stock market correctly determines the consequences of oil shocks on the economy. This is shown to be the case in the United States and Canada. The mechanism by which oil price increases affect stock prices is by the "impact of news on current and future real cash flows" (Jones and Kaul, 1996: 464) and/or "changes in expected returns" (Jones and Kaul, 1996: 463). In the United Kingdom and Japan, oil price increases affect the stock prices more than they should. This should be due to an overreaction by the stock prices in the case of the United Kingdom and Japan, or the proxies used do not measure correctly. These findings are from Jones and Kaul (1996).

Increase in oil price affect the return on the stocks in the stock market. Oil price increases and volatility affect the economy. Thus, oil price increases and volatility affect the price of stocks in the stock market. This is from Sadorsky (1999). It is then possible to look at the stock market's response to oil price increase which is the increase or decrease in stock price. Then what may be determined is if there will be more unemployment or employment in a certain sector. The mechanism is that if there is a decrease in stock price, there should be trouble in that company. What can be looked at are many companies in that industrial sector. If many companies in that industrial sector's stock price decreases then this should foretell more unemployment in that industrial sector.

3.2 Review of Literature

Above we looked at the theories that link oil price and unemployment but now we look at special features of some distinctive studies found. Such as the Davis and Haltiwanger (2001) study which look at how increases in oil prices increases unemployment but differently, depending on what manufacturing sectors are looked at and the extent at which the sectors are energy intensive and capital intensive. The Burbidge and Harrison (1984) and Darby study go beyond America and look at other countries. We now also note and look at how correct authors who believe oil price increase has an effect are. Because some studies find mixed results or no effect at all.

Energy and labor are significant inputs in the production function. Output is then determined by these inputs. If oil price increases, then the cost of production will in turn increase. The price of products will increase and there will be a decrease in demand for the production of products. Firms will then decrease their production of products that use oil as an input factor. Then since they decrease their production of products that use oil as an input,

they must lay off workers involved in the production of products that use oil as an input which will increase the unemployment rate.

Davis and Haltiwanger (2001), Labonte (2004), Carruth, Hooker, and Oswald (1998), Hamilton (1983), Hamilton (1996), Gisser and Goodwin (1986), and Uri (1996) find that large increases and/or fluctuation in oil price increases unemployment rate (or has an effect on the economy). Burbidge and Harrison (1984) and Darby (1982) have mixed results that say oil price increases do effect the economy and that oil price increases do not effect the economy. While Loungani (1996) find that oil price increase does not have an effect on unemployment.

Davis and Haltiwanger (2001) write about the effect of oil price changes to sectoral job creation and destruction. They look at oil price changes and its effect on unemployment and employment but they are different from other authors since they break down unemployment and employment into different sectors of manufacturing. They specifically look at manufacturing jobs from 1972 to 1988. They study the size of employer, durability of final product, age of production plant, capital intensity, and energy intensity. Job destruction increases when energy intensity, capital intensity, and product durability increases. Breaking down information into details allows these authors to better determine what effect changes in oil prices has on unemployment. They are able to confidently report the effects. They study aggregate and allocative channels by which oil price shocks occur. Aggregate channels are income transfer, sticky wage, and potential output effects. Allocative channels are the differences in match between the actual and desired distributions of labor and capital inputs. With aggregate aspects of an oil price rise there is a reduction in job creation and increase in destruction. While in allocative, there is an increase in job creation and destruction. The affects of oil shocks are found to be larger than monetary shocks on unemployment and

employment. Within two years of a shock, 290,000 production jobs are destroyed with a unit standard deviation positive oil shock and 30,000 jobs are created. The manufacturing sector is divided into different details and analyzed. The details include nondurable (which includes: food products, textile mill products, apparel and other textiles, paper and allied products, printing and publishing, chemical and allied products, petroleum and coal products, rubber and plastics, and leather products), durable (which includes: lumber and wood products, furniture and fixtures, stone-clay-glass products, primary metals, fabricated metals, nonelectrical machinery, electrical machinery, transportation equipment, instruments and related products, and miscellaneous manufacturing), energy intensity, capital intensity, durability of final product sections, old manufacturing plants (9 to 13 years old), new manufacturing plants (less than 9 to 13 years old), and number of employees. Job destruction rises with plant size, age, capital intensity, energy intensity, and product durability. Oil shocks are shown to cause more destruction than creation in the short run. The largest oil shock which occurred between the third and fourth quarter of 1973 resulted in an eight percent decrease in manufacturing employment within two years. When there is a large decrease in the price of oil, the change in employment is small, but employment growth decreases greatly when there is a large increase in the price of oil.

International Energy Agency (2004) carried out a study with the Organization for Economic Cooperation and Development Economics Department and the International Monetary Fund Research Department. In one scenario called the “base case” (International Energy Agency, 2004: 7) the price of oil was kept at a base level of twenty five dollars per barrel. In another scenario called the “Sustained Higher Oil Price Case” (International Energy Agency, 2004: 7) the price of oil was raised to thirty five dollars per barrel. In the OECD, the findings reveal that in the first two years of the “Sustained Higher Oil Price Case”

compared to the “base case” GDP was lower by 0.4 percentage points in first year and the follow year. Unemployment rate in the OECD was lower by 0.1 percentage points in the first year and the following year. For the United States specifically, GDP was lower by 0.3 percent points in the first year and the year afterwards. In terms of unemployment rate, the unemployment rate was lower by 0.1 percentage points in the first year after the price increase and was lower by 0.2 percentage points in the following year of the price increase. This shows that oil price increase affects GDP and unemployment rate by decreasing GDP and increasing unemployment rate. In the “base case” the price of oil was twenty five dollars per barrel and in the “Sustained Higher Oil Price Case” it was thirty five dollars per barrel, but it must be noted that the affects of oil price increase may be even larger in this thesis because oil price reaches average monthly levels of over seventy dollars per barrel during the range of time studied. The International Energy Agency study also reveals that the more a country is energy intensive and the more oil it imports, the more it experiences “adverse economic impact” from oil price increase.

Labonte (2004) revealed that oil shocks can be very important since after World War II, eight out of the nine recessions that the United States recently faced happened with increases in oil price. This article is different from other articles because its main focus is to review other articles that study the effects of oil price change on the economy. The 1973 to 1975 recession happened after the oil embargo. Another oil shock happened before the 1980 to 1982 recession. This recession also happened after the Iran-Iraq War and the revolution in Iran. The oil shock after the first Gulf War preceded the 1990 to 1991 recession. After the oil shock between 1999 to 2000 came the 2001 recession. A ten percent increase in oil price during a quarter causes a decrease of 0.7 to 1.4 percentage points in economic growth in the

following year. Review of article by Carruth, Hooker, and Oswald showed that a ten percent increase in the price of oil, increases unemployment rate by 0.1 percentage points.

Carruth, Hooker, and Oswald (1998) discovered that the rate of unemployment is affected by the input prices. This study is different from most other studies in that it focuses on the price of oil and the interest rate as input prices. They try to find out if oil price and interest rate determine the unemployment rate. The result is oil price determine unemployment much more than interest rates. They are different in that they developed equations which predict unemployment several years outside of the sample by using oil price and interest rate as input prices. This study is also different from most other studies because it uses the Granger causality test to compare with the error correction model and the results are comparable to each other. While most other studies use the VAR and the Granger causality test.

Hamilton (1983) reveals that all of the recessions, except one, since World War II have followed large increases in the price of oil. It is unlikely that there is a third variable that results in recession and oil price increase. The time between oil price increase and recession has been about three-fourths of a year. The idea that the oil price increases preceding all the recessions except one since World War II is just a coincidence is rejected. The null hypothesis that there is no relation is rejected. This is at the .01 significance level and sometimes at the .001 significance level. There is no evidence that a third variable causes both the oil price increases and the recessions.

Hamilton (1996) says that evidence from after he wrote his article in 1983 show that his 1983 findings are supported even further. Oil price shocks and recession are correlated. Violence in the Middle East will provide economists with more data on the effects of oil price shocks and its effect on the economy. This is what happened in the first Gulf War. The oil

shock that followed was a factor in causing the recession that ensued. His prediction is that in the future there will be another Middle East war which will cause disruption in oil supply and a shock in prices. In the United States, this will then result in a recession.

Gisser and Goodwin (1986) find that there is a relationship between oil price fluctuation and the economy. There is a complementary relationship between energy and capital. This is true before and after the 1973 dramatic increase in oil price. Gisser and Goodwin (1986) find that oil prices "always" (Gisser and Goodwin, 1986: 102) have more of an effect than fiscal policy and "often" (Gisser and Goodwin, 1986: 102) more of an effect than monetary policy on the economy. There have been a strong relationship between the price of oil and its effects on the economy before OPEC oil embargo of 1973 and after. This is different from some of the other studies in that this study says that before and after 1973 there is little difference in how the price of oil affects the United States economy. They "find evidence that prior to 1973 the rate of inflation was strongly informative about the future course of oil prices, but after that time a broader array of indicators of the U.S. economy were weakly informative" (Gisser and Goodwin, 1986: 102).

Uri (1996) comments that his review of literature on oil price fluctuation and unemployment shows that there is no clear consensus on whether oil price and unemployment rate are related. He says that many of the different past research varies considerably. Not only may the results vary but characteristics of the research also vary considerably such as the method used, the data series which cover different time periods, and the frequencies of the data. Also, many of the studies do not examine time periods after 1982. These reasons motivate Uri to perform his research. He performs his research using test for conintegration. Uri finds that there is a relation between oil price fluctuation and unemployment. The average real price of oil increased 1.54 percent per year from 1947 to

1994 with standard error of .7297. Average yearly unemployment rate has increased .0078 percent due to the increase in the price of oil. This is important since this is "more than one-half of the observed increase over the post World War II period" (Uri, 1996: 37). He finds that it takes three years after an oil shock before the effects of the oil shock on unemployment ends. The affects of oil price fluctuation on gross national product is also studied. This study is similar to the Davis and Haltiwanger (2001) study because it talks about the shift of labor to less energy intensive sectors after an oil price shock. Uri finds that there is a relationship between oil price and unemployment rate. He also finds that there is a relationship between oil price and gross national product.

Gramlich (2004) explained that oil shocks have grave effects on the economy. This literature review is different from that of others because it is a speech by Governor Edward Gramlich of the Federal Reserve Board. The price of production input of oil is increased and consumer good of heating oil and gasoline are increased. The prices of other energy will probably increase also. There has been a rise in output gap following all the oil shocks after and including 1973. Economists believe there has been a one third of one percent increase in unemployment for a permanent increase in oil price of ten dollars a barrel.

Burbidge and Harrison (1984) say that previous research reveal that large increases in oil prices decreases output and increases prices and wages. Their study is different from other studies since they look at different countries. They look at Germany, United States, Japan, United Kingdom, and Canada. Industrial output and price level are looked at. Similar to other studies, they use vector autoregression. Monthly data between 1961 to 1982 is used. Their study is different from other studies since they have mixed results on the effect of oil price change on that of economic variables. The oil price shock of 1979 to 1980 had little effect on the prices and output of the countries studied, except maybe for that of Japan.

However, the oil price shock for that of 1973 to 1974 affected the economies of the countries studied. It worsened a recession that was already going to happen. The effects of oil price shock on price level are highly significant in the United States and Canada. The effects are significant but small in Germany, the United Kingdom, and Japan. In the United States and the United Kingdom, oil price shocks influence industrial production greatly but in the other countries they only have a little impact.

Darby (1982) explains that many believe that the increase in oil prices during the 1973 to 1974 caused the recession and inflation in the years following. Increase in oil price results in an adverse shift in aggregate supply curve. This means that there is a lower output and higher price level. This is what many economists believe, but Darby (1982) is not sure if this is the case so he does his own research. His study is similar to that of Burbidge and Harrison (1984) because Darby (1982) looks at different countries. He looks at the United States, Germany, United Kingdom, Canada, Japan, the Netherlands, Italy, and France. His results are confounded and varied because of the price control and decontrol during the time of 1973 to 1974. Using data from the United States show that the results are not statistically significant. The two different and diverse views upon the effects of the oil price shock of 1973 to 1974 are both applicable. Similar to Burbidge and Harrison (1984), Darby (1982) says that by his study both sides are supported.

Loungani (1996) does not find any relationship between energy price changes and unemployment. This is different from the findings of the previous authors of Davis and Haltiwanger (2001), Labonte (2004), Hamilton (1983), Hamilton (1996), Gisser and Goodwin (1986), Uri (1996), and Gramlich (2004). It is in part similar to the findings of Burbidge and Harrison (1984) and Darby (1982) because Burbidge and Harrison (1984) and Darby (1982) have results that support both sides, those that believe oil price change and/or

fluctuation have an effect on economy and those that believe that oil price change and fluctuation do not have an effect on the economy. Loungani (1986) uses a dispersion index which covers the years of 1947 to 1982. Research by David Lilien states that the dispersion of employment growth throughout sectors explains a large portion of aggregate unemployment. Lilien believes that about half of cyclical unemployment can be explained by the "slow adjustment" of labor from one sector to another. A dispersion index which measures the amount of labor reallocation needed is constructed by Loungani (1986), in following Lilien's research. Loungani (1986) finds that the differential effect of oil shocks across sectors explains most of the variation in Lilien's dispersion index. When dispersion in employment growth caused by oil shocks is considered, the remaining dispersion does not explain unemployment. "Reallocative shocks have not been a major source of cyclical variation in unemployment" (Loungani, 1986: 539). The exceptions are that of the oil price shocks of the 1950s and 1970s. They were so extreme that it caused people to reallocate work from one sector to another sector. However, this conjecture needs further empirical research to prove it. This study is similar to that of the Davis and Haltiwanger (2001) in that it looks at the importance of different sectors when analyzing the effects of oil price changes.

CHAPTER IV

RESULTS OF OP, OF, AND GDP ON UNEMPLOYMENT RATE

In several of the sectors the findings came out according to the direction of Okun's Law. Okun's Law says that as GDP increases, there should be a following decrease in unemployment rate. When GDP decreases, there should be a following increase in unemployment rate. As Knotek (2007) says this law has lasted through many tests and survives because its simplicity and truth.

Coefficients significant at the 95% confidence level have t values bolded and are analyzed and interpreted.

Table 4.1: 2003 Total, 1999 Total, 1990 Total

Sector →	Total		Total		Total	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	6.910687	2.480254	-6.010973	-1.219301	-2.843912	-0.983326
GDP_t	1.326168	1.715640	-2.501739	**-3.33695**	2.724663	**2.490255**
GDP_{t-1}	-2.421499	**-3.14187**	2.769668	**3.804554**	-2.507462	**-2.441867**
OP_t	0.171291	1.626656	-0.31029	**-2.67619**	-0.078923	-0.705996
OP_{t-1}			-0.25287	**-2.86676**	-0.096068	-0.769678
OP_{t-2}			-0.2019	**-3.04984**		
OP_{t-3}			-0.15737	**-3.08036**		
OP_{t-4}			-0.11929	**-2.72146**		
OP_{t-5}			-0.08766	-2.02686		
OP_{t-6}			-0.06247	-1.36086		
OP_{t-7}			-0.04373	-0.89663		
OP_{t-8}			-0.03143	-0.62533		
OP_{t-9}			-0.02557	-0.51266		
OP_{t-10}			-0.02616	-0.54545		
OP_{t-11}			-0.0332	-0.72544		
OP_{t-12}			-0.04668	-1.01962		
OP_{t-13}			-0.06661	-1.29906		
OP_{t-14}			-0.09299	-1.44989		
OP_{t-15}			-0.1258	-1.49693		
OP_{t-16}			-0.16507	-1.50118		
OF_t	-2.436734	**-2.049577**	4.168114	1.482121	4.216399	**2.171617**
OF_{t-1}			3.046581	1.187438		
Number of Observations		48		35		33
R-squared		0.291767		0.459592		0.320777
Adjusted R-squared		0.225885		0.319486		0.194994
Durbin-Watson stat		2.282311		2.765627		1.747703

Oil Price Shock of 2003:

The effect of GDP_{t-1} to UN (Total) is negative. This follows the direction of Okun's Law and is what is hoped to be seen. When GDP_{t-1} increases, UN (Total) decreases. The effect of OF_t to UN (Total) is negative. This is because during the time frame studied, OF_t increases while UN (Total) decreases. The effect of OF_t to UN (Total) is not positive as hoped because UN (Total) follows GDP more closely. If the effect of OF_t to UN were positive it would mean that for much of the time as OF_t increases (which OF_t does increases for a lot of this time frame) UN (Total) would increase as well. However, for this time frame, UN decreases since GDP increases. This follows what is seen in Okun's Law.

Oil Price Shock of 1999:

The total effect of GDP to UN (Total) is positive and is not what is hoped to be seen. This is against the direction of Okun's Law. However, the total effect of GDP to UN (Total) is small. The total effect is only 0.467604. The total effect of GDP decreases, while during the timeframe studied UN (Total) decreases for much of the time. The total effect of OP to UN (Total) is negative. This is because total effect of OP increases while during the time frame studied UN decreases.

The magnitude of the total effect of OP to UN (Total) is small possibly because it includes all of the sectors. Total includes those that are strongly affected by OP increase and those that may be less affected by OP increase or even oppositely affected. However, for the Oil Price Shock of 1999 there were no sectors that are significant in total effect of OP to UN.

Oil Price Shock of 1990:

The total effect of GDP to UN (Total) is positive. This is contrary to Okun's Law and not what is hoped to be seen. However, the total effect is small. The total effect is only

0.217201. The effect of OF_t to UN (Total) is positive. As OF_t increases, UN (Total) increases as well. This is what is hoped to be seen. OF_t increase may cause instability and may thus result in UN (Total) to increase. Also during this time frame, GDP decreases and there is a recession, and so UN (Total) should increase.

The magnitude of the positive effect of OF_t to UN (Total) is less than the magnitude of the positive effect of OF_t to UN (Construction) because construction is more focused and concerned to oil price. This is described in the Construction section below. Whereas the effect of OF_t to UN (Total) is less focus since it contains the UN for every sector.

Table 4.2: 2003 Mining, 1999 Mining, 1990 Mining

Sector →	Mining		Mining		Mining	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	74.66414	1.155939	11.44910	0.701680	0.857554	0.079078
GDP_t	-12.30225	-1.098655	-0.827814	-0.194861	11.39164	**2.604187**
GDP_{t-1}			-0.691894	-0.114058	-11.439	**-2.872152**
GDP_{t-2}			6.395009	1.521583		
OP_t	-1.288596	-0.516619	-0.88025	-1.27056	0.466092	1.055380
OP_{t-1}			-1.41864	-1.99836	-0.791106	-1.465117
OP_{t-2}			-1.48805	**-2.22379**	0.746802	1.461194
OP_{t-3}					0.618337	1.390813
OF_t	-8.738621	-0.315085	-8.338531	-0.74997	2.843809	0.388134
Number of Observations	49		49		31	
R-squared	0.032697		0.2867		0.388389	
Adjusted R-squared	-0.03179		0.164917		0.202246	
Durbin-Watson stat	2.301978		2.742863		3.241255	

Oil Price Shock of 1999:

The total effect of OP to UN (Mining) is negative. This is because OP increases at this time while the UN (Mining) decreases. When looking at the Mining sector in the "Unpublished Detailed Occupation and Industry tables" from the Current Population Survey of the Bureau of Labor Statistics, the mining sector includes: Oil And Gas Extraction; Coal Mining; Nonmetallic Mining And Quarrying; and Metal Mining. Because of the increase in OP, there should be more employment in Oil And Gas Extraction and possibly more employment in Coal Mining as some look to alternatives to Oil Extraction at this time

because of the high price. Then Oil And Gas Extraction, and Coal Mining companies may hire more workers or hire to capacity. This should decrease UN for the Mining sector.

The magnitude of the total effect of OP to UN (Mining) is highest when compared to other sectors whose total effect of OP to UN are significant. This is because the Mining sector concerns very directly with oil price. Such as described above it includes Oil And Gas Extraction. When oil price increases there should be more jobs created in Oil And Gas Extraction or less jobs cut. Since oil price increases, it is possible that the companies in this sector have more money and can hire more workers. Also, as the price of oil increases the value of the product (oil) the companies in this sector are looking for increases and becomes more attractive to discover and extract. More companies may be created or companies of small size may expand in order to extract more oil. These events would create much more jobs. Also as the price of oil increases it is possible that companies in Coal Mining may expand and hire more workers as people look towards alternatives to oil.

Oil Price Shock of 1990:

The total effect of GDP to UN (Mining) is negative and follows the direction of Okun' Law. When the total effect of GDP decreases and there is a recession, UN (Mining) increases.

Table 4.3: 2003 Construction, 1999 Construction, 1990 Construction

Sector →	Construction		Construction		Construction	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	t value
constant	24.58820	3.044462	-0.586802	-0.076875	-5.178545	-0.920983
GDP_t	-0.500056	-0.252457	-2.587272	-1.299124	6.261982	**2.297104**
GDP_{t-1}	-3.053606	-1.565563	0.461944	0.154906	-8.841071	**-2.27579**
GDP_{t-2}			5.620853	1.935701	3.635269	1.466910
GDP_{t-3}			-2.207456	-1.156568		
OP_t	0.186507	0.701887	-0.03596	-0.108034	-0.19072	-0.877811
OP_{t-1}			-1.237414	**-3.790203**		
OF_t	-1.650071	-0.507851	1.644077	0.318398	8.044732	**2.228267**
OF_{t-1}	-6.320376	-1.875982				
Number of Observations		48		48		32
R-squared		0.234476		0.397045		0.307536
Adjusted R-squared		0.143342		0.291527		0.17437
Durbin-Watson stat		1.122283		1.851971		0.984456

Oil Price Shock of 1990:

The total effect for GDP to UN (Construction) is negative. When total effect of GDP decreases and there is a recession, the Construction sector should suffer since there is less expansion of businesses. People build less. Thus, the UN (Construction) should suffer and increase. The direction of the effect of OF_t to UN is positive. Thus, when oil price swings and is unstable, UN (Construction) increases. Companies may hold off expanding and construction.

Amongst the sectors that are significant in effect of OF_t to UN for the Oil Price Shock of 2003, the Construction sector has the largest positive magnitude of effect. This is because

the Construction sector concerns oil price more. This is through what is explained in the paragraph above.

Table 4.4: 2003 Manufacturing, 1999 Manufacturing, 1990 Manufacturing

Sector →	Manufacturing		Manufacturing		Manufacturing	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	4.315379	1.170752	-3.770578	-0.886841	-0.216254	-0.065399
GDP_t	-0.441921	-0.691584	-2.287135	**-3.537292**	2.786153	**2.048034**
GDP_{t-1}			1.659405	**2.643017**	-3.348384	**-2.690477**
OP_t	0.128686	0.904080	-0.33213	**-3.32148**	-0.061244	-0.465346
OP_{t-1}			-0.25942	**-3.4101**		
OP_{t-2}			-0.19534	**-3.42142**		
OP_{t-3}			-0.13989	**-3.17494**		
OP_{t-4}			-0.09308	**-2.46202**		
OP_{t-5}			-0.05489	-1.47157		
OP_{t-6}			-0.02533	-0.63987		
OP_{t-7}			-0.00441	-0.10478		
OP_{t-8}			0.00789	0.182		
OP_{t-9}			0.01155	0.26854		
OP_{t-10}			0.00659	0.15922		
OP_{t-11}			-0.00701	-0.17759		
OP_{t-12}			-0.02924	-0.7404		
OP_{t-13}			-0.06009	-1.35888		
OP_{t-14}			-0.09958	-1.80042		
OP_{t-15}			-0.1477	**-2.0378**		
OP_{t-16}			-0.20445	**-2.15591**		
OF_t	-2.355368	-1.488217	1.693986	0.698434	2.730112	1.272164
OF_{t-1}			5.192254	**2.346528**		
Number of Observations		49		35		33
R-squared		0.069143		0.499648		0.271125
Adjusted R-squared		0.007085		0.369927		0.167
Durbin-Watson stat		2.732808		2.700866		1.78158

Oil Price Shock of 1999:

The total effect of GDP to UN (Manufacturing) is negative. This follows the direction in Okun's Law and is what is hoped to be seen. As total effect of GDP decreases, UN (Manufacturing) increases. The total effect of OP to UN (Manufacturing) is negative and is not what is hoped to be seen. This occurred because as total effect of OP increases, during the time frame looked at UN (Manufacturing) decreases. The effect of OF_{t-1} to UN (Manufacturing) is positive. This is because as OF_{t-1} increases, UN increases.

The magnitude of the total effect of OP to UN (Manufacturing) is small, actually it is the smallest amongst the sectors that are total effect of OP to UN that are significant. Davis and Haltiwanger (2001) describe that the more durable a product that the Manufacturing sector produces the more that sector is affected by an oil price increase. The Manufacturing sector includes two components: Manufacturing (Durables) and Manufacturing (Nondurables). Since Manufacturing includes Manufacturing (Durables) sector it should be largely affected by OP increase. However, the other component of the Manufacturing sector is the Manufacturing (Nondurable) sector, this sector should be less or oppositely affected by OP increase. This mix may cause the magnitude of OP to UN (Manufacturing) to turn out as such.

Also, it may be that the magnitude of the total effect of OP to UN (Manufacturing) is small because at the same time the effect of OF_{t-1} to UN (Manufacturing) is also small. These two occurrences may stem from similar reasons, possibly those described in the above paragraph. However, the direction of total effect of OP to UN (Manufacturing) is negative while the direction of the effect of OF_{t-1} to UN (Manufacturing) is positive.

Oil Price Shock of 1990:

The total effect of GDP to UN (Manufacturing) is negative. This follows the direction of Okun's Law and is what is hoped to be seen. As total effect of GDP decreases and there is a recession, UN (Manufacturing) increases. When GDP decreases and there is a recession, people purchase less products and so there is less manufacturing of products needed. Thus, manufacturers must cut jobs.

Table 4.5: 2003 Manufacturing Durables, 1999 Manufacturing Durables, 1990 Manufacturing Durables

Sector →	Manufacturing Durables		Manufacturing Durables		Manufacturing Durables	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.396397	0.20351	0.175963	0.022124	-2.707738	-0.688625
GDP_t	-0.433332	-0.479052	-0.490884	-0.464505	6.015409	**3.155486**
GDP_{t-1}			0.593322	0.581269	-9.977185	**-3.672549**
GDP_{t-2}					4.505762	**2.599964**
OP_t	0.047011	0.252686	-0.47821	**-2.90867**	-0.088392	-0.581769
OP_{t-1}			-0.37012	**-2.97069**		
OP_{t-2}			-0.27395	**-2.9442**		
OP_{t-3}			-0.18971	**-2.6485**		
OP_{t-4}			-0.1174	-1.89669		
OP_{t-5}			-0.05701	-0.91958		
OP_{t-6}			-0.00855	-0.12817		
OP_{t-7}			0.02799	0.39127		
OP_{t-8}			0.0526	0.70784		
OP_{t-9}			0.06529	0.87821		
OP_{t-10}			0.06605	0.91688		
OP_{t-11}			0.05488	0.79519		
OP_{t-12}			0.03179	0.46381		
OP_{t-13}			-0.00322	-0.04289		
OP_{t-14}			-0.05016	-0.54664		
OP_{t-15}			-0.10903	-0.91889		
OP_{t-16}			-0.17982	-1.16463		
OF_t	-5.184247	**-2.237175**	-1.908211	-0.465782	4.359576	1.726761
OF_{t-1}	4.536294	1.825444	6.715414	1.836114		
OF_{t-2}	-3.778527	-1.520386	-2.107316	-0.559592		
OF_{t-3}	3.894043	1.691484				
Number of Observations	46		35		32	
R-squared	0.2058		0.382778		0.410975	
Adjusted R-squared	0.083615		0.192863		0.2977	
Durbin-Watson stat	2.399546		2.885793		2.112704	

Oil Price Shock of 2003:

The effect of OF_t to UN (Durable Goods) is negative. During this time GDP increases and UN (Durable Goods) decreases. UN (Durable Goods) decrease follows the GDP increases. This is why as OF_t increases during this time, UN (Durable Goods) does not follow in increasing as well. The effect of OF_t to UN (Durable Goods) is not positive. Also there is a negative effect for the sheer reason that as OF_t increases, while during the time frame studied UN (Durable Goods) decreases.

Oil Price Shock of 1990:

The total effect of GDP to UN (Manufacturing, Durable) is positive which goes against Okun's Law but the effect is small. The total effect of GDP to UN (Manufacturing, Durable) is only 0.543986.

Table 4.6: 2003 Primary And Fabricated Metals, 1999 Primary Metals, 1990 Primary Metals

Sector →	Primary And Fabricated Metals		Primary Metals		Primary Metals	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	17.54855	1.44822	4.87273	0.208844	-14.51445	-0.79561
GDP_t	-7.886946	**-2.169833**	3.501316	0.875801	4.186636	0.996195
GDP_{t-1}	7.125844	1.356771	-6.908562	-1.314151		
GDP_{t-2}	-1.871554	-0.528001	4.559989	0.85611		
GDP_{t-3}			-2.802726	-0.618222		
OP_t	0.015378	0.039848	-0.22535	-0.38752	0.116955	0.1837
OP_{t-1}			-0.15916	-0.33436	-0.672807	-0.900254
OP_{t-2}			-0.09925	-0.24579	0.718527	1.1498
OP_{t-3}			-0.04562	-0.126		
OP_{t-4}			0.00173	0.00505		
OP_{t-5}			0.0428	0.12825		
OP_{t-6}			0.07759	0.23819		
OP_{t-7}			0.10609	0.33996		
OP_{t-8}			0.12832	0.4423		
OP_{t-9}			0.14427	0.55125		
OP_{t-10}			0.15393	0.65353		
OP_{t-11}			0.15732	0.68109		
OP_{t-12}			0.15442	0.56995		
OP_{t-13}			0.14524	0.40278		
OP_{t-14}			0.12979	0.26454		
OF_t	-5.270416	-1.166985	-6.962697	-0.580472	-1.45836	-0.137049
OF_{t-1}			9.917912	0.824504	16.98868	1.563649
Number of Observations	47		37		32	
R-squared	0.134838		0.204177		0.191211	
Adjusted R-squared	0.02933		-0.061098		-0.002898	
Durbin-Watson stat	2.199007		2.519943		2.840745	

Oil Price Shock of 2003:

The effect of GDP_t to UN (Primary and Fabricated Metal Products) is negative. This follows the direction of Okun's Law and is what is hoped to be seen. When GDP_t increases, there is a decrease in UN.

Table 4.7: 2003 Primary And Fabricated Metals, 1999 Fabricated Metals, 1990 Fabricated Metals

Sector →	Primary And Fabricated Metals		Fabricated Metals		Fabricated Metals	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	17.54855	1.44822	5.630723	0.498712	5.947462	0.577629
GDP_t	-7.886946	**-2.169833**	0.793558	0.404447	-1.112023	-0.428729
GDP_{t-1}	7.125844	1.356771				
GDP_{t-2}	-1.871554	-0.528001				
OP_t	0.015378	0.039848	-0.31066	-0.73491	-0.349106	-0.755753
OP_{t-1}			-0.20776	-0.83971	-0.122692	-0.237931
OP_{t-2}			-0.11079	-0.46894	-0.798745	-1.592434
OP_{t-3}			-0.01975	-0.07751	1.219854	**2.554088**
OP_{t-4}			0.06535	0.27814	-0.579571	-1.232917
OP_{t-5}			0.14452	0.60257		
OP_{t-6}			0.21775	0.53288		
OF_t	-5.270416	-1.166985	-1.559622	-0.192094	0.505825	0.072141
Number of Observations	47		45		30	
R-squared	0.134838		0.03191		0.318034	
Adjusted R-squared	0.02933		-0.092204		0.101044	
Durbin-Watson stat	2.199007		2.565028		2.249997	

Oil Price Shock of 1990:

The effect of OP_{t-3} to UN (Fabricated Metal) is positive. This means that when OP_{t-3} increases, UN (Fabricated Metal) increases. This is what is hoped to be seen. This could be because when oil price increases business slows in many sectors and thus there is less expansion and less need for Fabricated Metal sector which includes Fabricated Structural Metal Products and other components needed for construction. Also, as GDP decreases and there is a recession, UN (Fabricated Metal) increases.

The two sectors that are significant in OP_{t-3} are the Fabricated Metal and Motor Vehicles And Equipment sector. However, the effect of OP_{t-3} to UN for the Fabricated Metal

sector is less than that of Motor Vehicles And Equipment sector for the reasons described below in the Motor Vehicles And Equipment sector section. However, OP increase is still important for the Fabricated Metal sector. Since as OP increases there may be less building and expansion by companies. Since the Fabricated Metal sector, includes Fabricated Structural Metal Products which may be used for building and expansion, this sector should suffer. This sector may have to cut jobs.

Table 4.8: 2003 Transportation Equipment, 1999 Transportation Equipment, 1990 Transportation Equipment

Sector →	Transportation Equipment		Transportation Equipment		Transportation Equipment	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	27.24412	1.122091	8.67001	0.706665	-6.465171	-0.646425
GDP_t	4.231868	0.782957	-8.379854	**-2.717514**	16.67173	**3.438301**
GDP_{t-1}	-7.334822	-1.407221	13.0012	**3.288688**	-30.16787	**-4.365825**
GDP_{t-2}			-6.37975	**-2.048859**	16.1212	**3.657285**
OP_t	0.64543	0.915963	0.27494	0.70084	-0.294361	-0.761694
OP_{t-1}			0.17258	0.64032		
OP_{t-2}			0.08834	0.39546		
OP_{t-3}			0.02222	0.09892		
OP_{t-4}			-0.02579	-0.11206		
OP_{t-5}			-0.05567	-0.24901		
OP_{t-6}			-0.06743	-0.3078		
OP_{t-7}			-0.06108	-0.23535		
OP_{t-8}			-0.0366	-0.09704		
OF_t	-18.58545	**-2.118594**	-0.544461	-0.063226	7.797614	1.21426
OF_{t-1}	18.9782	1.97398				
OF_{t-2}	-8.252285	-0.927372				
Number of Observations	47		43		32	
R-squared	0.181675		0.272689		0.441171	
Adjusted R-squared	0.058926		0.127226		0.333704	
Durbin-Watson stat	2.676633		2.362297		2.434656	

Oil Price Shock of 2003:

The effect of OF_t to UN (Transportation Equipment) is negative. The effect did not turn out positive as hoped. This would have meant that when OF_t increases, UN (Transportation Equipment) increases. However, as GDP increases, as it does for this time frame, UN (Transportation Equipment) decreases. UN decreases follows the GDP increases. OF_t does increase at this time but UN does not follow closely in increasing as well. Also,

there is a negative effect of OF_t to UN (Transportation Equipment) because during the time frame studied OF_t increases while UN decreases.

As OF_t increase there is a decrease in UN (Transportation Equipment) possibly because people purchase more parts to fix or equip transportation products instead of purchasing new transportation products. People shift to purchasing the parts and equipment for transportation products instead of the products themselves. As OF_t increases people do not know whether or not to purchase more transportation products which may use a lot of oil so they stay put and shift to just purchasing equipment or parts to fix or maintain their existing transportation products.

This shift in behavior concerns oil a lot since the transportation sector concerns oil very directly. This may be the cause for the large magnitude in the negative direction of OF_t to UN (Transportation Equipment).

Oil Price Shock of 1999:

The total effect of GDP to UN (Transportation Equipment) is negative and this follows the direction of Okun's Law and what is hoped to be seen. As total effect of GDP decreases, UN (Transportation Equipment) increases.

Oil Price Shock of 1990:

The total effect of GDP to UN (Transportation Equipment) is positive. This is because as total effect of GDP decreases (or increases), during the time frame studied UN (Transportation Equipment) decrease (or increases) respectively. Also because this sector contains a variety of components and some that are needed regardless of the economic situation such as Guided Missiles, Space Vehicles, and Parts. These components may require more employees or lay off less workers compared to other sectors as the population increases. Those in defense may also have contracts for many years and long in advance of economic

troubled times. This would help people in this sector survive during troubled economic times.

Table 4.9: 2003 Wood Products, 1999 Lumber And Wood Products Except Furniture, 1990 Lumber And Wood Products Except Furniture

Sector →	Wood Products		Lumber And Wood Products Except Furniture		Lumber And Wood Products Except Furniture	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-18.45352	-1.157861	-17.10156	-0.925766	-4.591141	-0.630046
GDP_t	-0.000343	-0.000124	-0.441914	-0.120894	0.778131	0.423633
GDP_{t-1}			0.151065	0.041063		
OP_t	-0.553319	-0.898931	0.092699	0.134231	-0.284524	-0.97455
OP_{t-1}	-1.216788	-1.963466				
OP_{t-2}	-0.501825	-0.772095				
OF_t	16.75009	**2.461527**	-2.902194	-0.260274	7.203352	1.517744
OF_{t-1}			25.25907	**2.281531**		
Number of Observations		47		50		34
R-squared		0.201971		0.114047		0.097405
Adjusted R-squared		0.10465		0.013371		0.007146
Durbin-Watson stat		2.25379		2.534895		1.841805

Oil Price Shock of 2003:

The effect of OF_t to UN (Wood Products) is positive. OF_t increases and UN (Wood Products) increases. A positive effect is what is hoped for. This could be because the construction and expansion of new buildings requires the Wood Products sector. During this time since OF_t increases, companies hold off expansion and the building of new buildings.

The effect of OF_t to UN for the Wood Products sector is high in magnitude and positive because this sector is necessary for building and expansion which as described in the paragraph above may become halted when OF_t increases. However, the energy intensity and capital intensity for the Wood Products sector is not as high as the Chemicals sector (which can be seen in the Chemicals sector section). This is possibly why is the Chemicals sector still has a higher effect of OF_t to UN.

Oil Price Shock of 1999:

The effect of OF_{t-1} to UN (Lumber And Woods Products, Except Furniture) is positive as should be seen. As OF_{t-1} increases, the economic situation may become unstable and thus worsen, this causes UN (Lumber And Wood Products, Except Furniture) to increase. People curtail investment and expansion (or lessen) so they build less buildings which therefore require less Lumber And Wood Products, Except Furniture. This can be seen through what comprises the Lumber And Wood Products, Except Furniture sector. The Lumber And Wood Products, Except Furniture sector is composed of Wood Buildings and Mobile Homes, Sawmills, Planning Mills, and Millwork, Logging, and Miscellaneous Wood Products. Thus, Wood Buildings, Sawmills, Planing Mills, and Millwork, and Logging suffer.

Because the Lumber And Woods Products, Except Furniture sector concerns oil more closely for the reasons explained in the above paragraph, there is a large magnitude in the positive direction for the effect of OF_{t-1} to UN (Lumber And Woods Products, Except Furniture).

Table 4.10: 2003 Furniture And Fixtures, 1999 Furniture And Fixtures, 1990 Furniture And Fixtures

Sector →	Furniture And Fixtures		Furniture And Fixtures		Furniture And Fixtures	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.599535	0.126838	16.53819	0.341673	-16.21071	-1.145741
GDP_t	-1.996993	-0.913449	-9.563782	-1.88124	9.77759	1.215578
GDP_{t-1}			4.212446	0.838831	-7.19194	-0.612618
GDP_{t-2}					11.85377	1.212841
GDP_{t-3}					-25.09705	**-2.4199**
GDP_{t-4}					26.57503	**2.370736**
GDP_{t-5}					-12.97462	-2.006161
OP_t	-0.438487	-0.900412	-0.87256	-1.10261	0.370216	0.684038
OP_{t-1}			-0.65438	-1.09435	-0.852777	-1.428847
OP_{t-2}			-0.46264	-1.04083	-0.098712	-0.164735
OP_{t-3}			-0.29733	-0.87402	0.747993	1.370507
OP_{t-4}			-0.15846	-0.54008	0.336082	0.609398
OP_{t-5}			-0.04603	-0.15578		
OP_{t-6}			0.03996	0.12473		
OP_{t-7}			0.09952	0.28729		
OP_{t-8}			0.13265	0.36531		
OP_{t-9}			0.13933	0.37885		
OP_{t-10}			0.11958	0.3292		
OP_{t-11}			0.07339	0.20497		
OP_{t-12}			0.00077	0.00209		
OP_{t-13}			-0.09829	-0.24		
OP_{t-14}			-0.22379	-0.45063		
OP_{t-15}			-0.37572	-0.59677		
OP_{t-16}			-0.55409	-0.6892		
OF_t	5.34429	0.986974	-18.30167	-0.939269	16.35826	1.704598
OF_{t-1}			20.81803	1.142945		
OF_{t-2}			-7.763463	-0.409756		
OF_{t-3}			14.99924	0.7731		
OF_{t-4}			7.629254	0.430925		
OF_{t-5}			-14.32966	-0.834087		
Number of Observations		49		35		29
R-squared		0.062493		0.29668		0.655102
Adjusted R-squared		-0.000008		-0.039691		0.396428
Durbin-Watson stat		2.910559		3.145818		2.995264

Oil Price Shock of 1990:

The total effect of GDP to UN (Furniture And Fixtures) is positive. This is contrary to Okun's Law. However, the effect is small. The total effect of GDP to UN (Furniture And Fixtures) is only 1.47798.

Table 4.11: 2003 Manufacturing Nondurables, 1999 Manufacturing Nondurables, 1990 Manufacturing Nondurables

Sector →	Manufacturing Nondurables		Manufacturing Nondurables		Manufacturing Nondurables	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-1.515884	-0.342737	-1.193869	-0.296213	1.314764	0.36292
GDP_t	-0.107176	-0.139781	-3.950347	**-4.394149**	1.855166	1.24472
GDP_{t-1}			2.385971	**2.625736**	-2.468508	-1.810444
OP_t	0.355379	**2.08074**	-0.14722	-1.06404	0.014292	0.099119
OP_{t-1}			-0.10092	-0.96627		
OP_{t-2}			-0.06181	-0.78744		
OP_{t-3}			-0.02987	-0.48207		
OP_{t-4}			-0.00511	-0.09237		
OP_{t-5}			0.01248	0.22412		
OP_{t-6}			0.02288	0.3909		
OP_{t-7}			0.0261	0.43106		
OP_{t-8}			0.02214	0.36778		
OP_{t-9}			0.01101	0.19229		
OP_{t-10}			-0.0073	-0.13867		
OP_{t-11}			-0.0328	-0.66496		
OP_{t-12}			-0.06547	-1.2489		
OP_{t-13}			-0.10532	-1.59025		
OP_{t-14}			-0.15235	-1.68388		
OP_{t-15}			-0.20656	-1.67774		
OF_t	0.619695	0.326313	5.549204	1.732868	0.860151	0.365842
Number of Observations	49		36		33	
R-squared	0.089379		0.507889		0.122931	
Adjusted R-squared	0.028671		0.406073		-0.002364	
Durbin-Watson stat	2.705336		2.398607		2.287041	

Oil Price Shock of 2003:

The effect of OP_t to UN (Nondurable Goods) is positive. This is what is hoped to be seen. As OP_t increases, the UN (Nondurable Goods) increases as well.

The positive magnitude of the effect of OP_t to UN (Nondurable Goods) may be the least compared to other sector that have significant effect of OP_t to unemployment because as Davis and Haltiwanger (2001) describe sectors that are more durable lose more jobs when there is an oil price shock. Since the Nondurable Goods sector is the least durable in the spectrum of durables to nondurables, they should lose the least amount of jobs. This may be why the effect of OP_t to UN (Nondurable Goods) is the least in positive magnitude.

Oil Price Shock of 1999:

The total effect of GDP to UN (Manufacturing, Nondurables) is negative and this follows Okun's Law and is what is hoped to be seen. When total effect of GDP decreases there should be effects on UN especially in the Manufacturing (Nondurables) sector because these products are what people use the most and immediately. There is less of a delay in their purchase compared to nondurable products. People then must curtail their purchase of nondurable goods and this is seen. Jobs in the Nondurables Manufacturing must then be cut. Thus, there is an increase in UN (Manufacturing (Nondurables)) when GDP decreases.

Table 4.12: 2003 Food Manufacturing, 1999 Food And Kindred Products, 1990 Food And Kindred Products

Sector →	Food Manufacturing		Food And Kindred Products		Food And Kindred Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	6.706546	0.866279	-1.06049	-0.104737	7.620573	1.126104
GDP_t	-1.458967	-1.087071	-0.644366	-0.426119	-0.040326	-0.01295
GDP_{t-1}					2.348616	0.531609
GDP_{t-2}					-4.423314	-1.572597
OP_t	0.068259	0.228324	-0.445208	-1.008175	0.188013	0.636108
OP_{t-1}					-0.110054	-0.332868
OP_{t-2}					0.379685	1.157798
OP_{t-3}					-0.031389	-0.101006
OP_{t-4}					0.415442	1.383062
OF_t	-0.990891	-0.298089	6.770694	0.947316	-4.044934	-0.889824
Number of Observations		49		51		30
R-squared		0.02704		0.047785		0.286461
Adjusted R-squared		-0.037824		-0.012994		-0.034632
Durbin-Watson stat		2.179795		2.658017		2.80247

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.13: 2003 Petroleum And Coal Products, 1999 Petroleum And Coal Products, 1990 Petroleum And Coal Products

Sector →	Petroleum And Coal Products		Petroleum And Coal Products		Petroleum And Coal Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	14.1306	0.208068	-63.13013	-1.524637	327.5581	1.49125
GDP_t	-48.08844	**-2.48187**	3.814323	0.425654	-44.36589	-0.827797
GDP_{t-1}	92.88727	**3.474657**	-1.46082	-0.161246		
GDP_{t-2}	-85.29566	**-3.711515**				
GDP_{t-3}	34.54537	1.2954				
GDP_{t-4}	15.30731	0.867015				
OP_t	-1.483691	-0.862184	-0.5306	-0.38207	13.04674	1.533027
OP_{t-1}			-0.46914	-0.44803		
OP_{t-2}			-0.41717	-0.53197		
OP_{t-3}			-0.37467	-0.60919		
OP_{t-4}			-0.34165	-0.6262		
OP_{t-5}			-0.31811	-0.57922		
OP_{t-6}			-0.30405	-0.5248		
OP_{t-7}			-0.29947	-0.49747		
OP_{t-8}			-0.30437	-0.50618		
OP_{t-9}			-0.31875	-0.55485		
OP_{t-10}			-0.3426	-0.64549		
OP_{t-11}			-0.37594	-0.75535		
OP_{t-12}			-0.41876	-0.79684		
OP_{t-13}			-0.47105	-0.71637		
OP_{t-14}			-0.53283	-0.59621		
OP_{t-15}			-0.60408	-0.49746		
OF_t	-0.036386	-0.001744	76.19465	**2.377734**	-132.0814	-0.937779
Number of Observations		39		34		32
R-squared		0.423198		0.182908		0.080049
Adjusted R-squared		0.292952		0.001332		-0.018517
Durbin-Watson stat		2.665029		2.65641		1.347214

Oil Price Shock of 2003:

The total effect of GDP to UN (Petroleum And Coal Products) is negative. This is what is hoped to be seen and follows the direction of Okun's Law. As total effect of GDP increases, UN (Petroleum And Coal Products) decreases as well.

Oil Price Shock of 1999:

The effect of OF_t to UN (Petroleum And Coal Products) is positive. When OF_t increases, UN (Petroleum And Coal Products) increases as well. This follows what is hoped to be seen. This should be especially poignant in the Petroleum And Coal Products sector. Since the Petroleum And Coal Products sector includes Petroleum Refining And Miscellaneous Petroleum And Coal Products it should be heavily affected by OF_t. When OF_t increases it creates instability in the petroleum sector. Following from what this research studies, the UN of sectors related to petroleum should be affected.

Table 4.14: 2003 Chemicals, 1999 Chemicals And Allied Products, 1990 Chemicals And Allied Products

Sector →	Chemicals		Chemicals And Allied Products		Chemicals And Allied Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-5.905456	-0.296751	-28.9489	-0.899073	2.05969	0.195545
GDP_t	1.270378	0.421625	-18.13101	**-3.088604**	-0.50992	-0.20715
GDP_{t-1}			28.26109	**3.85485**		
GDP_{t-2}			-18.87607	**-2.644007**		
GDP_{t-3}			14.47829	**2.188833**		
OP_t	-0.50252	-0.761247	-0.11322	-0.14198	0.019575	0.059876
OP_{t-1}			-0.28955	-0.44098		
OP_{t-2}			-0.43157	-0.77551		
OP_{t-3}			-0.53928	-1.08958		
OP_{t-4}			-0.61266	-1.32156		
OP_{t-5}			-0.65173	-1.44969		
OP_{t-6}			-0.65649	-1.4917		
OP_{t-7}			-0.62693	-1.47216		
OP_{t-8}			-0.56305	-1.40136		
OP_{t-9}			-0.46485	-1.26605		
OP_{t-10}			-0.33234	-1.01615		
OP_{t-11}			-0.16552	-0.55807		
OP_{t-12}			0.03563	0.11718		
OP_{t-13}			0.27108	0.72547		
OP_{t-14}			0.54086	1.07456		
OP_{t-15}			0.84495	1.24314		
OF_t	17.47671	**2.169313**	-16.77925	-1.011004	-8.280889	-1.427938
OF_{t-1}	-13.15459	-1.579163	39.85173	**2.378593**	10.57498	1.78414
OF_{t-2}					-1.280542	-0.241115
Number of Observations	48		36		32	
R-squared	0.124699		0.516766		0.159707	
Adjusted R-squared	0.043276		0.349492		-0.001888	
Durbin-Watson stat	2.400792		3.074316		2.541038	

Oil Price Shock of 2003:

The effect of OF_t to UN (Chemicals) is positive. As OF_t increases, UN (Chemicals) increases. This is what is hoped to be seen.

As described in the section entitled Energy Intensity and Capital Intensity as Explanations for Effects, the Chemicals sector may have the largest positive magnitude of the effect of OF_t to UN. This is possibly explained by the Chemicals sector having the largest energy intensity and capital intensity of the manufacturing sectors that have energy intensities and capital intensities and are significant in effect of OF_t to UN. This similar what Davis and Haltiwanger (2001) found. Since they found the more energy intensive and capital intensive a sector is, the more it is affected by an oil price shock.

Oil Price Shock of 1999:

The total effect of GDP to UN (Chemicals And Allied Products) is positive and this does not follow Okun's Law and is not what is hoped to be seen. This is because when total effect of GDP decreases (or increases), UN (Chemicals And Allied Products) decreases (or increases) respectively during the time frame looked at. The effect of OF_{t-1} to UN (Chemicals And Allied Products) is positive. This is because when OF_{t-1} increases (or decreases), UN increases (or decreases) respectively as well. This is what is hoped for.

Table 4.15: 2003 Plastic And Rubber Products, 1999 Rubber And Miscellaneous Plastic Products, 1990 Rubber And Miscellaneous Plastic Products

Sector →	Plastic And Rubber Products		Rubber And Miscellaneous Plastic Products		Rubber And Miscellaneous Plastic Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	14.64852	0.692028	-17.17269	-0.588313	8.024223	0.78358
GDP_t	-1.830198	-0.498749	0.376829	0.086544	-2.304884	-0.892925
GDP_{t-1}			0.686856	0.156201		
OP_t	0.576406	0.705162	-0.56809	-0.84773	0.157787	0.384579
OP_{t-1}			-0.48321	-0.95635		
OP_{t-2}			-0.40467	-1.0639		
OP_{t-3}			-0.33247	-1.09594		
OP_{t-4}			-0.2666	-0.96566		
OP_{t-5}			-0.20707	-0.73117		
OP_{t-6}			-0.15388	-0.51007		
OP_{t-7}			-0.10702	-0.33887		
OP_{t-8}			-0.0665	-0.20865		
OP_{t-9}			-0.03232	-0.10441		
OP_{t-10}			-0.00447	-0.01527		
OP_{t-11}			0.01704	0.06071		
OP_{t-12}			0.03221	0.10956		
OP_{t-13}			0.04105	0.11643		
OP_{t-14}			0.04355	0.09458		
OP_{t-15}			0.03971	0.065		
OF_t	-2.118549	-0.233093	-4.303968	-0.270201	-1.042413	-0.15629
OF_{t-1}			22.95865	1.476975		
Number of Observations	49		36		34	
R-squared	0.016796		0.134542		0.042151	
Adjusted R-squared	-0.048751		-0.081823		-0.053634	
Durbin-Watson stat	2.75848		2.26774		2.806434	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.16: 2003 Wholesale And Retail Trade, 1999 Wholesale And Retail Trade, 1990 Wholesale And Retail Trade

Sector →	Wholesale And Retail Trade		Wholesale And Retail Trade		Wholesale And Retail Trade	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.370122	0.253407	-10.44879	-1.468093	-3.608886	-1.092716
GDP_t	3.777251	**2.328947**	-2.068926	**-2.187764**	2.426925	1.83748
GDP_{t-1}	-5.77679	**-2.465036**	2.558413	**2.800925**	-1.764787	-1.457428
GDP_{t-2}	1.718346	1.086448				
OP_t	0.145699	0.8461	-0.26404	-1.7947	-0.08298	-0.622674
OP_{t-1}			-0.21775	-1.95304	-0.150393	-0.932664
OP_{t-2}			-0.1773	**-2.12928**	0.07315	0.531248
OP_{t-3}			-0.14269	**-2.22605**		
OP_{t-4}			-0.11392	**-2.05682**		
OP_{t-5}			-0.09101	-1.64038		
OP_{t-6}			-0.07393	-1.2388		
OP_{t-7}			-0.0627	-0.97941		
OP_{t-8}			-0.05731	-0.86176		
OP_{t-9}			-0.05776	-0.86825		
OP_{t-10}			-0.06406	-0.99373		
OP_{t-11}			-0.0762	-1.23372		
OP_{t-12}			-0.09419	-1.53537		
OP_{t-13}			-0.11801	-1.75625		
OP_{t-14}			-0.14769	-1.79849		
OP_{t-15}			-0.1832	-1.72542		
OP_{t-16}			-0.22456	-1.62526		
OF_t	-0.58292	-0.289265	7.562026	**2.062712**	4.277996	1.914799
OF_{t-1}			2.973974	0.908674		
OF_{t-2}			0.694899	0.206209		
Number of Observations	47		35		32	
R-squared	0.203391		0.373843		0.212514	
Adjusted R-squared	0.106243		0.181179		0.023517	
Durbin-Watson stat	2.326808		2.785293		2.316645	

Oil Price Shock of 2003:

The total effect of GDP to UN (Wholesale And Retail Trade) is negative. This follows the direction of Okun's Law and is what is hoped to found. As total effect of GDP increases, UN (Wholesale And Retail Trade) decreases.

Oil Price Shock of 1999:

The total effect of GDP to UN (Wholesale And Retail Trade) is positive. As total effect GDP decreases, during the time frame studied UN (Wholesale And Retail Trade) also decreases. The total effect of OP to UN (Wholesale And Retail Trade) is negative. The effect of OF_t to UN (Wholesale And Retail Trade) is positive. For OF_t, what is hoped to be seen is seen which is when OF_t increases there may be uncertainty in the economy and thus uncertainty in the decision making of sectors of whether to hire and result in the tendency to lay off workers.

The magnitude of the total effect of OP to UN (Wholesale And Retail Trade) is similar to the total effect of OP to UN (Retail Trade) since Wholesale And Retail Trade sector includes the Retail Trade sector as one of the two components it has. Thus, it is a major component. The magnitude for Wholesale And Retail Trade sector may be as such because of similar reasons for the Retail Trade sector.

The magnitude of the effect of OF_t to UN (Wholesale And Retail Trade) is small and positive possibly for similar reasons, as those described above. As the Retail Trade sector is a part of the Wholesale And Retail Trade sector.

Table 4.17: 2003 Wholesale Trade, 1999 Wholesale Trade, 1990 Wholesale Trade

Sector →	Wholesale Trade		Wholesale Trade		Wholesale Trade	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	5.266772	0.735826	4.200958	0.422478	2.340098	0.429081
GDP_t	-1.562555	-1.259272	-3.423007	-1.539807	0.201536	0.146604
GDP_{t-1}			4.045879	1.880025		
OP_t	0.089446	0.323609	-0.46289	-1.34627	0.003136	0.014351
OP_{t-1}			-0.34244	-1.30997		
OP_{t-2}			-0.2371	-1.2141		
OP_{t-3}			-0.14685	-0.98849		
OP_{t-4}			-0.07171	-0.57734		
OP_{t-5}			-0.01168	-0.09754		
OP_{t-6}			0.03325	0.26472		
OP_{t-7}			0.06307	0.47626		
OP_{t-8}			0.07779	0.57536		
OP_{t-9}			0.07741	0.58534		
OP_{t-10}			0.06192	0.49749		
OP_{t-11}			0.03132	0.27006		
OP_{t-12}			-0.01438	-0.12428		
OP_{t-13}			-0.07518	-0.55841		
OP_{t-14}			-0.15109	-0.85304		
OP_{t-15}			-0.2421	-1.0084		
OP_{t-16}			-0.34822	-1.0887		
OF_t	-0.260475	-0.084753	0.57067	0.070582	-0.118308	-0.033307
Number of Observations	49		35		34	
R-squared	0.035988		0.135413		0.001934	
Adjusted R-squared	-0.028279		-0.049855		-0.097873	
Durbin-Watson stat	2.786553		2.138365		2.499419	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.18: 2003 Retail Trade, 1999 Retail Trade, 1990 Retail Trade

Sector →	Retail Trade		Retail Trade		Retail Trade	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.107714	0.172591	-10.30586	-1.654991	-3.618407	-1.037951
GDP_t	4.821499	**2.504356**	-1.924643	**-2.032371**	0.693312	0.827634
GDP_{t-1}	-6.847644	**-2.461546**	2.328277	**2.531954**		
GDP_{t-2}	2.029143	1.080789				
OP_t	0.183033	0.895419	-0.23814	-1.62606	-0.108379	-0.800488
OP_{t-1}			-0.19836	-1.78029	-0.092835	-0.62953
OP_{t-2}			-0.16362	-1.95671		
OP_{t-3}			-0.13393	**-2.07535**		
OP_{t-4}			-0.10928	-1.97371		
OP_{t-5}			-0.08968	-1.64165		
OP_{t-6}			-0.07513	-1.29564		
OP_{t-7}			-0.06562	-1.06524		
OP_{t-8}			-0.06115	-0.96335		
OP_{t-9}			-0.06174	-0.97977		
OP_{t-10}			-0.06736	-1.11174		
OP_{t-11}			-0.07804	-1.34983		
OP_{t-12}			-0.09375	-1.62107		
OP_{t-13}			-0.11452	-1.76806		
OP_{t-14}			-0.14033	-1.73225		
OP_{t-15}			-0.17118	-1.61256		
OP_{t-16}			-0.20709	-1.49096		
OF_t	-0.903265	-0.3776	8.0939	**2.278491**	4.141748	1.763999
OF_{t-1}			2.926243	0.90293		
Number of Observations	47		35		33	
R-squared	0.344782		0.344782		0.11747	
Adjusted R-squared	0.109603		0.174911		-0.008606	
Durbin-Watson stat	2.419092		2.536626		2.223422	

Oil Price Shock of 2003:

The total effect of GDP to UN (Retail Trade) is negative which follows the direction of Okun's Law. This is what is hoped to be seen. As total effect of GDP increases, UN (Retail Trade) decreases.

Oil Price Shock of 1999:

The Retail Trade sector has a similar result to the Wholesale And Retail Trade sector which Retail Trade is a part of and for similar reasons. The effect of GDP to UN (Retail Trade) is positive. The total effect of OP to UN (Retail Trade) is negative. The effect of OF_t to UN (Retail Trade) is positive.

The negative magnitude of the total effect of OP to UN (Retail Trade) is small and lower than Mining; Transportation, Communication, And Public Utilities; and Goods Producing Industries. This is because Retail Trade does not relate as directly to OP as these sectors do. Mining has the components of Oil And Gas Extraction and Coal Mining. Where the Transportation, Communication, And Public Utilities sector has the Public Utilities sector component which has the further components that relate to energy and oil which are Electric Light And Power. Transportation, Communication, And Public Utilities also has the component of Transportation which relate to oil since much of transportation needs oil.

The Goods Producing Industries Sector has the four components of Agriculture, Mining, Construction, and Manufacturing which may concern more with oil than does the Retail Trade sector. Mining as explained has Oil And Gas Extraction and Coal mining which concerns oil. In regards to Manufacturing also has a significant effect of OP to UN (Manufacturing). Also manufacturing as discussed by Davis and Haltiwanger has the Manufacturing (Nondurables) sector as a component. As a sector manufactures more durable products, the more affected it is by OP increase. Also the Construction sector may concern

OP as described in the construction section. As can be seen the Retail Trade sector is concerned with oil price less. However, the Retail Trade sector also concerns oil since it still includes components such as Gasoline Service Stations and Fuel Dealers. These may create more jobs as oil price increases and it may be more profitable to expand and to be in business.

Also, it may be that the magnitude of the total effect of OP to UN (Retail Trade) is small because at the same time the magnitude of the effect of OF_t to UN (Retail Trade) is also small. These two occurrences may stem from similar reasons. However, the direction of total effect of OP to UN (Retail Trade) is negative while the direction of the effect of OF_t to UN (Retail Trade) is positive.

Table 4.19: 2003 Professional And Business Services, 1999 Professional Services, 1990 Professional Services

Sector →	Professional And Business Services		Professional Services		Professional Services	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	6.817696	1.502896	2.591258	0.334801	-5.857966	-1.095759
GDP_t	1.491913	1.185461	-2.227555	-1.287381	3.59118	1.775641
GDP_{t-1}	-2.53864	**-2.023119**	4.429124	**2.644166**	-2.003933	-1.055742
OP_t	-0.037632	-0.219499	-0.37141	-1.38781	0.186446	0.902268
OP_{t-1}			-0.31174	-1.53209	-0.33747	-1.46269
OP_{t-2}			-0.25632	-1.68629		
OP_{t-3}			-0.20516	-1.7742		
OP_{t-4}			-0.15826	-1.63685		
OP_{t-5}			-0.11561	-1.24033		
OP_{t-6}			-0.07723	-0.78998		
OP_{t-7}			-0.0431	-0.41812		
OP_{t-8}			-0.01323	-0.12572		
OP_{t-9}			0.01238	0.12028		
OP_{t-10}			0.03373	0.34823		
OP_{t-11}			0.05083	0.56304		
OP_{t-12}			0.06367	0.70709		
OP_{t-13}			0.07225	0.68942		
OP_{t-14}			0.07657	0.55539		
OP_{t-15}			0.07663	0.41006		
OP_{t-16}			0.07243	0.29095		
OF_t	-2.242173	-1.158355	-3.658543	-0.581346	5.047413	1.406362
Number of Observations	48		35		33	
R-squared	0.116022		0.237707		0.185517	
Adjusted R-squared	0.033792		0.074358		0.034686	
Durbin-Watson stat	2.528257		2.65685		2.738115	

Oil Price Shock of 2003:

The effect of GDP_{t-1} to UN (Professional And Business Services) is negative. This follows the direction of Okun's Law. When GDP_{t-1} increases, UN (Professional And Business Services) decreases.

Oil Price Shock of 1999:

The effect of GDP_{t-1} to UN (Professional Services) is positive. Professional Services sector should be most resistant to GDP decrease. This is because of the nature of professional services. People must use professional services even in troubled times. There are less of alternatives to professional services. If one must see a doctor or lawyer one must see a doctor or lawyer. There are less of alternatives. Also the cost of professional services does not vary greatly. Doctors and lawyers charge similar rates within their professions. Those in the Professional Services sector also do not loose their jobs greatly in troubled economic times. Many may also be self employed and do not lay themselves off. The nature of how they are paid may also contribute to this.

Professional Services include: Hospitals, Health Services Excluding Hospitals, Educational Services, Social Services, and Other Professional Services. Health Services Excluding Hospitals include Offices and Clinics of Physicians (Medical Doctors), Offices And Clinics of Dentists, Offices And Clinics of Chiropractors, Offices And Clinics of Optometrists, Offices And Clinics of Health Care Practitioners, Nursing And Personal Care Facilities, and other Health Services;

Educational Services includes Elementary And Secondary Schools, College And Universities, Vocational Schools, Libraries, and other Educational Services; Social Services includes Job Training And Vocational Rehabilitation Services, Child Day Care Services, Family Child Care Homes, Residential Care Facilities without Nursing, and other Social Services;

Other Professional Services includes Legal Services, Museum, Art Galleries, And Zoos, Labor Unions, Religious Organizations, Membership Organizations, Engineering, Architect, And Survey Services, Account, Audit, And Bookkeeping Services, Research,

Development And Testing Services, Management And Public Relations Services, and Miscellaneous Professional And Related Services.

Many of these sectors are state run and paid for organizations. Many of the subsectors are institutionalized. Because of this they survive well during troubled economic times. Some jobs may be added to the Professional Services sector during troubled economic times because yearly population increases require this. This is true of state run and paid for organizations and institutionalized sectors.

An example is medical doctors. Medical doctors graduate and most find jobs. This happens even in troubled economic times. There is competition to get into medical school every year and a competition to hire them. Often there is a shortage of personnel in this profession. When there is troubled economic times there is still competition to get into medical school. In the year 2000, there where 37,088 applicants to medical schools in the United States and only 17,535 accepted. Thus, many thousands more people try to get accepted into medical school than those are accepted.

Table 4.20: 2003 Educational Services, 1999 Educational Services, 1990 Educational Services

	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	t value
constant	9.480296	0.677662	28.21489	1.301347	2.339444	0.158522
GDP_t	5.678218	1.451542	-12.5285	**-2.263167**	1.584851	0.426039
GDP_{t-1}	-6.941281	-1.78589	19.01135	**2.423108**		
GDP_{t-2}			-8.918214	-1.665942		
OP_t	0.709545	1.342478	-0.48954	-0.536882	0.053777	0.09095
OP_{t-1}	-0.99694	-1.79561				
OF_t	-0.800572	-0.134053	-10.04753	-0.681443	-0.456122	-0.047454
Number of Observations	48		49		34	
R-squared	0.157231		0.127255		0.014135	
Adjusted R-squared	0.056901		0.025773		-0.084451	
Durbin-Watson stat	1.852177		2.413435		2.571749	

Oil Price Shock of 1999:

The total effect of GDP to UN (Educational Services) is positive and is thus contrary to Okun's Law. This is because as total effect of GDP decreases (or increases), during the time frame studied UN (Educational Services) decreases (or increases) respectively.

Table 4.21: 2003 Hospitals, 1999 Hospitals, 1990 Hospitals

Sector →	Hospitals		Hospitals		Hospitals	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	10.67492	1.11878	14.17814	0.974521	7.36955	0.880749
GDP_t	-1.274654	-0.766133	0.782595	0.276762	-1.248139	-0.591779
OP_t	0.115101	0.312519	-0.30352	-0.71846	0.50838	1.516467
OP_{t-1}	-0.656277	-1.704447	-0.24837	-0.70971		
OP_{t-2}			-0.19684	-0.68274		
OP_{t-3}			-0.14892	-0.62422		
OP_{t-4}			-0.10463	-0.51827		
OP_{t-5}			-0.06395	-0.35803		
OP_{t-6}			-0.0269	-0.16066		
OP_{t-7}			0.00653	0.03963		
OP_{t-8}			0.03635	0.21803		
OP_{t-9}			0.06254	0.36933		
OP_{t-10}			0.08511	0.49946		
OP_{t-11}			0.10407	0.61663		
OP_{t-12}			0.1194	0.7269		
OP_{t-13}			0.13111	0.83084		
OP_{t-14}			0.13921	0.91787		
OP_{t-15}			0.14368	0.95968		
OP_{t-16}			0.14453	0.92019		
OP_{t-17}			0.14176	0.79648		
OP_{t-18}			0.13537	0.63296		
OP_{t-19}			0.12537	0.47539		
OP_{t-20}			0.11174	0.34295		
OP_{t-21}			0.09449	0.23694		
OF_t	-2.130782	-0.512087	-12.46223	-1.000088	-4.198829	-0.770463
Number of Observations	48		30		34	
R-squared	0.086886		0.084079		0.071364	
Adjusted R-squared	0.001945		-0.106738		-0.021499	
Durbin-Watson stat	2.773643		2.521804		2.901848	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.22: 2003 Food Services And Drinking Places, 1999 Eating And Drinking Places, 1990 Eating And Drinking Places

Sector →	Food Services And Drinking Places		Eating And Drinking Places		Eating And Drinking Places	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	6.57714	1.400354	-10.55755	-1.234745	-0.48208	-0.105334
GDP_t	-0.472746	-0.580529	-1.152954	-1.014832	-0.343946	-0.309678
GDP_{t-1}			1.733034	1.5793		
OP_t	0.038174	0.210447	-0.09812	-0.55514	-0.189216	-1.147392
OP_{t-1}	0.186257	1.019868	-0.096	-0.71672		
OP_{t-2}	-0.343706	-1.794444	-0.09403	-0.93996		
OP_{t-3}			-0.0922	-1.19734		
OP_{t-4}			-0.09053	-1.36048		
OP_{t-5}			-0.089	-1.33541		
OP_{t-6}			-0.08763	-1.22225		
OP_{t-7}			-0.0864	-1.12349		
OP_{t-8}			-0.08532	-1.06801		
OP_{t-9}			-0.0844	-1.05597		
OP_{t-10}			-0.08362	-1.0797		
OP_{t-11}			-0.08299	-1.11837		
OP_{t-12}			-0.0825	-1.11952		
OP_{t-13}			-0.08217	-1.0179		
OP_{t-14}			-0.08199	-0.83109		
OP_{t-15}			-0.08195	-0.64249		
OP_{t-16}			-0.08207	-0.49442		
OF_t	-2.887333	-1.439818	9.772969	**2.218981**	2.82881	0.974354
OF_{t-1}			4.252464	1.08153	-0.984006	-0.345893
OF_{t-2}			-3.860109	-0.953482		
Number of Observations	47		35		33	
R-squared	0.160387		0.260154		0.095003	
Adjusted R-squared	0.057995		0.032509		-0.034283	
Durbin-Watson stat	2.626806		2.444315		2.581284	

Oil Price Shock of 1999:

The effect of OF_t to UN (Eating And Drinking Places) is positive. This is because as OF_t fluctuation increases there is less stability in the economy. People may have less money and need to save and spend less on food or then when oil price swings back to a lower price they may have some money but feel they need to save the money and spend less on food since oil price may swings to a higher price. They see that going too often to eating and drinking establishments waste money and find eating and drinking at home as a better way to save. People thus go to less eating and drinking establishments. These eating and drinking establishments may have to cut jobs. People may make food and drinks at home. This cost less.

For the reasons in the above paragraph and because going to Eating And Drinking Places is what people can cut back on more easily than others, the effect of OF_t to UN (Eating And Drinking) is large in magnitude and positive.

Table 4.23: 2003 Government Workers, 1999 Public Administration, 1990 Public Administration

Sector →	Government Workers		Public Administration		Public Administration	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	4.300386	0.527538	-0.376103	-0.065332	-2.124706	-0.322054
GDP_t	3.25435	1.439008	0.969879	1.117756	-1.023122	-0.645368
GDP_{t-1}	-3.725005	-1.65197				
OP_t	0.865517	2.80936	0.3818	1.50622	0.576179	**2.248726**
OP_{t-1}			-0.09926	-0.38745	-0.687252	**-2.462575**
OP_{t-2}			-0.5406	**-2.14522**		
OF_t	-2.304645	-0.66257	-0.151136	-0.037003	4.138641	0.931413
Number of Observations		48		49		33
R-squared		0.209406		0.16275		0.288559
Adjusted R-squared		0.135862		0.065395		0.186924
Durbin-Watson stat		1.88709		1.895695		2.3071

Oil Price Shock of 2003:

The effect of OP_t to UN (Government Workers) is positive. This is what is in general what is hoped for. As OP_t increases, UN should increase also. However, the total effect of OP to UN (Public Administration) is negative for the Oil Price Shock of 1999. This is a difference in direction to the Oil Price Shock of 2003. However, the title of Public Administration (which is for the Oil Price Shock of 1999) is different from the title of Government Workers (which is for the Oil Price Shock of 2003). What both are comprised of is also different in composition.

At this time GDP increases and UN for other sectors (private companies) decreases. It could be possible that as GDP increases and the economy does well, workers in the Government Workers sector lose jobs but then the some jobs are absorbed into the other sectors (private companies) that are doing well indicated by a strong GDP and economy.

New workers may go to other sectors (private companies) instead of going to the Government Workers sector.

Also a Republican Administration is in power at this time. Thus, the acceleration of the growth of Government Workers is possibly curtailed and the Bush tax cuts in 2001 and 2003 are put into effect. The Bush tax cut of 1.35 trillion dollars in 2001 is called the "first major tax cut in 20 years" (Wallace, 2001: 1). Thus, government civil service workers are curtailed at this time.

Oil Price Shock of 1990:

The total effect of OP to UN (Public Administration) is negative. As total effect of OP increases, UN decreases. This could do to the nature of Public Administration. The Public Administration sector may not be affected by OP increase and may actually show increase employment compared to some other sectors. Government does not lay off lots of workers even during times of economic trouble. They may just have a hiring freeze and halt the hiring of workers or just move workers between agencies but within the same department. They may even hire more workers to serve because the population still increases. To understand the character and nature of what is meant by Public Administration, the following is a list of what comprises Public Administration: Executive And Legislative Offices; Justice, Public Order, And Safety; National Security And International Affairs; Public Finance, Taxation, And Monetary Policy; Administration of Economic Programs; Administration of Environment, Quality, And Housing Programs; Administration of Human Resources Programs; and General Government. Often the plans for the hiring of government employees are made ahead of time and for a lengthy time in advance. This allows for the continued hiring of government employees even in times where important economic commodities such

as oil price shocks. Employees in the Justice, Public Order, And Safety; National Security And International Affairs; and Executive And Legislative Offices; sector should surely continue to be hired according to population increases. This would be due to public safety and necessity of the establishment of order.

It is difficult to compare of the magnitude of the total effect of OP to UN (Public Administration) since there are no other sectors in the 1990 oil shock that are significant in total effect of OP to UN.

Please note that Table 4.24 to Table 4.25 do not have applicable data for the Oil Price Shock of 1999 so the section for the Oil Price Shock of 1999 is blank.

Table 4.24: 2003 Health Services Except Hospitals, 1990 Medical Except Hospitals

Sector →	Health Services Except Hospitals				Medical Except Hospitals	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	3.157817	0.466707			-7.332198	-1.02792
GDP_t	0.211802	0.180568			2.52433	1.472726
OP_t	-0.224664	-0.859849			0.335521	1.211141
OP_{t-1}					-0.428864	-1.421312
OF_t	-1.704438	-0.586678			6.746829	1.404366
Number of Observations	49				33	
R-squared	0.024106				0.157329	
Adjusted R-squared	-0.040953				0.036948	
Durbin-Watson stat	2.825955				2.535143	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.25: 2003 Arts, Entertainment, And Recreation, 1990 Entertainment And Recreation Services

Sector →	Arts, Entertainment, And Recreation				Entertainment And Recreation Services	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	8.997643	0.919263			-4.695745	-0.500284
GDP_t	1.111321	0.654856			1.815354	0.767289
OP_t	-0.577341	-1.527272			-0.093021	-0.247359
OP_{t-1}	0.643518	1.690841				
OP_{t-2}	-0.78283	-1.96119				
OF_t	-6.089151	-1.45706			5.820959	0.95218
Number of Observations	47				34	
R-squared	0.2268				0.031552	
Adjusted R-squared	0.132507				-0.065292	
Durbin-Watson stat	2.565104				2.646605	

The above table does not have any coefficients significant at or above the 95% confidence level.

Please note that Table 4.26 to Table 4.40 do not have applicable data for the Oil Price Shock of 2003 so the section for the Oil Price Shock of 2003 is blank.

Table 4.26: 1999 Goods Producing Industries, 1990 Goods Producing Industries

Sector →			Goods Producing Industries		Goods Producing Industries	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			-12.47015	-2.167695	-1.714635	-0.417544
GDP_t			-3.117597	**-3.56359**	4.523951	**2.272341**
GDP_{t-1}			3.41101	**4.01531**	-7.02424	**-2.475788**
GDP_{t-2}					2.693329	1.488137
OP_t			-0.43325	**-3.20228**	-0.122208	-0.770178
OP_{t-1}			-0.34823	**-3.38315**		
OP_{t-2}			-0.27345	**-3.53987**		
OP_{t-3}			-0.20893	**-3.50446**		
OP_{t-4}			-0.15464	**-3.02328**		
OP_{t-5}			-0.11061	**-2.19172**		
OP_{t-6}			-0.07682	-1.43419		
OP_{t-7}			-0.05329	-0.9364		
OP_{t-8}			-0.04	-0.68202		
OP_{t-9}			-0.03695	-0.63484		
OP_{t-10}			-0.04416	-0.78889		
OP_{t-11}			-0.06161	-1.15362		
OP_{t-12}			-0.08931	-1.67162		
OP_{t-13}			-0.12726	**-2.12682**		
OP_{t-14}			-0.17546	**-2.3445**		
OP_{t-15}			-0.2339	**-2.38505**		
OP_{t-16}			-0.30259	**-2.35824**		
OF_t			5.670122	1.727813	4.136502	1.568829
OF_{t-1}			8.350453	**2.789128**		
Number of Observations			35		32	
R-squared			0.534291		0.299371	
Adjusted R-squared			0.413552		0.164634	
Durbin-Watson stat			2.058957		1.239364	

Oil Price Shock of 1999:

The total effect of GDP to UN (Goods Producing Industries) is positive and is against the direction of Okun's Law. However, this total effect of GDP to UN (Goods Producing

Industries) is small. The effect is only 0.45172. The total effect of OP to UN (Goods Producing Industries) is negative. The effect of OF_{t-1} to UN (Goods Producing Industries) is positive. This is what is hoped to be seen.

The magnitude of the total effect of OP to UN (Goods Producing Industries) is sizable because it includes the four components of Mining, Manufacturing, Construction, and Agriculture. Goods Producing Industries sector includes Mining which has the largest effect OP to UN amongst the sectors with significant total effect of OP to UN and so the Goods Producing Industries sector should too have a sizable effect. The Goods Producing Industries sector also includes the Manufacturing sector which is also significant in total effect of OP to UN but it is smallest in total effect of OP to UN amongst those that are significant in total effect of OP to UN. This could make the total effect of OP to UN (Goods Producing Industries) balanced and be smaller than total effect of OP to UN (Mining) but larger than OP to UN (Manufacturing).

Oil Price Shock of 1990:

The total effect of GDP to UN (Goods Producing Industries) is negative. This follows the same direction as Okun's Law and what is hoped to be seen. As total effect of GDP decreases and there is a recession, the UN (Goods Producing Industries) increases.

Table 4.27: 1999 Service Producing Industries, 1990 Service Producing Industries

Sector →			Service Producing Industries		Service Producing Industries	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			-5.837957	-0.861399	-3.41683	-1.278167
GDP_t			-2.318795	**-2.57498**	2.473937	**2.446261**
GDP_{t-1}			2.877215	**3.307951**	-1.914844	-2.017456
OP_t			-0.23758	-1.69584	-0.03872	-0.374723
OP_{t-1}			-0.2003	-1.88669	-0.129688	-1.124119
OP_{t-2}			-0.16686	**-2.10444**		
OP_{t-3}			-0.13725	**-2.24855**		
OP_{t-4}			-0.11147	**-2.11341**		
OP_{t-5}			-0.08952	-1.69461		
OP_{t-6}			-0.07141	-1.25664		
OP_{t-7}			-0.05713	-0.93727		
OP_{t-8}			-0.04669	-0.73728		
OP_{t-9}			-0.04007	-0.63261		
OP_{t-10}			-0.0373	-0.60758		
OP_{t-11}			-0.03835	-0.65204		
OP_{t-12}			-0.04324	-0.74018		
OP_{t-13}			-0.05196	-0.81199		
OP_{t-14}			-0.06451	-0.82499		
OP_{t-15}			-0.0809	-0.80011		
OP_{t-16}			-0.10111	-0.76853		
OF_t			3.146197	0.901244	3.915307	**2.181677**
OF_{t-1}			0.570046	0.18291		
OF_{t-2}			2.570354	0.801005		
Number of Observations			35		33	
R-squared			0.387219		0.270127	
Adjusted R-squared			0.198671		0.134965	
Durbin-Watson stat			2.7847		2.718821	

Oil Price Shock of 1999:

The total effect of GDP to UN (Service Producing Industries) is positive. This is against the direction of Okun's Law and is not the result that is hoped for. This occurred because as total effect of GDP decreases (or increases), during the time frame studied UN (Service Producing Industries) decreases (or increases).

Oil Price Shock of 1990:

The effect of GDP_t to UN (Service Producing Industries) is positive which is contrary to Okun's Law. This is not what is hoped to be seen. The effect of OF_t to UN (Service Producing Industries) is positive. Thus when OF_t increases there is instability and UN (Service Producing Industries) increases. Also, as GDP decreases and there is a recession during this time frame, UN (Service Producing Industries) increases.

The Service Producing Industries sector is the least in positive magnitude of the effect of OF_t to UN amongst the sectors that are significant in effect of OF_t to UN in the 1990 Oil Price Shock. Since Service Producing industries sector is defined as Nonagriculture less mining, construction, and manufacturing, it does not include important sectors that focus on and involve oil. The mining sector includes Oil And Gas extraction which involve oil. The Construction sector, explained below in the Construction sector section, involves oil and has the largest positive magnitude of OF_t to UN. Also, Manufacturing sector includes Manufacturing (Durables) sector which as described by Davis and Haltiwanger (2001), is sensitive to oil price.

Table 4.28: 1999 Stone, Clay, And Glass Products, 1990 Stone, Clay, And Glass Products

Sector →			Stone, Clay, And Glass Products		Stone, Clay, And Glass Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			43.40465	1.725604	4.832717	0.327542
GDP_t			-0.717207	-0.181654	-0.824089	-0.243518
OP_t			-0.78943	-0.96183	0.050852	0.097869
OP_{t-1}			-0.46606	-0.77047	0.488584	0.852714
OP_{t-2}			-0.18639	-0.41612	-0.338685	-0.622741
OP_{t-3}			0.04959	0.13724	0.633803	1.218085
OP_{t-4}			0.24188	0.7076	1.064232	**2.106886**
OP_{t-5}			0.39047	1.08663		
OP_{t-6}			0.49538	1.29891		
OP_{t-7}			0.55659	1.42618		
OP_{t-8}			0.57411	1.50966		
OP_{t-9}			0.54794	1.54514		
OP_{t-10}			0.47808	1.45803		
OP_{t-11}			0.36452	1.09844		
OP_{t-12}			0.20728	0.51455		
OP_{t-13}			0.00634	0.01155		
OP_{t-14}			-0.23829	-0.31506		
OF_t			-31.36866	-1.607556	6.1432	0.778954
OF_{t-1}					-18.6799	**-2.163851**
OF_{t-2}					13.36158	1.806892
Number of Observations			37		30	
R-squared			0.11393		0.565578	
Adjusted R-squared			-0.028984		0.370087	
Durbin-Watson stat			2.387568		1.754361	

Oil Price Shock of 1990:

The effect of OP_{t-4} to UN (Stone, Clay, And Glass Products) is positive which is what is hoped to be seen. As OP_{t-4} increases there is UN increase also for the Stone, Clay And Glass Products sector. This could be because there are less new buildings created when OP increases. These new buildings and infrastructure may require Stone, Clay, And Glass Products. Included in the Stone, Clay, And Glass Products sector are products such as Glass, Cement, and Concrete. The effect of OF_{t-1} to UN (Stone, Clay, And Glass Products) is negative. Because during the timeframe studied, as OF_{t-1} increases, UN (Stone, Clay, And Glass Products) decreases as well.

It is difficult to compare the magnitude of the effect of OP_{t-4} to UN (Stone, Clay, And Glass Products) since there are no other sectors that are significant in effect of OP_{t-4} to UN.

The meaning of the magnitude of the effect of OF_{t-1} to UN (Stone, Clay, And Glass Product is difficult to determine since there is no other sector which has a significant effect of OF_{t-1} to UN.

Table 4.29: 1999 Machinery Except Electrical, 1990 Machinery Except Electrical

Sector →			Machinery Except Electrical		Machinery Except Electrical	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			25.35958	2.282738	-4.811805	-0.770161
GDP_t			0.960329	0.537969	9.816413	**3.240792**
GDP_{t-1}					-15.60989	**-3.616236**
GDP_{t-2}					7.523988	**2.732402**
OP_t			-0.57158	-1.59695	0.047857	0.198235
OP_{t-1}			-0.43884	-1.70521		
OP_{t-2}			-0.31574	-1.66347		
OP_{t-3}			-0.20226	-1.2572		
OP_{t-4}			-0.09842	-0.60481		
OP_{t-5}			-0.00421	-0.02399		
OP_{t-6}			0.08037	0.43559		
OP_{t-7}			0.15532	0.84478		
OP_{t-8}			0.22064	1.27622		
OP_{t-9}			0.27632	1.76848		
OP_{t-10}			0.32237	**2.1844**		
OP_{t-11}			0.35879	**2.11875**		
OP_{t-12}			0.38558	1.65806		
OP_{t-13}			0.40274	1.21846		
OF_t			-19.9865	**-2.361068**	5.694025	1.419399
Number of Observations			38		32	
R-squared			0.24779		0.367428	
Adjusted R-squared			0.130257		0.24578	
Durbin-Watson stat			2.436906		2.598619	

Oil Price Shock of 1999:

The effect of OF_t to UN (Machinery, Except Electrical) is negative and this is against what is thought would occur. This is because as OF_t increases (or decreases), during the time frame looked at UN (Machinery, Except Electrical) decreases (or increases) respectively.

Oil Price Shock of 1990:

The total effect of GDP to UN (Machinery, Except Electrical) is positive. This is against the direction of Okun's Law. This is because as total effect of GDP decreases (or increases), during the time frame studied UN (Machinery, Except Electrical) decreases (or increases) respectively.

Table 4.30: 1999 Electrical Machinery Equipment And Supplies, 1990 Electrical Machinery Equipment And Supplies

Sector →			Electrical Machinery Equipment And Supplies		Electrical Machinery Equipment And Supplies	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			5.253876	0.283466	-4.037056	-0.657946
GDP_t			0.308995	0.104616	0.822923	0.532072
GDP_{t-1}			1.04148	0.276778		
GDP_{t-2}			-0.741265	-0.242667		
OP_t			-0.47863	-1.26042	0.146387	0.595472
OP_{t-1}			-0.38525	-1.31669		
OP_{t-2}			-0.29996	-1.31563		
OP_{t-3}			-0.22277	-1.17845		
OP_{t-4}			-0.15366	-0.87989		
OP_{t-5}			-0.09264	-0.52493		
OP_{t-6}			-0.03972	-0.21606		
OP_{t-7}			0.00512	0.02708		
OP_{t-8}			0.04187	0.22179		
OP_{t-9}			0.07052	0.38696		
OP_{t-10}			0.09109	0.52998		
OP_{t-11}			0.10357	0.63169		
OP_{t-12}			0.10796	0.63681		
OP_{t-13}			0.10425	0.52224		
OP_{t-14}			0.09246	0.35939		
OP_{t-15}			0.07258	0.21407		
OF_t			-0.843231	-0.09342	4.337639	1.085402
OF_{t-1}			16.11622	1.826883		
OF_{t-2}			-15.83054	-1.773261		
Number of Observations			36		34	
R-squared			0.325009		0.084883	
Adjusted R-squared			0.091358		-0.006629	
Durbin-Watson stat			2.721715		2.717232	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.31: 1999 Motor Vehicles And Equipment (Automobiles), 1990 Motor Vehicles And Equipment (Automobiles)

Sector →			Motor Vehicles And Equipment (Automobiles)		Motor Vehicles And Equipment (Automobiles)	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			7.556864	0.303839	-2.066465	-0.120636
GDP_t			-9.503218	-1.48634	24.41868	**3.097965**
GDP_{t-1}			16.86501	**2.071942**	-38.67356	**-3.458212**
GDP_{t-2}			-1.608223	-0.243709	17.85704	**2.508053**
OP_t			-1.04634	-1.22472	0.213068	0.284786
OP_{t-1}			-0.6463	-1.10207	-0.022103	-0.02641
OP_{t-2}			-0.34278	-0.74998	-0.191287	-0.230437
OP_{t-3}			-0.1358	-0.30696	1.678871	**2.13423**
OP_{t-4}			-0.02534	-0.05456	-0.296624	-0.390117
OP_{t-5}			-0.01141	-0.02428		
OP_{t-6}			-0.094	-0.20867		
OP_{t-7}			-0.27312	-0.61793		
OP_{t-8}			-0.54877	-1.0536		
OP_{t-9}			-0.92094	-1.24799		
OF_t			-3.831817	-0.222212	4.669266	0.405788
Number of Observations			42		30	
R-squared			0.211375		0.509693	
Adjusted R-squared			0.049011		0.289055	
Durbin-Watson stat			2.819948		2.361327	

Oil Price Shock of 1999:

The effect of GDP_{t-1} to UN (Motor Vehicles And Equipment (Automobiles)) is positive. This is against the direction of Okun's Law and is not what is hoped to occur. This happened because as GDP_{t-1} decreases (or increases), during much of the time frame studied UN (Motor Vehicles And Equipment (Automobiles)) also decreases (or increases) respectively.

Oil Price Shock of 1990:

The total effect of GDP to UN (Motor Vehicles And Equipment (Automobiles)) is positive. When total effect of GDP decreases (or increases), during the time frame studied UN (Motor Vehicles And Equipment (Automobiles)) decreases (or increases) respectively. Also because this sector is a mix and includes Motor Vehicles and their Equipment. It could be during GDP decreases and recession people purchase less new motor vehicles but they purchase more equipment to fix and maintain their motor vehicles. This would cause the UN in the Motor Vehicle And Equipment to decrease. The effect of OP_{t-3} to UN (Motor Vehicles And Equipment (Automobiles)) is positive because as OP increases, UN increases. This is because when OP_{t-3} increases people use Motor Vehicles less and thus there is more unemployment found in this sector. People may look to alternative transportation besides Motor Vehicles.

For the Oil Price Shock of 1990, the Motor Vehicles And Equipment sector and the Fabricated Metal sector are both significant in OP_{t-3}. It can be seen that the Motor Vehicles And Equipment sector has a larger effect of OP_{t-3} to UN, which is 1.678871, than the Fabricated Metal sector, which has an effect of OP_{t-3} to UN of 1.219854. This means that the Motor Vehicles And Equipment sector is more sensitive and has more of an effect from OP_{t-3} than the Fabricated Metal sector. This is because the Motor Vehicles sector deals with oil price change most directly and poignantly. According to the U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007), 96 percent of transportation sector uses petroleum and the transportation sector is represented by vehicles that move products and people. Hinton et al (1999) reveals 45.7 percent of petroleum is used for motor gasoline. As can be seen the Motor Vehicles And Equipment sector is very dependent on oil. When the price of oil increases dramatically

people cut down on the use of Motor Vehicles And Equipment and look for alternatives. This causes trouble in the Motor Vehicles And Equipment sector and this sector must cut jobs.

Table 4.32: 1999 Professional And Photographic Equipment And Watches, 1990 Professional And Photographic Equipment And Watches

Sector →			Professional And Photographic Equipment And Watches		Professional And Photographic Equipment And Watches	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			21.3837	0.87344	5.289739	0.425731
GDP_t			-8.770733	-1.445222	-0.823763	-0.26302
GDP_{t-1}			5.440118	0.695755		
GDP_{t-2}			-10.60869	-1.661485		
OP_t			0.76367	1.00033	0.067095	0.13478
OP_{t-1}			0.77012	1.36047		
OP_{t-2}			0.75408	1.66558		
OP_{t-3}			0.71557	1.71524		
OP_{t-4}			0.65456	1.54222		
OP_{t-5}			0.57107	1.30762		
OP_{t-6}			0.4651	1.07208		
OP_{t-7}			0.33664	0.81673		
OP_{t-8}			0.1857	0.48262		
OP_{t-9}			0.01227	0.03169		
OP_{t-10}			-0.18364	-0.39381		
OP_{t-11}			-0.40204	-0.62948		
OF_t			10.50492	0.606406	1.111091	0.137298
Number of Observations			40		34	
R-squared			0.194206		0.010307	
Adjusted R-squared			0.017939		-0.088663	
Durbin-Watson stat			2.791009		2.762162	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.33: 1999 Textile Mill Products, 1990 Textile Mill Products

Sector →			Textile Mill Products		Textile Mill Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			-16.22699	-1.04277	2.82067	0.221431
GDP_t			0.314684	0.123807	-0.165856	-0.051654
OP_t			-0.24191	-0.46623	-0.177735	-0.348252
OP_{t-1}			-0.19053	-0.49249		
OP_{t-2}			-0.14812	-0.51792		
OP_{t-3}			-0.11465	-0.51415		
OP_{t-4}			-0.09015	-0.44925		
OP_{t-5}			-0.0746	-0.36087		
OP_{t-6}			-0.06801	-0.30707		
OP_{t-7}			-0.07038	-0.30364		
OP_{t-8}			-0.0817	-0.35222		
OP_{t-9}			-0.10198	-0.46089		
OP_{t-10}			-0.13122	-0.64474		
OP_{t-11}			-0.16941	-0.89295		
OP_{t-12}			-0.21656	-1.08186		
OP_{t-13}			-0.27267	-1.08106		
OP_{t-14}			-0.33773	-0.9783		
OP_{t-15}			-0.41175	-0.87413		
OF_t			21.63116	1.786787	2.785303	0.335716
Number of Observations			36		34	
R-squared			0.106612		0.010946	
Adjusted R-squared			-0.042286		-0.087959	
Durbin-Watson stat			2.510509		2.717777	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.34: 1999 Apparel And Other Fabricated Textile Products, 1990 Apparel And Other Fabricated Textile Products

Sector →			Apparel And Other Fabricated Textile Products		Apparel And Other Fabricated Textile Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			-0.807127	-0.060956	3.940256	0.42691
GDP_t			-7.913872	**-3.020415**	5.343273	1.778436
GDP_{t-1}			7.595252	**2.880318**	-5.937172	**-2.11769**
OP_t			-0.792795	-1.601584	0.219021	0.695311
OP_{t-1}					-0.737561	-1.983672
OP_{t-2}					0.919391	**2.824186**
OF_t			10.58742	1.324665	15.08086	**2.866627**
OF_{t-1}			-4.717115	-0.594426	-15.58955	**-2.819484**
Number of Observations			50		32	
R-squared			0.252649		0.474852	
Adjusted R-squared			0.167723		0.321684	
Durbin-Watson stat			2.471623		2.871294	

Oil Price Shocks of 1999:

The total effect of GDP to UN (Apparel And Other Fabricated Textile Products) is negative. This follows Okun's Law and what is hoped to be seen. The Apparel And Other Fabricated Textile Products sector is a nondurable product and follows the Manufacturing (Nondurables) sector in having a total effect of GDP to UN as negative.

Oil Price Shocks of 1990:

The effect of GDP_{t-1} to UN (Apparel And Other Fabricated Textile Products) is negative and follows the direction of Okun's Law and is what is hoped to be seen. When GDP decreases and there is a recession, UN increases. The effect of OP_{t-2} to UN (Apparel And Other Fabricated Textile Products) is positive so as OP_{t-2} increases there is an increase in UN. This is what is hoped to be seen and is possibly because as OP increases people spend

more on oil and less on Apparel And Other Fabricated Textile Products. This increases UN in the Apparel And Other Fabricated Textile Products. The total effect of OF to UN (Apparel And Other Fabricated Textile Products) is negative. However, this effect is small. It is only -0.50869.

It is difficult to compare the magnitude of the effect of OP_{t-2} to UN (Apparel And Other Fabricated Textile Products) since there are no other sectors that are significant in effect of effect of OP_{t-2} to UN.

Since the Apparel And Other Fabricated Textile Products sector is the only one sector in the 1990 Oil Price Shock that has a significant total effect of OF to UN, it is difficult to compare the total effect of OP to UN (Apparel And Other Fabricated Textile Products).

Table 4.35: 1999 Paper And Allied Products, 1990 Paper And Allied Products

Sector →			Paper And Allied Products		Paper And Allied Products	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			1.211472	0.047765	9.932584	0.55985
GDP_t			-9.21348	-1.835794	0.928297	0.217744
GDP_{t-1}			11.79306	**2.334787**		
OP_t			1.478221	1.559017	-0.915854	-1.329184
OP_{t-1}					1.007159	1.341998
OF_t			-31.69525	**-2.070297**	-4.034936	-0.337677
OF_{t-1}			35.36236	**2.326404**		
Number of Observations			50		33	
R-squared			0.249094		0.095877	
Adjusted R-squared			0.163763		-0.033284	
Durbin-Watson stat			2.90264		2.711921	

Oil Price Shock of 1999:

The effect of GDP_{t-1} to UN (Paper And Allied Products) is positive. This does not follow the direction of Okun's Law. As GDP_{t-1} decreases (or increases), UN (Paper And Allied Products) decreases (or increases) during the time frame studied. The total effect of OF to UN (Paper And Allied Products) is positive. When total effect of OF increases (or decreases), UN (Paper And Allied Products) increases (or decreases) respectively also. This is what is hoped to be seen.

The magnitude of the total effect of OF to UN (Paper And Allied Products) is difficult to compare since there are no other sectors that are significant in total effect of OF to UN in the 1999 Oil Price Shock.

Table 4.36: 1999 Printing, Publishing, And Allied Industries, 1990 Printing, Publishing, And Allied Industries

Sector →			Printing, Publishing, And Allied Industries		Printing, Publishing, And Allied Industries	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			11.70218	1.075269	6.521106	0.884113
GDP_t			-1.746933	-0.731334	-0.773162	-0.415856
GDP_{t-1}			-2.593517	-1.05921		
OP_t			0.11602	0.33519	0.278517	0.942478
OP_{t-1}			0.15166	0.59317		
OP_{t-2}			0.17797	0.89057		
OP_{t-3}			0.19495	1.08996		
OP_{t-4}			0.2026	1.12284		
OP_{t-5}			0.20092	1.07118		
OP_{t-6}			0.18991	1.00168		
OP_{t-7}			0.16956	0.92715		
OP_{t-8}			0.13988	0.82391		
OP_{t-9}			0.10088	0.62871		
OP_{t-10}			0.05254	0.30136		
OP_{t-11}			-0.00514	-0.02263		
OP_{t-12}			-0.07214	-0.2278		
OF_t			0.061731	0.007277	-2.453188	-0.510657
Number of Observations			39		34	
R-squared			0.126835		0.029024	
Adjusted R-squared			-0.036883		-0.068073	
Durbin-Watson stat			2.009649		2.5862	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.37: 1999 Leather And Not Specified Manufacturing, 1990 Leather And Not Specified Manufacturing

Sector →			Leather And Not Specified Manufacturing		Leather And Not Specified Manufacturing	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			69.75025	1.664083	14.34583	0.735488
GDP_t			-18.07521	-1.796729	-1.889754	-0.384362
GDP_{t-1}			13.14852	1.318893		
OP_t			1.680992	0.842919	0.00933	0.011939
OP_{t-1}			1.396987	0.690973		
OF_t			-26.08135	-0.869107	-1.076087	-0.084705
Number of Observations			44		34	
R-squared			0.120126		0.007217	
Adjusted R-squared			0.004354		-0.092062	
Durbin-Watson stat			3.023196		2.970307	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.38: 1999 Transportation, Communication, And Other Public Utilities, 1990 Transportation, Communication, And Other Public Utilities

Sector →			Transportation, Communication, And Other Public Utilities		Transportation, Communication, And Other Public Utilities	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			-1.926382	-0.285673	-7.164706	-1.155379
GDP_t			-4.649889	**-3.091439**	6.174754	**2.420312**
GDP_{t-1}			5.31724	**3.497444**	-5.190946	**-2.224129**
OP_t			-0.71037	**-3.06868**	-0.25076	-1.01599
OP_{t-1}			-0.54779	**-3.1347**		
OP_{t-2}			-0.40443	**-3.07972**		
OP_{t-3}			-0.28028	**-2.70403**		
OP_{t-4}			-0.17536	-1.89609		
OP_{t-5}			-0.08965	-0.96266		
OP_{t-6}			-0.02317	-0.23659		
OP_{t-7}			0.0241	0.23792		
OP_{t-8}			0.05215	0.51771		
OP_{t-9}			0.06099	0.63662		
OP_{t-10}			0.0506	0.57426		
OP_{t-11}			0.021	0.25448		
OP_{t-12}			-0.02782	-0.31723		
OP_{t-13}			-0.09586	-0.86514		
OP_{t-14}			-0.18312	-1.20973		
OP_{t-15}			-0.2896	-1.40591		
OF_t			4.616415	0.861625	7.920454	1.968032
Number of Observations			36		33	
R-squared			0.438379		0.236475	
Adjusted R-squared			0.322182		0.1274	
Durbin-Watson stat			2.908542		2.57502	

Oil Price Shock of 1999:

The total effect of GDP to UN (Transportation, Communication, And Other Public Utilities) is positive. What is seen in the utilities sector is that when total effect of GDP

decreases, UN (Transportation, Communication And Other Public Utilities) decreases. This may be a result of the nature of the utilities sector. It includes what is needed. It should therefore do and perform well even though there is a GDP decrease. It may even add jobs even though GDP decreases as the population that demand and requires utilities still increase in number. The total effect of OP to UN (Transportation, Communication, And Other Public Utilities) is negative. When total effect of OP increases, the utilities sector continues to expand and have UN decreases. Since the utilities sector contains jobs which are needed even when the economy is bad or when OP increases. Also, when the price of energy increases such as oil, Electric Light And Power which is a component of Public Utilities does well and may be able to hire more workers and expand.

For these reasons the magnitude of the total effect of OP to UN (Transportation, Communication, And Other Public Utilities) is high. However, it is still only in the middle range of sectors that are significant in total effect of OP to UN because this sector not only includes Public Utilities but it includes Transportation which mitigates the effect.
As total effect of OP increases Transportation should suffer since as the U.S. Department of Energy/ EIA's "Annual Energy Review 2006: U.S. Primary Energy Consumption By Source and Sector" (2007) reveals transportation obtains 96 percent of its energy from oil. Now since oil is more expensive the transportation sector may have to cut jobs since people may look to alternatives to the traditional transportation. Some of the Transportation which includes Air Transportation or Taxicab Service may have to raise fares (or rates). This causes people to look for alternatives at least some of the time. Some of these companies may cut jobs or possibly go out of business.

Oil Price Shock of 1990:

The total effect of GDP to UN (Transportation, Communication, And Other Public Utilities) is positive. As total effect of GDP decreases, during the time frame studied UN (Transportation, Communication, And Other Public Utilities) decreases. This goes against the direction of Okun's Law but can be explained because this sector is the Utilities sector. By the nature of utilities, it is what is needed. Even in troubled economic times this sector is needed. Therefore, as population increases there is more need for this sector and this sector needs to add more jobs. This sector includes components such as: Telephone Communications; U.S. Postal Service; Electric Light And Power; Gas And Steam Supply Systems; Electric And Gas; Water Supply And Irrigation; and Sanitary Services.

Table 4.39: 1999 Finance, Insurance, Real Estate, 1990 Finance, Insurance, Real Estate

Sector →			Finance, Insurance, Real Estate		Finance, Insurance, Real Estate	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			-8.582796	-0.97262	-0.280746	-0.044926
GDP_t			-7.9109	**-2.298503**	2.570804	1.028703
GDP_{t-1}			9.518051	1.827968	-2.448407	-1.068644
GDP_{t-2}			0.850153	0.225442		
GDP_{t-3}			-9.022618	**-2.40725**		
GDP_{t-4}			11.40201	**2.269973**		
GDP_{t-5}			-2.911904	-0.836576		
OP_t			-0.51841	-1.64959	-0.031879	-0.126429
OP_{t-1}			-0.44632	-1.57514	0.082562	0.270602
OP_{t-2}			-0.38152	-1.46107	-0.056487	-0.216814
OP_{t-3}			-0.32401	-1.3206		
OP_{t-4}			-0.2738	-1.17294		
OP_{t-5}			-0.23087	-1.03622		
OP_{t-6}			-0.19525	-0.92385		
OP_{t-7}			-0.16691	-0.84537		
OP_{t-8}			-0.14588	-0.8098		
OP_{t-9}			-0.13213	-0.83024		
OP_{t-10}			-0.12568	-0.92877		
OP_{t-11}			-0.12652	-1.13114		
OP_{t-12}			-0.13466	-1.38434		
OP_{t-13}			-0.15009	-1.42342		
OP_{t-14}			-0.17281	-1.2264		
OP_{t-15}			-0.20283	-1.03409		
OF_t			8.011692	1.63405	2.351125	0.556177
Number of Observations				36		32
R-squared				0.393987		0.072499
Adjusted R-squared				0.151582		-0.150102
Durbin-Watson stat				2.267859		2.897303

Oil Price Shock of 1999:

The total effect of GDP to UN (Finance, Insurance, Real Estate) is negative. As GDP decreases and the economy slows, UN (Finance, Insurance, Real Estate) increases. This should be because this sector deal and relate most directly with the economy and thus have trouble when the economy slows and contracts. The Finance, Insurance, and Real Estate sector includes: Banking; Savings Institutions, Including Credit Unions; Credit agencies; Security, Commodity Brokerage, And Investment Companies; Insurance; and Real Estate, including Real Estate-Insurance Offices.

Table 4.40: 1999 Forestry And Fisheries, 1990 Forestry And Fisheries

Sector →			Forestry And Fisheries		Forestry And Fisheries	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant			310.3455	2.613598	117.415	1.28281
GDP_t			-76.14342	**-2.500726**	-65.67605	-1.7441
GDP_{t-1}			90.75744	2.000625	52.51522	1.524443
GDP_{t-2}			-71.98314	-1.616925		
GDP_{t-3}			29.27868	0.985392		
OP_t			-4.557698	-0.888409	0.959432	0.263364
OF_t			-137.8086	-1.713974	-46.9179	-0.789829
Number of Observations			48		33	
R-squared			0.180103		0.10038	
Adjusted R-squared			0.060118		-0.028137	
Durbin-Watson stat			2.160168		2.396886	

Oil Price Shock of 1999:

The effect of GDP_t to UN (Forestry And Fisheries) is negative and the follows the direction of Okun's Law. Where when GDP decreases, the economy slows and UN should increase.

Please note that Table 4.41 to Table 4.77 do not have applicable data for the Oil Price Shock of 1999 and the Oil Price Shock of 1990 so the sections for the Oil Price Shock of 1999 and the Oil Price Shock of 1990 are blank.

Table 4.41: 2003 Nonmetallic Mineral Products

Sector →	Nonmetallic Mineral Products					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	30.00494	0.862447				
GDP_t	-3.11273	-0.516101				
OP_t	1.827848	1.360538				
OF_t	-6.226781	-0.416836				
Number of Observations	49					
R-squared	0.047559					
Adjusted R-squared	-0.015937					
Durbin-Watson stat	2.355655					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.42: 2003 Machinery Manufacturing

Sector →	Machinery Manufacturing					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-2.523748	-0.191439				
GDP_t	-0.651654	-0.283487				
OP_t	0.23247	0.456846				
OP_{t-1}	0.928205	1.744798				
OF_t	2.048543	0.356332				
Number of Observations	48					
R-squared	0.07404					
Adjusted R-squared	-0.012096					
Durbin-Watson stat	2.602265					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.43: 2003 Computer And Electronic Products

Sector →	Computer And Electronic Products					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-5.404842	-0.580115				
GDP_t	1.721836	1.066047				
OP_t	-0.263939	-0.733609				
OF_t	-0.286673	-0.07166				
Number of Observations	49					
R-squared	0.035992					
Adjusted R-squared	-0.028276					
Durbin-Watson stat	2.373204					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.44: 2003 Electrical Equipment And Appliances

Sector →	Electrical Equipment And Appliances					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.622298	0.077211				
GDP_t	0.175989	0.048316				
OP_t	0.194027	0.239135				
OF_t	2.660782	0.294931				
Number of Observations	49					
R-squared	0.003017					
Adjusted R-squared	-0.063352					
Durbin-Watson stat	2.472275					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.45: 2003 Miscellaneous Manufacturing

Sector →	Miscellaneous Manufacturing					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	38.63334	2.681762				
GDP_t	-2.874054	-1.317671				
OP_t	-0.713451	-1.492984				
OF_t	-5.502654	-0.943525				
OF_{t-1}	-10.59085	-1.7563				
Number of Observations	48					
R-squared	0.167747					
Adjusted R-squared	0.090328					
Durbin-Watson stat	2.450745					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.46: 2003 Beverage And Tobacco Products

Sector →	Beverage And Tobacco Products					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	19.36074	0.565262				
GDP_t	-1.461381	-0.248798				
OP_t	0.177856	0.136637				
OP_{t-1}	0.223514	0.158893				
OF_t	0.142146	0.009587				
Number of Observations	46					
R-squared	0.002419					
Adjusted R-squared	-0.094906					
Durbin-Watson stat	2.069308					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.47: 2003 Textile, Apparel, And Leather

Sector →	Textile, Apparel, And Leather					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-5.602038	-0.513162				
GDP_t	1.186464	0.626927				
OP_t	0.524103	1.243242				
OF_t	1.488823	0.317624				
Number of Observations	49					
R-squared	0.042741					
Adjusted R-squared	-0.021076					
Durbin-Watson stat	2.162942					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.48: 2003 Paper And Printing

Sector →	Paper And Printing					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-12.53294	-0.774863				
GDP_t	0.945776	0.386202				
OP_t	1.280022	**2.385735**				
OF_t	-3.457294	-0.527997				
OF_{t-1}	9.472125	1.399038				
Number of Observations	48					
R-squared	0.14526					
Adjusted R-squared	0.065749					
Durbin-Watson stat	2.299189					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.49: 2003 Transportation And Utilities

Sector →	Transportation And Utilities					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.869737	0.305719				
GDP_t	-0.700705	-0.660893				
OP_t	0.744916	**3.154133**				
OF_t	-0.449367	-0.171122				
Number of Observations	49					
R-squared	0.186851					
Adjusted R-squared	0.132642					
Durbin-Watson stat	2.236796					

Oil Price Shock of 2003:

There is a positive effect of OP_t to UN (Transportation And Utilities). This is what is hoped to been seen. When OP_t increases, UN should also increase. Specifically, when the sector concerns transportation there should be a positive relationship. This is because the transportation sector uses a lot of oil. When OP_t increases, UN concerning transportation should increase as well. The Transportation And Utilities sector includes the Transportation And Warehousing sector which as described below, should require the use of a lot of oil. Transportation And Utilities sector also includes the Utilities sector.

It may be that the effect of OP_t to UN (Transportation And Utilities) turns out to be less than the effect of OP_t to UN (Transportation And Warehousing) because the Transportation And Warehousing sector is the main concern to oil. Whereas the Transportation And Utilities sector contains both the Transportation And Warehousing sector and the Utilities sector. As OP_t increases, transportation should be affected more since transportation as revealed by U.S. Department of Energy/ EIA's "Annual Energy

Review 2006: U.S. Primary Energy Consumption By Source And Sector" (2007) uses 96 percent of oil. Also, in America, as revealed by Hinton et al (1999), 45.7 percent of petroleum is made into motor gasoline. Whereby the Transportation And Warehousing sector uses a lot of this oil as can seen by what comprises the Transportation And Warehousing sector. This is shown and listed below in the Transportation And Warehousing sector section. When OP_t increases the Transportation And Warehousing sector may then suffer a lot. The Transportation And Warehousing sector may have to cut jobs.

While the Utilities sector should not be as greatly effected or should have a negative effect of OP_t to UN (Utilities). This is because the Utilities sector contains components that workers may have to be shifted to when OP_t increases. It is possible that as OP_t increases there is a shift in using less oil and having Utilities obtain energy from other sources besides oil. Then there could be a shift into the utilities sector if this occurs. There could be more job expansion and openings. By its very nature the Utilities sector contains components that are necessary for common everyday usage. As the population increases there will be need for more workers in this sector and more jobs should be made for this sector. The impacts discussed are seen because when OP_{t-1} increases the utilities sector has a decrease in UN. Also, at this time GDP increases. As the economy grows more in the Utilities sector is needed.

Table 4.50: 2003 Transportation And Warehousing

Sector →	Transportation And Warehousing					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.562558	0.242493				
GDP_t	-0.66585	-0.596065				
OP_t	0.806311	**3.240389**				
OF_t	-0.280686	-0.101449				
Number of Observations	49					
R-squared	0.193523					
Adjusted R-squared	0.139757					
Durbin-Watson stat	2.431273					

Oil Price Shock of 2003:

The effect of OP_t to UN (Transportation And Warehousing) is positive. This is what is hoped to be seen. When looking specifically at this sector, this should especially occur because the transportation uses a lot of oil. The Transportation And Warehousing sector includes components such as: Air Transportation; Truck Transportation; Taxi And Limousine Service; Scenic And Sightseeing Transportation; Postal Service; Couriers And Messengers; and Warehousing And Housing. As can be seen, many of the components of the sector of Transportation And Warehousing require the use a lot of oil. Thus, when OP_t increases, the Transportation And Warehousing sector may have to raise prices. There may be hardship in the Transportation And Warehousing sector which causes jobs to be cut in this sector and subsequently UN (Transportation And Warehousing) increases.

The possible reasons why the magnitude of the effect of OP_t to UN (Transportation And Warehousing) is large is explained above paragraph and in the section on Transportation And Utilities.

Table 4.51: 2003 Utilities

Sector →	Utilities					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	8.443505	0.409775				
GDP_t	-2.310355	-0.643034				
OP_t	0.630794	0.793101				
OP_{t-1}	-1.711395	**-2.05821**				
OF_t	5.430413	0.604339				
Number of Observations	48					
R-squared	0.120625					
Adjusted R-squared	0.038823					
Durbin-Watson stat	2.126615					

Oil Price Shock of 2003:

The effect of OP_{t-1} to UN (Utilities) is a negative. This is different from the Transportation And Utilities sector that the Utilities sector is a component part of. This could be because the Transportation And Utilities sector is separated into two main components, the Transportation And Warehousing sector which requires a lot of oil, and the Utilities sector which requires much less oil. The Utilities sector is composed of electric power generation, transmission, and distribution; natural gas distribution; electric and gas, and other combinations; water, steam, air condition, and irrigation systems; sewage treatment facilities; and not specified utilities. As can be seen the components of the Utilities sector have much less to do with oil than the components of the Transportation And Warehousing sector. UN (Utilities) decreases because Utilities are what is needed for people to use. As GDP increases (as it does for this time frame) and there is an expansion of the economy, the population may require the use of Utilities more. More people may need to be hired to fill jobs in the Utilities

sector. Also, as described in the Transportation And Utilities section, as population increase, the demand for Utilities increases and more in Utilities sector may have to be hired.

The magnitude of the effect of OP_{t-1} to UN (Utilities) is difficult to explain because there is no other sector in the Oil Price Shock of 2003 with a significant OP_{t-1}. Thus, there is no sector to compare the effect. It is then difficult to gauge whether this effect is large or small.

Table 4.52: 2003 Information

Sector →	Information					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-3.974002	-0.518338				
GDP_t	-0.321081	-0.241576				
OP_t	0.046808	0.158103				
OF_t	3.209369	0.974914				
Number of Observations	49					
R-squared	0.02396					
Adjusted R-squared	-0.041109					
Durbin-Watson stat	2.635849					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.53: 2003 Publishing Except Internet

Sector →	Publishing Except Internet					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	1.800138	0.087654				
GDP_t	2.160577	0.606859				
OP_t	-0.244859	-0.308753				
OF_t	-1.195066	-0.135524				
Number of Observations	49					
R-squared	0.010978					
Adjusted R-squared	-0.054957					
Durbin-Watson stat	2.737433					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.54: 2003 Motion Picture And Sound Recording Industries

Sector →	Motion Picture And Sound Recording Industries					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	18.10791	1.087582				
GDP_t	-2.588164	-0.896684				
OP_t	-0.710519	-1.105097				
OF_t	-2.090317	-0.292393				
Number of Observations	49					
R-squared	0.044291					
Adjusted R-squared	-0.019423					
Durbin-Watson stat	2.821198					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.55: 2003 Broadcasting Except Internet

Sector →	Broadcasting Except Internet					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	16.57472	0.396462				
GDP_t	-1.949746	-0.269022				
OP_t	2.45144	1.518474				
OF_t	1.626335	0.0906				
Number of Observations	49					
R-squared	0.05					
Adjusted R-squared	-0.013333					
Durbin-Watson stat	2.631301					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.56: 2003 Telecommunications

Sector →	Telecommunications					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-18.28142	-1.195611				
GDP_t	1.05522	0.398086				
OP_t	-0.085214	-0.144318				
OF_t	10.79622	1.644422				
Number of Observations	49					
R-squared	0.058048					
Adjusted R-squared	-0.004748					
Durbin-Watson stat	2.516501					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.57: 2003 Internet Services Providers And Data Processing Services

Sector →	Internet Services Providers And Data Processing Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	241.7333	2.399645				
GDP_t	-33.79898	**-2.16753**				
OP_t	3.399222	1.118877				
OF_t	-8.84757	-0.234711				
OF_{t-1}	-45.25506	-1.155393				
Number of Observations	44					
R-squared	0.145099					
Adjusted R-squared	0.057417					
Durbin-Watson stat	1.613251					

Oil Price Shock of 2003:

There is a negative effect of GDP_t to UN (Internet Service Providers and Data Processing Services). The direction of Okun's Law is followed and this is what is hoped to be seen. As GDP increases, UN (Internet Service Providers and Data Processing Services) decreases.

Table 4.58: 2003 Other Information Services

Sector →	Other Information Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-72.50923	-0.617856				
GDP_t	42.66414	1.947256				
OP_t	2.789868	0.623635				
OF_t	-0.168719	-0.003142				
Number of Observations	34					
R-squared	0.130507					
Adjusted R-squared	0.043558					
Durbin-Watson stat	2.554169					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.59: 2003 Financial Activities

Sector →	Financial Activities					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-6.62345	-1.018634				
GDP_t	0.832653	0.738672				
OP_t	0.112239	0.447001				
OF_t	2.191227	0.784843				
Number of Observations	49					
R-squared	0.026374					
Adjusted R-squared	-0.038534					
Durbin-Watson stat	2.623603					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.60: 2003 Finance And Insurance

Sector →	Finance And Insurance					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-7.230554	-0.916725				
GDP_t	1.243751	0.909609				
OP_t	0.186724	0.613055				
OF_t	1.718	0.507285				
Number of Observations	49					
R-squared	0.029396					
Adjusted R-squared	-0.035311					
Durbin-Watson stat	2.454705					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.61: 2003 Finance

Sector →	Finance					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-1.3445	-0.139408				
GDP_t	-0.011935	-0.007138				
OP_t	0.121718	0.326822				
OF_t	1.103649	0.266514				
Number of Observations	49					
R-squared	0.003851					
Adjusted R-squared	-0.062559					
Durbin-Watson stat	2.254461					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.62: 2003 Insurance

Sector →	Insurance					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-22.48446	-1.681076				
GDP_t	5.387127	**2.323357**				
OP_t	0.52561	1.017652				
OF_t	3.422937	0.596026				
Number of Observations	49					
R-squared	0.127869					
Adjusted R-squared	0.069727					
Durbin-Watson stat	2.789054					

Oil Price Shock of 2003:

The effect of GDP_t to UN (Insurance) is positive. This may be because when the economy is doing well and GDP increases, people worry less about insurance. They buy less insurance and so the insurance sector may need less workers and therefore have to cut workers.

Table 4.63: 2003 Real Estate And Rental And Leasing

Sector →	Real Estate And Rental And Leasing					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-4.0054	-0.239949				
GDP_t	0.57259	0.247157				
OP_t	-0.211512	-0.433392				
OF_t	12.75567	**2.100684**				
OF_{t-1}	-12.44395	-1.874924				
OF_{t-2}	2.584727	0.419883				
Number of Observations	47					
R-squared	0.127045					
Adjusted R-squared	0.020587					
Durbin-Watson stat	3.184625					

Oil Price Shock of 2003:

The effect of OF_t to UN (Real Estate And Rental And Leasing) is positive. This is what is hoped to be seen. This could be because similar to the Wood Products sector where when OF_t increases causes companies to delay the purchase of real estate to expand and to construct new infrastructure.

The Wood Products sector has a larger effect of OF_t to UN but not by much. It is possible that this is because the Real Estate And Rental And Leasing sector concern less with expansion and building of new buildings than the Wood Products sector. The Real Estate And Rental And Leasing sector may concern more and focus more on with the purchasing of old homes and old buildings.

Table 4.64: 2003 Real Estate

Sector →	Real Estate					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-8.12021	-0.613388				
GDP_t	0.557666	0.242994				
OP_t	-0.357758	-0.699824				
OF_t	6.037644	1.062177				
Number of Observations	49					
R-squared	0.035818					
Adjusted R-squared	-0.028461					
Durbin-Watson stat	3.099135					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.65: 2003 Rental And Leasing Services

Sector →	Rental And Leasing Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	12.18523	0.400583				
GDP_t	-2.838439	-0.613838				
OP_t	0.223135	0.22113				
OP_{t-1}	1.942434	1.843029				
OF_t	16.96558	1.37732				
OF_{t-1}	-15.11017	-1.185648				
Number of Observations	48					
R-squared	0.124872					
Adjusted R-squared	0.02069					
Durbin-Watson stat	2.625043					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.66: 2003 Professional And Technical Services

Sector →	Professional And Technical Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-3.976556	-0.506172				
GDP_t	2.260024	1.292272				
GDP_{t-1}	-2.402279	-1.424399				
OP_t	-0.035767	-0.156872				
OF_t	-3.985344	-1.404028				
OF_{t-1}	4.067727	1.3076				
OF_{t-2}	2.607718	0.905682				
Number of Observations	47					
R-squared	0.002171					
Adjusted R-squared	0.002171					
Durbin-Watson stat	2.514192					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.67: 2003 Management, Administrative, And Waste Services

Sector →	Management, Administrative, And Waste Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	7.081554	1.248257				
GDP_t	-0.828922	-0.842835				
OP_t	-0.008858	-0.040436				
OF_t	-2.50405	-1.027968				
Number of Observations	49					
R-squared	0.033623					
Adjusted R-squared	-0.030803					
Durbin-Watson stat	2.691505					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.68: 2003 Administrative And Support Services

Sector →	Administrative And Support Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	8.491425	1.491367				
GDP_t	-1.132485	-1.147335				
OP_t	0.009435	0.042912				
OF_t	-2.762646	-1.130032				
Number of Observations	49					
R-squared	0.048478					
Adjusted R-squared	-0.014956					
Durbin-Watson stat	2.669337					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.69: 2003 Waste Management And Remediation Services

Sector →	Waste Management And Remediation Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-40.05658	-0.941541				
GDP_t	8.961934	1.215124				
OP_t	1.474198	0.897329				
OF_t	17.4506	0.955294				
Number of Observations	49					
R-squared	0.060967					
Adjusted R-squared	-0.001635					
Durbin-Watson stat	2.183067					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.70: 2003 Education And Health Services

Sector →	Education And Health Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	2.580098	0.497544				
GDP_t	0.118843	0.131432				
OP_t	0.012855	0.064224				
OP_{t-1}	-0.177951	-0.850379				
OF_t	-1.375809	-0.608384				
Number of Observation	48					
R-squared	0.026563					
Adjusted R-squared	-0.063989					
Durbin-Watson stat	2.672113					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.71: 2003 Health Care And Social Assistance

Sector →	Healthcare And Social Assistance					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	3.516332	0.729756				
GDP_t	0.145216	0.173843				
OP_t	-0.253799	-1.363982				
OF_t	-2.111411	-1.020522				
Number of Observations	49					
R-squared	0.060508					
Adjusted R-squared	-0.002125					
Durbin-Watson stat	2.994715					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.72: 2003 Social Assistance

Sector →	Social Assistance					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	2.054152	0.195578				
GDP_t	0.814315	0.444643				
OP_t	-0.455522	-1.123608				
OP_{t-1}	0.577273	1.362024				
OF_t	-2.016345	-0.440227				
Number of Observations	48					
R-squared	0.077669					
Adjusted R-squared	-0.008129					
Durbin-Watson stat	2.315536					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.73: 2003 Leisure And Hospitality

Sector →	Leisure And Hospitality					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	7.506071	1.638812				
GDP_t	0.868306	0.663857				
GDP_{t-1}	-1.437959	-1.131326				
OP_t	-0.122313	-0.6995				
OP_{t-1}	0.183081	1.036148				
OP_{t-2}	-0.399958	**-2.129696**				
OF_t	-3.027314	-1.566986				
Number of Observations	47					
R-squared	0.229687					
Adjusted R-squared	0.11414					
Durbin-Watson stat	2.858379					

Oil Price Shock of 2003:

The effect of OP_{t-2} to UN (Leisure And Hospitality) is negative. When OP_{t-2} increases then UN (Leisure And Hospitality) decreases. It may appear that the Leisure And Hospitality sector should have increase in UN when there is an increase in OP_{t-2} because less people travel since the cost of traveling increases. However, it may be possible that people still visit Leisure and Hospitality venues but closer to home so they do not have to travel so far and waste expensive oil. The Leisure And Hospitality sector is composed of: Arts, Entertainment, And Recreation; and Accommodation And Food Services. The Arts, Entertainment And Recreation is composed of: Independent Artists, Performing Arts, Spectator Sports, And related; Museums, Art Galleries, Historical Sites, And Similar Institutions; Bowling Centers; and other Amusement, Gambling, And Recreation Industries. The Accommodation And Food Services sector is composed of: Traveler Accommodation; Recreational Vehicle Parks And Camps, And Rooming And Boarding House; Restaurants

And Other Food Services; and Drinking Places, Alcoholic Beverages. There are only two sectors: Traveler Accommodation; Recreational Vehicle Parks And Camps, And Rooming and Boarding House that imply travel. The other sectors do not have to involve travel.

Also, as GDP increases during time, UN (Leisure And Hospitality) decreases as well. As GDP increases and the economic situation fares well, people can spend time using the Leisure And Hospitality sector more. The Leisure And Hospitality sector may hire more workers.

The magnitude of the effect of OP_{t-2} to UN (Utilities) is difficult to explain because there is no other sector in the 2003 Oil Price Shock with a significant OP_{t-2}. Thus, there is no sector to compare the effect. It is then difficult to gauge whether this effect is large or small.

Table 4.74: 2003 Accommodation And Food Services

Sector →	Accomodation And Food Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	7.649525	1.792843				
GDP_t	0.808173	0.682755				
GDP_{t-1}	-1.620709	-1.373226				
OP_t	0.02876	0.178354				
OF_t	-3.069638	-1.686072				
Number of Observations	48					
R-squared	0.102005					
Adjusted R-squared	0.018471					
Durbin-Watson stat	2.950699					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.75: 2003 Accommodation

Sector →	Accomodation					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	6.945187	0.733228				
GDP_t	-1.329907	-0.809897				
OP_t	-0.640895	-1.752156				
OF_t	0.500333	0.12302				
Number of Observations	49					
R-squared	0.079193					
Adjusted R-squared	0.017805					
Durbin-Watson stat	1.991241					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.76: 2003 Personal And Laundry Services

Sector →	Personal And Laundry Services					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	-4.507408	-0.339892				
GDP_t	-1.383026	-0.601587				
OP_t	0.711066	1.388528				
OF_t	6.474868	1.137121				
Number of Observations	49					
R-squared	0.075128					
Adjusted R-squared	0.01347					
Durbin-Watson stat	2.625794					

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.77: 2003 Membership Association And Organizations

Sector →	Membership Association And Organizations					
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant	10.92838	0.714155				
GDP_t	-1.699294	-0.800132				
OP_t	0.067442	0.150744				
OF_t	7.359529	1.322124				
OF_{t-1}	-7.009672	-1.152093				
OF_{t-2}	-1.706276	-0.302362				
Number of Observations	47					
R-squared	0.070531					
Adjusted R-squared	-0.042818					
Durbin-Watson stat	2.891435					

Please note that Table 4.78 to Table 4.85 do not have applicable data for the Oil Price Shock of 2003 and the Oil Price Shock of 1999 so the sections for the Oil Price Shock of 2003 and the Oil Price Shock of 1999 are blank.

Table 4.78: 1990 Other Transportation Equipment Except Autos And Aircrafts

Sector →					Other Transportation Equipment Except Autos And Aircrafts	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					3.053703	0.183919
GDP_t					0.267851	0.065381
OP_t					-0.622112	-0.925282
OP_{t-1}					0.161446	0.198715
OP_{t-2}					0.025742	0.038371
OF_t					4.603027	0.409054
Number of Observations						32
R-squared						0.043741
Adjusted R-squared						-0.140155
Durbin-Watson stat						2.966163

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.79: 1990 Tobacco

Sector →					Tobacco	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					-27.22888	-0.561727
GDP_t					25.57663	**2.051081**
OP_t					-0.438769	-0.224738
OF_t					30.89953	0.972545
Number of Observations						32
R-squared						0.14686
Adjusted R-squared						0.055452
Durbin-Watson stat						2.243185

Oil Price Shock of 1990:

The effect of GDP_t to UN (Tobacco) is positive. As GDP_t decreases (or increases), during the time frame studied UN (Tobacco) also decreases (or increases) respectively. This may be because of the nature of the tobacco products. Many people who use tobacco are addicted to tobacco and thus must use tobacco. They do not stop using Tobacco. More people also become addicted to and use tobacco as time passes by since the population increases. Also, Tobacco is a product that is internationally used and even when GDP in America decreases, there are other countries that use tobacco products made in America.

Table 4.80: 1990 Communications

Sector →					Communications	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					-5.788955	-0.435198
GDP_t					1.239426	0.369652
OP_t					0.040376	0.075761
OF_t					9.369446	1.081467
Number of Observations					34	
R-squared					0.058298	
Adjusted R-squared					-0.035873	
Durbin-Watson stat					3.107542	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.81: 1990 Other Public Utilities Except Communications

Sector →					Other Public Utilities Except Communications	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					11.13326	0.538714
GDP_t					-0.257661	-0.049462
OP_t					0.683026	0.824908
OF_t					0.018279	0.001358
Number of Observations					34	
R-squared					0.028141	
Adjusted R-squared					-0.069045	
Durbin-Watson stat					2.563138	

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.82: 1990 Banking And Other Financial Organizations

Sector →					Banking And Other Financial Organizations	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					-5.051823	-0.641373
GDP_t					1.316776	0.677532
OP_t					-0.428563	-1.343637
OP_{t-1}					0.441589	1.145727
OP_{t-2}					-0.353766	-1.111577
OF_t					6.114317	1.145373
Number of Observations						32
R-squared						0.141748
Adjusted R-squared						-0.0233
Durbin-Watson stat						2.978349

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.83: 1990 Insurance And Real Estate

Sector →					Insurance And Real Estate	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					2.690632	0.390084
GDP_t					-0.213228	-0.128647
OP_t					0.333538	1.245083
OP_{t-1}					-0.22125	-0.758284
OF_t					0.40024	0.086155
Number of Observations						33
R-squared						0.059313
Adjusted R-squared						-0.075071
Durbin-Watson stat						2.75802

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.84: 1990 Welfare And Religious Services

Sector →					Welfare And Religious Services	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					1.95137	0.210526
GDP_t					1.36547	0.584431
OP_t					0.237849	0.64047
OF_t					-0.533464	-0.088365
Number of Observations						34
R-squared						0.043233
Adjusted R-squared						-0.052444
Durbin-Watson stat						2.748784

The above table does not have any coefficients significant at or above the 95% confidence level.

Table 4.85: 1990 Other Professional Services (Not Medical, Hospital, Welfare, And Education

Sector →					Other Professional Services (Not Medical, Hospital, Welfare, And Education)	
	Oil Price Shock 2003		Oil Price Shock 1999		Oil Price Shock 1990	
	coefficient	t value	coefficient	t value	coefficient	tvalue
constant					-6.250466	-0.807805
GDP_t					2.121827	1.087902
OP_t					-0.383087	-1.235732
OF_t					6.361566	1.262323
Number of Observations						34
R-squared						0.068121
Adjusted R-squared						-0.025067
Durbin Watson stat						2.645576

The above table does not have any coefficients significant at or above the 95% confidence level.

CHAPTER V

ENERGY INTENSITY AND CAPITAL INTENSITY

5.1 The Idea Behind Energy Intensity and Capital Intensity

Davis and Haltiwanger (2001) find that the more energy intensive a sector is, the more it is affected by an oil price shock. Davis and Haltiwanger (2001) also find that the more capital intensive a sector is, the more it is affected by an oil price shock. It may thus be possible to conjecture which sector will be more affected by an oil price shock. Or, if there are results of which sectors are more affected by an oil price shock, looking at the energy intensity and capital intensity may help to explain why.

5.2 How to Calculate Energy Intensity and Capital Intensity

Energy intensity as defined by Davis and Haltiwanger (2001) is the "ratio of energy costs to total shipments" (Davis and Haltiwanger, 2001: 496). Capital intensity is measured by "capital per production worker" (Davis and Haltiwanger, 2001: 496) of the sector.

It should be seen that the sectors least in energy intensiveness lose the least jobs (have smaller unemployment rates) or should even be seen that those least in energy intensiveness may have more jobs added relative to those most in energy intensiveness. Possibly, even a reduction in unemployment rate. Also, it should be seen that the sectors least in capital intensiveness lose the least jobs (have smaller unemployment rates) or it should even be seen that those least in capital intensiveness have the more jobs added relative to those most in capital intensiveness. It should be seen that those least in capital intensiveness could see a reduction in unemployment rate.

5.3 The Unique Way This Author Has Found Energy Intensity And Capital Intensity In An Attempt to Sternly Follow the Guidance of Previous Researchers

The findings of Davis and Haltiwanger (2001) can be used for the oil shocks of 1990, 1999, and 2003. Davis and Haltiwanger (2001) use the Bartelsman Gray NBER Productivity database to find energy intensity and capital intensity. The NBER Productivity database does not have the exact information needed to conduct energy intensive and capital intensive ratios for the oil shocks covered in this thesis. This is because the database is not up to date. The latest Bartelsman Gray NBER Productivity database only covers up to the year 1996.

Bartelsman Gray NBER Productivity database obtains its information from the United States Census Bureau. The U.S. Census Bureau has an Annual Survey of Manufactures which keeps data concerning sectors on different characteristics. It is mainly from the Annual Survey of Manufactures that the Bartelsman Gray NBER Productivity database produces its information. To obtain recent information and to conduct energy intensity and capital intensity ratios, it is possible to go directly to the U.S. Census Bureau's Annual Survey of Manufactures.

5.4 The Annual Survey of Manufactures and Why it is Possible to Obtain Energy And Capital Intensity for Oil Price Shock of 1990 And 2003 But Not For the Oil Price Shock of 1999

It is possible to obtain energy intensity and capital intensity for the oil shocks of 1990 and 2003. For the oil shock of 1999, it is not possible to obtain clear and appropriate information.

It is possible to obtain the energy intensity and capital intensity ratios for the oil shock of 2003. This is because the U.S. Census Bureau uses the North America Industry Classification System (NAICS) for the years after 1997. U.S. Department of Labor uses

NAICS for data after 2000. Thus, U.S. Department of Labor's unemployment data and U.S. Census Bureau's Annual Survey of Manufactures for the years covered for the Oil Price Shock of 2003 are both in NAICS format. This means that when the U.S. Census Bureau's Annual Survey of Manufactures classifies a sector, such as the "petroleum and coal industry," it matches up with the unemployment data from the U.S. Department of Labor for the "petroleum and coal industry". They are of the same name and have the same meaning.

For the years covered for the oil shock of 1999, the U.S. Department of Labor's unemployment data and the U.S. Census Bureau's Annual Survey of Manufactures are in different format/system. U.S. Department of Labor's unemployment data is in SIC (Standard Industrial Classification) system. While the U.S. Census Bureau's Annual Survey of Manufactures, which is used to obtain the energy intensity and capital intensity, is in NAICS system. The SIC system from the Department of Labor says "printing, publishing, and allied industries" while the NAICS system from the Census Bureau says "paper and printing." They are not the same. Clear and useful information for energy intensity and capital intensity can not be obtained for the Oil Price Shock of 1999. For the Oil Price Shock of 1999, the energy intensity and capital intensity can not be found.

The years covered for 1990 oil price shock, the energy intensity and the capital intensity can be found. This is because the U.S. Census Bureau's Annual Survey of Manufactures uses the SIC system during this time and the U.S. Department of Labor's unemployment data uses the SIC system. Hence, data for unemployment which is obtained from the U.S. Department of Labor corresponds with the U.S. Census Bureau's Annual Survey of Manufactures data, which is used to find energy intensity and capital intensity ratios.

This study breaks down unemployment rate into sectors. However, the energy intensity can only be found in regards to the manufacturing sector. This is because the U.S. Census Bureau's Annual Survey of Manufactures database describes sectors within manufacturing, not all sectors that can be found in U.S. Department of Labor's unemployment data.

5.5 Additional Capital Intensities Found Besides from the U.S. Census Bureau's Annual Survey of Manufactures

Capital Intensity for sectors outside manufacturing for the Oil Price Shock of 2003 are found from the U.S. Census Bureau's program entitled Annual Capital Expenditures and from the 2002 Economic Census. The Annual Capital Expenditures is the conduit by which the capital for sector outside manufacturing is ascertained. The Economic Census is the way in which the number of workers per sector outside manufacturing is found. Then capital intensity is the ratio between the capital per worker. Table 5.3 lists the combined capital intensities of manufacturing sectors and sectors outside manufacturing in order from high intensity to low intensity. Additional energy intensities could not be found outside the manufacturing sectors. The U.S. Department of Energy/ Energy Information Administration, the U.S. Census Bureau, and the Department of Labor was contacted to obtain, find the whereabouts of, or recommendations to finding the existence of data of energy use per sector (for sectors outside manufacturing), but this data does not exist.

For the Oil Price Shock of 1990 to find capital intensity beyond the manufacturing sectors it is possible to go to the University of Virginia's Geospatial And Statistical Data Center which has historical Data from the U.S. Census Bureau to find the number of workers in sectors beyond manufacturing. To find capital for sectors beyond manufacturing one needs to go to the U.S. Department of Commerce's Bureau of Economic Analysis. Table 5.6

lists the capital intensity for Oil Price Shock of 1990 for sectors beyond manufacturing and manufacturing sectors in order from high capital intensity to low capital intensity.

Table 5.1: Oil Price Shock of 2003: Energy Intensity for Manufacturing Sectors

Sector	Energy Intensity
Nonmetallic Mineral Products	0.049099188
Paper And Printing	0.031552623
Primary And Fabricated Metal Products	0.03076974
Petroleum And Coal Products	0.030219366
Chemicals	0.029970809
Plastics And Rubber Products	0.02147204
Wood Products	0.018665565
Manufacturing	0.018052878
Food Manufacturing	0.014768217
Electrical Equipment And Appliances	0.009698286
Textile, Apparel, Leather	0.009420218
Furniture And Fixtures	0.008854365
Machinery Manufacturing	0.007662463
Beverage And Tobacco Products	0.007189063
Miscellaneous Manufacturing	0.006889046
Computer And Electronic Products	0.006873861
Transportation Equipment	0.006027999

For the oil price shock of 2003, the Nonmetallic Mineral Products sector should be the most sensitive to oil price shock because its energy intensity ratio is the highest, 0.049099188. This is followed by the Paper And Printing sector which has an energy intensity ratio of 0.031552623. Next should be the Primary And Fabricated Metal Products sector which has an energy intensity ratio of 0.03076974. The Transportation Equipment sector which has an energy intensity ratio of 0.006027999 is the least in energy intensiveness. Second to the least in energy intensiveness is the Computer And Electronic Products sector which has an energy intensity ratio of 0.006873861. Third to the least in energy

intensiveness is the Miscellaneous Manufacturing sector which has an energy intensity ratio of 0.006889046.

Table 5.2: Oil Price Shock of 2003: Capital Intensity for Manufacturing Sectors

Sector	Capital Intensity
Petroleum And Coal Products	121925.6055
Beverage And Tobacco Products	38542.72939
Chemicals	37535.25576
Computer And Electronic Products	23074.08808
Nonmetallic Mineral Products	13812.97528
Transportation Equipment	13670.88148
Manufacturing	12172.20799
Paper And Printing	11386.38851
Plastics And Rubber Products	9704.517775
Food Manufacturing	9645.412058
Machinery Manufacturing	9095.476083
Miscellaneous Manufacturing	8159.73205
Primary And Fabricated Metal Products	7902.434986
Electrical Equipment And Appliances	7666.373182
Wood Products	5466.256405
Furniture And Fixtures	3742.122196
Textile, Apparel, Leather	2111.640331

Table 5.3: Oil Price Shock of 2003: Capital Intensity For Sectors Outside Manufacturing and Manufacturing Sectors

Sector	Capital Intensity
Petroleum And Coal Products	121925.6055
Mining	114795.7315
Utilities	101255.7236
Real Estate And Rental And Leasing	49634.18395
Educational Services	45206.01445
Beverage And Tobacco Products	38542.72939
Chemicals	37535.25576
Information	23801.53857
Computer And Electronic Products	23074.08808
Nonmetallic Mineral Products	13812.97528
Transportation Equipment	13670.88148
Transportation And Warehousing	13085.68751
Manufacturing	12172.20799
Paper And Printing	11386.38851
Plastics And Rubber Products	9704.517775
Food Manufacturing	9645.412058
Machinery Manufacturing	9095.476083
Miscellaneous Manufacturing	8159.73205
Primary And Fabricated Metal Products	7902.434986
Electrical Equipment And Appliances	7666.373182
Arts, Entertainment, and Recreation	7477.251262
Wood Products	5466.256405
Construction	4771.183645
Wholesale Trade	4739.210721
Retail Trade	4053.066442
Health Care And Social Assistance	3926.122697
Furniture And Fixtures	3742.122196
Accomodation And Food Services	2219.257854
Textile, Apparel, And Leather	2111.640331

If following from Davis and Haltiwanger (2001), the sector which is the most capital intensive should be the most sensitive to oil price shock. Although, some sectors that do not require much oil or need oil as it's by product may not reflect this. For the Oil Price Shock of 2003, the sector that is the most capital intensive is the Petroleum And Coal Products sector which has a capital intensity of 121925.6055. Next is the Mining sector which has a capital

intensity of 114795.7315. Next is the Utilities sector which has a capital intensity of 101255.7236. The sector that is least in capital intensiveness is the Textile, Apparel, And Leather sector which has a capital intensity of 2111.640331. The Accommodation And Food Services sector which has a capital intensity of 2219.257854 is second to the least in capital intensiveness. The Furniture And Fixtures sector which has a capital intensity of 3742.122196 is the third least in capital intensiveness.

Table 5.4: Oil Price Shock of 1990: Energy Intensity for Manufacturing Sectors

Industry	Energy Intensity
Stone, Clay, And Glass Products	0.056510883
Primary Metal Industries	0.054914279
Paper And Allied Products	0.039896838
Chemicals And Allied Products	0.033309971
Textile Mill Products	0.030479119
Petroleum And Coal Products	0.026036502
Rubber And Miscellaneous Plastic Products	0.024866689
Lumber And Wood Products, Except Furniture	0.020593743
Manufacturing	0.019912392
Fabricated Metal Industries	0.017331859
Food And Kindred Products	0.013345638
Furniture And Fixtures	0.012587389
Leather And Not Specified Manufacturing	0.009023457
Other Transportation Equipment Except Autos And Aircraft	0.008714809
Printing, Publishing, And Allied Industries	0.008635077
Apparel And Other Fabricated Textile Products	0.007823517
Transportation Equipment	0.007809428
Motor Vehicles And Equipment (Automobiles)	0.007262907
Tobacco Products	0.005014901

For the oil price shock of 1990, the Stone, Clay, And Glass Products sector should be the most sensitive to oil price shock when considering energy intensity because its energy intensity ratio is the highest. The Stone, Clay, And Glass Products sector has an energy

intensity ratio of 0.056510883. The Primary Metal Industries sector which has an energy intensity ratio of 0.054914279 should be next in sensitivity to oil price shock. The next sector that should be most sensitive to oil price shock is the Paper And Allied Products sector which has an energy intensity ratio of 0.039896838. The sector that is least in energy intensiveness is the Tobacco Products sector which has an energy intensity ratio of 0.005014901. The Motor Vehicles And Equipment (Automobiles) sector which has an energy intensity ratio of 0.007262907 is second least in energy intensiveness.

Table 5.5: Oil Price Shock of 1990: Capital Intensity for Manufacturing Sectors

Industry	Capital Intensity
Petroleum And Coal Products	46106.12245
Chemicals And Allied Products	28251.7049
Paper And Allied Products	21393.75775
Tobacco Products	12975
Primary Metal Industries	10522.31668
Motor Vehicles And Equipment (Automobiles)	9595.262267
Transportation Equipment	8778.378378
Food And Kindred Products	8358.409611
Manufacturing	8256.233035
Printing, Publishing, And Allied Industries	7628.319682
Stone, Clay, And Glass Products	7558.589871
Other Transportation Equipment Except Autos And Aircraft	6607.025247
Textile Mill Products	4294.096854
Fabricated Metal Industries	4651.822606
Furniture And Fixtures	2542.08589
Leather And Not Specified Manufacturing	1314.96063
Apparel And Other Fabricated Textile Products	1059.224986
Rubber And Miscellaneous Plastic Products	1028.449292
Lumber And Wood Products, Except Furniture	655.8612231

Table 5.6: Oil Price Shock of 1990: Capital Intensity For
Sectors Outside Manufacturing and Manufacturing Sectors

Industry	Capital Intensity
Petroleum And Coal Products	46106.12245
Chemicals And Allied Products	28251.7049
Paper And Allied Products	21393.75775
Mining	19820.06578
Transportation, Communications, and Utilities	19023.113
Finance, Insurance, And Real Estate	13901.84333
Tobacco Products	12975
Primary Metal Industries	10522.31668
Motor Vehicles And Equipment (Automobiles)	9595.262267
Transportation Equipment	8778.378378
Food And Kindred Products	8358.409611
Manufacturing	8256.233035
Printing, Publishing, And Allied Industries	7628.319682
Stone, Clay, And Glass Products	7558.589871
Other Transportation Equipment Except Autos And Aircraft	6607.025247
Textile Mill Products	4294.096854
Fabricated Metal Industries	4651.822606
Wholesale Trade	3644.649146
Construction	2912.466357
Furniture And Fixtures	2542.08589
Retail Trade	1798.795283
Leather And Not Specified Manufacturing	1314.96063
Apparel And Other Fabricated Textile Products	1059.224986
Rubber And Miscellaneous Plastic Products	1028.449292
Lumber And Wood Products, Except Furniture	655.8612231

When considering capital intensity of the Oil Price Shock of 1990, the Petroleum And Coal Products sector should be the most sensitive to oil price shock because it has the highest capital intensity ratio, 46106.12245. Next should be the Chemicals And Allied Products sector which has capital intensity ratio of 28251.7049. Next should be the Paper And Allied Products sector which has capital intensity ratio of 21393.75775. The sector that is least in capital intensity is the Lumber And Wood Products Except Furniture sector which has a capital intensity ratio of 655.8612231. The second to the least in energy intensiveness is the

Rubber And Miscellaneous Plastic Products sector which has a capital intensity ratio of 1028.449292.

5.6 Energy Intensity and Capital Intensity as Explanations for Effects

Davis and Haltiwanger find that the more energy intensive or capital intensive a sector is, the more it is affected by oil price. Therefore one can look at sectors that have energy intensities or capital intensities and have significant effect of OP to UN or OF to UN.

5.7 Oil Price Shock of 2003, Energy Intensity, Estimated Coefficient of OP

For the 2003 Oil Price Shock there is only one sector that has energy intensity and is significant in estimated coefficient of OP to UN. This sector is the Paper And Printing sector which has an absolute value estimated coefficient of OP of 1.28022 and an energy intensity of 0.031552623. It would not be possible to compare this sector to other sectors.

5.8 Oil Price Shock of 2003, Capital Intensity, Estimated Coefficient of OP

Table 5.7: Oil Price Shock of 2003, Capital Intensity, and Estimated Coefficient of OP

Rank Correlation Table					
Oil Price Shock of 2003					
Estimated Coefficient of OP			**Capital Intensity**		
Rank	Sector	absolute value of estimated coefficient of OP_t	**Rank**	Sector	capital intensity
1	Paper and Printing	1.280022	**2**	Paper and Printing	11386.38851
2	Transportation and Warehousing	0.806311	**1**	Transportation and Warehousing	13085.68751

There are three sectors in the Oil Price Shock of 2003 that have capital intensity and is significant in estimated coefficient of OP to UN. However, one, the Utilities sector has a time frame that no others have, OP_{t-1}, it thus can not be compared. The Utilities sector has a absolute value estimated coefficient of OP_{t-1} of 1.711395 and a capital intensity of 101255.7236. The other two, are compared. The Paper And Printing sector has a higher absolute value estimated coefficient of OP_t, 1.280022, than the Transportation And Warehousing sector's absolute value estimated coefficient of OP_t, 0.806311. However, the Paper And Printing sector has a lower capital intensity, 11386.38851, compared to the Transportation And Warehousing sector's capital intensity, 13085.68751.

5.9 Oil Price Shock of 2003, Energy Intensity, Estimated Coefficient of OF

Table 5.8: Oil Price Shock of 2003, Energy Intensity, and Estimated Coefficient of OF

Rank Correlation Table					
Oil Price Shock of 2003					
Estimated Coefficient of OF			**Energy Intensity**		
Rank	Sector	absolute value of estimated coefficient of OF_t	**Rank**	Sector	energy intensity
1	Transportation Equipment	18.58545	**3**	Transportation Equipment	0.006027999
2	Chemicals	17.47671	**1**	Chemicals	0.029970809
3	Wood Products	16.75009	**2**	Wood Products	0.018665565

For the Oil Price Shock of 2003, the Transportation Equipment sector, Chemicals sector, and Wood Products sector are significant in effect of estimated coefficient of OF_t to UN and have energy intensity that can be obtained. Of the three sectors, the Transportation Equipment sector has the highest absolute value estimated coefficient of OF_t, 18.58545 but has the least energy intensity, 0.006027999. The Chemicals sector is the next in effect of absolute value estimated coefficient of OF_t, 17.47671, but has the highest energy intensity,

0.029970809. The Wood Products sector is the last in effect of absolute value of estimated coefficient of OF_t, 16.75009, but is second in energy intensity, 0.018665565.

5.10 Oil Price Shock of 2003, Capital Intensity, Estimated Coefficient of OF

Table 5.9: Oil Price Shock of 2003, Capital Intensity, and Estimated Coefficient of OF

Rank Correlation Table					
Oil Price Shock of 2003					
Estimated Coefficient of OF			**Capital Intensity**		
Rank	Sector	absolute value of estimated coefficient of OF_t	**Rank**	Sector	capital intensity
1	Transportation Equipment	18.58545	**3**	Transportation Equipment	13670.88148
2	Chemicals	17.47671	**2**	Chemicals	37535.25576
3	Wood Products	16.75009	**4**	Wood Products	5466.256405
4	Real Estate And Rental And Leasing	12.75567	**1**	Real Estate And Rental And Leasing	49634.18395

There are four sectors in the Oil Price Shock of 2003 with Capital Intensity and are significant in effect of estimated coefficient of OF. They are the Transportation Equipment sector, Chemicals sector, the Wood Products sector, and Real Estate And Rental And Leasing sector. The Transportation Equipment sector has the most in effect of absolute value estimated coefficient of OF_t, 18.58545, but has only the third highest capital intensity of the four sectors, 13670.88148. The Chemicals sector is the next in effect of absolute value of estimated coefficient of OF_t, 17.47671, and is second in capital intensity, 37535.25576. The Wood Products sector is the next in effect (third out of the four) of absolute value estimated coefficient of OF_t, 16.75009, but has the least capital intensity, 5466.256405. The Real Estate And Rental And Leasing sector is the next (and last) in effect of absolute value estimated coefficient of OF_t, 12.75567, but is the most in capital intensity, 49634.18395.

5.11 Oil Price Shock of 1990, Energy Intensity, Estimated Coefficient of OP

Table 5.10: Oil Price Shock of 1990, Energy Intensity, and Estimated Coefficient of OP

Rank Correlation Table					
Oil Price Shock of 1990					
Estimated Coefficient of OP			**Energy Intensity**		
Rank	Sector	absolute value of estimated coefficient of OP_{t-3}	**Rank**	Sector	energy intensity
1	Motor Vehicles and Equipment (Automobiles)	1.678871	**2**	Motor Vehicles and Equipment (Automobiles)	0.007262907
2	Fabricated Metal Industries	1.219854	**1**	Fabricated Metal Industries	0.017331859

For the Oil Price Shock of 1990, there are two sectors that have energy intensity and are significant in effect of estimated coefficient of OP_{t-3}. They are the Motor Vehicles And Equipment (Automobiles) sector, and Fabricated Metal Industries sector. Two other sectors, the Stone, Clay And Glass Products sector and Apparel And Other Fabricated Textile Products sector, are significant but have coefficient of OP of unique times, estimated coefficient of OP_{t-4} and estimated coefficient of OP_{t-2} respectively, and can not be matched and compared. The Stone, Clay, And Glass Products sector has an absolute value estimated coefficient of OP_{t-4} of 1.064232 and energy intensity of 0.056510883. While the Apparel And Other Fabricated Textile Products sector has an absolute value estimated coefficient of OP_{t-2} of 0.919391 and energy intensity of 0.007823517.

The Motor Vehicles And Equipment (Automobiles) sector has an absolute value estimated coefficient of OP_{t-3} of 1.678871, which is more than the absolute value estimated coefficient of OP_{t-3} of Fabricated Metal Industries sector which is 1.219854. However, the Motor Vehicles And Equipment (Automobiles) sector has less energy intensity, 0.007262907, while the Fabricated Metals sector has an energy intensity of 0.017331859.

5.12 Oil Price Shock of 1990, Capital Intensity, Estimated Coefficient of OP

Table 5.11: Oil Price Shock of 1990, Capital Intensity, and Estimated Coefficient of OP

Rank Correlation Table					
Oil Price Shock of 1990					
Estimated Coefficient of OP			**Capital Intensity**		
Rank	Sector	absolute value of estimated coefficient of OP_{t-3}	**Rank**	Sector	capital intensity
1	Motor Vehicles and Equipment (Automobiles)	1.678871	**1**	Motor Vehicles and Equipment (Automobiles)	9595.262267
2	Fabricated Metal Industries	1.219854	**2**	Fabricated Metal Industries	4651.822606

For the Oil Price Shock of 1990, the Motor Vehicles And Equipment (Automobiles) sector and the Fabricated Metal Industries sector have capital intensity and are significant in estimated coefficient of OP_{t-3}. The Stone, Clay And Glass Products sector and Apparel And Other Fabricated Textile Products sector, are significant but have coefficients of OP of unique times, estimated coefficient of OP_{t-4} and estimated coefficient of OP_{t-2} respectively, and can not be matched and compared. The Stone, Clay, And Glass Products sector has an absolute value estimated coefficient of OP_{t-4} of 1.064232 and capital intensity of 7558.589871. While the Apparel And Other Fabricated Textile Products sector has an absolute value estimated coefficient of OP_{t-2} of 0.919391 and capital intensity of 1059.224986.

The Motor Vehicles And Equipment (Automobiles) sector has a higher absolute value estimated coefficient of OP_{t-3}, 1.678871 and has a higher capital intensity, 9595.262267 than the Fabricated Metal Industries sector has. The Fabricated Metal Industries sector has an absolute value estimated coefficient of OP_{t-3} of only 1.219854 and capital intensity of only 4651.822606.

5.13 Oil Price Shock of 1990, Energy Intensity, Estimated Coefficient of OF

For the Oil Price Shock of 1990, there are two sectors, Stone, Clay, And Glass Products and the Apparel And Other Fabricated Textile Products that have energy intensity and are significant in estimated coefficient of OF. However, they are of unique times and can not be matched and compared.

5.14 Oil Price Shock of 1990, Capital Intensity, Estimated Coefficient of OF

For the Oil Price Shock of 1990, there are three sectors, Stone, Clay, And Glass, Construction, and Apparel And Other Fabricated Textile Products, that have capital intensity and are significant in estimated coefficient of OF. However, they can not be matched and compared because they are of distinctive and varying times.

5.15 Further Discussion and Concluding Remarks About Energy and Capital Intensity

Davis and Haitiwanger (2001) reveal that the sector most in energy intensity is the most affected by oil price. The more energy intensive sectors should have higher absolute value estimated coefficient of OP to UN or OF to UN. This does not turn out to be correct if one looks at the rank correlation tables. Davis and Haltiwanger (2001) reveal that the more capital intensive a sector is, the more it is affected by oil price. Sectors with more capital intensity should have higher absolute value estimated coefficient of OP to UN or OF to UN. It turns out to only be true when (looking at Rank Correlation Table 5.11) for the Oil Price Shock of 1990 and capital intensity for sectors significant in OP. These are the Motor Vehicles and Equipment (Automobiles) and the Fabricated Metal Industries sector. It can be seen that energy intensity and capital intensity may not tell well exactly which sector will have more of an effect of absolute value estimated coefficient (impact) of OP to UN or OF to

UN. Only Table 5.11 is consistent with the idea that capital intensity can tell which sector will have more of an absolute value estimated coefficient (impact of OP to UN). Other rank correlation tables are inconsistent with the notion. Even with the consistency of Table 5.11, there are not many sectors to be rank and compared.

CHAPTER VI

RESULTS OVER TIME, CONCLUSION

6.1 A Look at Some Results Over Time

It may be said that the Motor Vehicles And Equipment (Automobiles) sector did not adjust as well or fully during the Oil Price Shock of 1990 as it did for the Oil Price Shock of 1999. The types of automobiles produced in the past, during and preceding the Oil Price Shock of 1990, were large automobiles that were not fuel efficient. So, what happened is that in 1990 when oil price went up, so did unemployment rate for the Motor Vehicles And Equipment sector. However, for the Oil Price Shock of 1999, automobiles produced became smaller and more fuel efficient. This caused the Motor Vehicles And Equipment (Automobiles) sector to be less impacted by oil price shock.

After the Arab Oil Embargo, the Department of Energy/ EIA's Petroleum Chronology of Events (2002) explains that Congress pasted the Energy Policy and Conservation Act which established the Corporate Average Fuel Economy standards. It mandated increases in automobile average fuel economy over time. By the year 2000 cars were to have an average of 27.5 miles per gallon and light trucks were to have an average of 20.7 miles per gallon. This is a big and steady gain from the start of the Corporate Average Fuel Economy Standards mandate of 18 miles per gallon for cars that began in the 1978.

The result was that more large automobiles that were not fuel efficient were replaced by smaller automobiles that are fuel efficient. The Motor Vehicles And Equipment (Automobiles) went through a big change. From 1975 to 1996 the U.S. Department of Energy/ EIA's U.S. MPG Rating for New Vehicles (2000) explains that there was an average fuel efficiency increase of 2.3 percent per year for automobiles and light trucks.

Not just because of mandates by law were the Motor Vehicles And Equipment (Automobiles) sector changing their practice of producing too many large and fuel inefficient vehicles but the sector had to change. Davis and Haltiwanger (2001) and Lee and Ni (2002) explain what happened to automobile manufacturers after the initial oil price shocks in the 1970s. Sales of large and fuel inefficient automobiles suffered greatly and “unmercifully” (Lee and Ni, 2002: 829) Some dealers did not even take large automobiles as trade ins. Dealerships with large cars had “new car stockpiles” (Lee and Ni, 2002: 829) that reached records highs. Automobiles that were large and fuel efficient were described as "virtually nobody wanted them” (Lee and Ni, 2002: 829).

Davis and Haltiwanger (2001) described the crisis after the initial oil price shocks in the 1970s from an unemployment perspective. Many of the “physical capital” (Davis and Haltiwanger, 2001: 467) in the Motor Vehicles And Equipment (Automobiles) sector was “dedicated” (Davis and Haltiwanger, 2001: 467) to producing these large cars. Many auto workers had learned skills only to produce specific models and they tended to be these large cars. Also research and design employees (engineers) at the American auto firms had been “specialized” (Davis and Haltiwanger, 2001: 467) to engineer these large cars. “The development of smaller, more fuel efficient cars required a costly and time-consuming reorientation of the knowledge base and the development of new skills by research and design personnel” (Davis and Haltiwanger, 2001: 467).

Thus gradually the automobile sector was undergoing a change in many aspects. Because of law, demand of more fuel efficient automobiles, employment situations, and internal structure, the automobile sector was evolving and transforming.

Another sector that could be looked at is the Mining sector. There is no significant effect of the Mining sector in terms of OP for the recent Oil Price Shock of 2003 but there is

a significant effect of OP for the Oil Price Shock of 1999. This could be due to trend towards less oil consumption and more conservation as time passes by. Carey and Franklin (1991) explain in their outlook of the mining industry from 1990 to 2005 that there would be more imports of oil as time passes by. The power industry may also switch to using coal more to generate power. The use of coal as a substitute for oil may also increase. This overall may cause a decrease in oil mining and an increase toward coal mining. Since there may be an emphasis on coal mining, or less of an emphasis on oil mining, there could be less impact on the economy and unemployment in this sector as oil price shocks as time passes by.

6.2 A Look at Change in Energy Intensity and Change in Impact Over Time

Table 6.1: Change in Energy Intensity and Change in Impact

		Change in Energy Intensity	
		Increase	Decrease
Change in Impact	increase	5	5
	decrease	2	4

Table 6.1 show the number of manufacturing sectors that increase or decrease in energy intensity and impact over time. Change in impact is the change in the value of the coefficient of OP_t from the Oil Price Shock of 1990 to Oil Price Shock of 2003. There is a look to see if there is a change in impact over time and a change in energy intensity over time. What is shown is that is not a great difference. Increase in energy intensity and increase in impact, decrease in energy intensity and increase in impact, and decrease in energy intensity and decrease in impact, are virtually the same in number.

6.3 Concluding Remarks

The conclusion is that OP does not relate that well to UN. As can be seen in the Chapter IV: Econometric Results of OP, OF, and GDP on Unemployment Rate, there were many sectors that had no significant effect of OP to UN. There were several sectors that should have had an effect of OP to UN but did not.

An example would be the Petroleum and Coal sector. This study focuses on the effect of OP on UN so the Petroleum sector itself (represented by the Petroleum And Coal Products sector) should have had an effect of OP to UN (Petroleum And Coal Products) of some variation of OP at least. However, this was not seen.

For the Oil Price Shock of 2003, there were no significant effect of OP to UN (Petroleum And Coal Products). There was also not a significant effect of OF to UN (Petroleum And Coal Products). This was the other variable directly involving oil that should possible have had a significant effect. There was however, a significant total effect of GDP to UN (Petroleum And Coal Products) which was negative and followed the direction of Okun's Law. This seems to reveal that UN follows GDP more than it follows OP.

Also, for the Oil Price Shock of 1999, the total effect of OP to UN (Petroleum And Coal Products) was not significant. However, the effect of OF_t to UN (Petroleum And Coal Products) was significant. This effect of OF_t to UN was not pervasive as it did not show up in the Oil Price Shock of 2003 or Oil Price Shock of 1990.

For the Oil Price Shock of 1990, the effect of OP to UN did not turn out significant. The effect of OF to UN also did not turn out significant. This thus, further shows a weak relationship of the effect of OP and OF to UN.

Usually the sector that had a significant effect of OP to UN or OF to UN did not show up consistently in different oil shocks. Sectors in the Oil Price Shock of 1999 and Oil Price

Shock of 1990 are comprised of in similar ways (Standard Industrial Classification) and should have had many sectors that came out significant in effect of OP to UN or OF to UN in both oil price shocks. However, this was not the case. Sectors that were significant in effect of OP to UN in one oil shock did not come out as significant in the other oil shock. This is also true for OF to UN.

Many of the sectors that came out significant in effect of OP to UN or OF to UN were explained as to why they had outcomes such as this in terms of direction and magnitude.

6.4 Policy Implications

Through this research it has been revealed that oil price shocks do not affect unemployment rate as much as expected. There are some sectors and some cases where oil price shocks do affect unemployment. However, what has a tendency to affect unemployment much more is GDP. To best control unemployment one must try to encourage and support GDP growth consistent with sustainable economic progress. If there is a choice in the ability to support GDP advancement or manipulate oil price, to affect more sectors and to reach more people in terms of unemployment, it is necessary to choose to support GDP growth. Governments must try to support GDP expansion in accordance with maintainable economic development if they are to manage unemployment rate in various sectors.

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APPENDICES

Data Sources

Unemployment Rate

U.S. Department of Labor/ Bureau of Labor Statistics' online database
http://data.bls.gov/cgi-bin/srgate

Unemployment codes obtained from Teri Morisi of the U.S. Department of Labor/ Bureau of Labor Statistics/ Current Population Survey

"Unpublished Detailed Occupation And Industry Tables" and "Employed Persons By Detailed Industry, Sex, And Age" which contain detailed information about what comprises each unemployment sector is obtained from the Teri Morisi of the U.S. Department of Labor/ Bureau of Labor Statistics. This information is used in the Interpretation/Analysis section to help analyze the Findings.

GDP

U.S. Department of Commerce/ Bureau of Economics Analysis' online database

http://www.bea.gov/national/xls/gdpchg.xls

Oil Price

West Texas Intermediate

U.S. Department of Energy/ Energy Information Administration's online database
Petroleum → Spot Prices → View History
http://tonto.eia.doe.gov/dnav/pet/hist/rwtcd.htm

Energy and Capital Intensity

U.S. Census Bureau: 2002 Economic Census

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BIOGRAPHY

Addy Adisorn Vutikullird was born in Bangkok, Thailand in 1980. He graduated from the College of Letter and Sciences, Department of Psychology at UCLA (University of California, Los Angeles). He earned a Bachelors of Arts with a major in Psychology in June of 2002.