Macroeconomic and Industrial Effects Of Higher Oil and Natural Gas Prices

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EXECUTIVE SUMMARY

In the past few years, the U.S. economy has grown at a healthy pace in the face of a relentless rise in energy prices. However, almost all analysts agree that continued energy price increases will affect the overall economy and employment, and might affect different sectors of the economy in different ways. This paper examines the possible effects of an energy price rise both at the national and industry level.

We modeled how the U.S. economy would react to a permanent spike in the price of oil of $20 per barrel and a permanent spike in the price of natural gas of $2.00 per thousand cubic feet (mcf) in 2006. This means that we assumed that oil prices remained $20 per barrel higher than would otherwise be assumed in a macro-economic model (i.e. $20 above their baseline prices) through 2020 and natural gas prices remained $2.00 higher than their baseline prices, but that their annual price rates of change follow their respective annual price growth path of the baseline—a "permanent" spike.

The baseline oil price is between $50 and $60 per barrel for West Texas Intermediate (WTI) in 2006. The $20 per barrel price increase therefore translates to a per barrel price of between $70 and $80. (Note that, in fact, the price of WTI crude oil has been above $70 for most of the time between mid-April and mid-May 2006). The $2 increase in the natural gas price translates to between $8.00 and $9.00/mcf, wellhead price, in the next few years—compared to a baseline price of between $6.00 and $7.00/mcf. (The actual wellhead price of natural gas dropped from $10.00/mcf in December of last year to $5.51 in September.)

We conclude that these levels of higher energy prices: (1) cause the economy to grow more slowly in 2006 and 2007, but not cause a recession; (2) reduce the growth in industry output and job creation across the economy as domestic income is transferred to foreign oil producing countries; and (3) induce U.S. energy consumers to use less energy in the long run.

In particular, we found that-

- In 2006, real Gross Domestic Product (GDP) growth slows by almost 0.5 percentage points below the baseline growth. In the second year, growth falls by another 0.2 percentage points. Given the strong momentum of economic growth, such slowdowns are far from what it would take to induce a recession. After 2007, real GDP growth rates more-or-less follow the baseline forecast through 2020.[1]

- The unemployment rate is almost 0.5 percentage points higher in 2007, at the height of the labor market impact. After 2007, the difference in the unemployment rate declines—by 2010, there is only about a 0.2 percentage

[1] Potential energy efficiency gains by industries in response to the energy price increases could reduce GDP and employment impacts, particularly near the end of the simulation horizon. Effects of these additional energy efficiency gains were not included in the simulation because of uncertainty about the extent of industrial adoption of greater energy efficiencies over the time period.

point difference.

- Compared to the baseline, the higher energy prices push up consumer price inflation (i.e., the personal consumption expenditure (PCE) deflator) by one percentage point and 0.6 percent points for 2006 and 2007, respectively. By 2008, however, inflation is back to baseline rates.

- Industrial output growth is affected adversely across the board. Higher energy prices slow down growth of output in most industries regardless of their energy intensity. However, most industries continue to grow—even if at a slower rate.

- Higher energy prices mean that the number of jobs that the economy creates is reduced. In this scenario, instead of creating 1.9 million new jobs in 2006, the economy creates 1.4 million new jobs—a difference of 500,000 jobs. In 2007, the economy loses another 200,000 jobs compared to the baseline. Missing jobs peak in 2007 at around 700,000.

- The largest economic impact comes through the loss of consumers' real disposable income. Higher crude oil prices act as a tax on real purchasing power, and the proceeds of this tax are spent abroad, reducing the purchasing power of the economy as a whole.

- Since we assume that the energy price shock is global, higher energy prices do not result in an appreciable loss of foreign competitiveness in energy intensive sectors. Nonetheless, since U.S. producers of tradable goods are slightly less energy efficient than their foreign counterparts, over the long run, the trade-weighted U.S. dollar will depreciate by about 2 percent in order to restore competitiveness on a global cost basis.

- Wholesale and Retail Trade, Finance and Insurance, and Construction are the industries with the greatest absolute employment impacts. The Energy, Transportation, and Durable Manufacturing industries have the largest output and employment effects relative to their size.

- As stated above, broadly-based reductions in real income account for the bulk of jobs reduction in general consumer-related industries such as Wholesale trade, Retail trade, and Construction. Therefore, in general, jobs impacts by state are proportional to the size of these sectors for each state, which are, in turn, roughly proportional to each state's employment share. Thus, California, Texas, New York and Florida lose the most jobs, in that order. Pennsylvania, Ohio, and Illinois come in close together at fifth place.

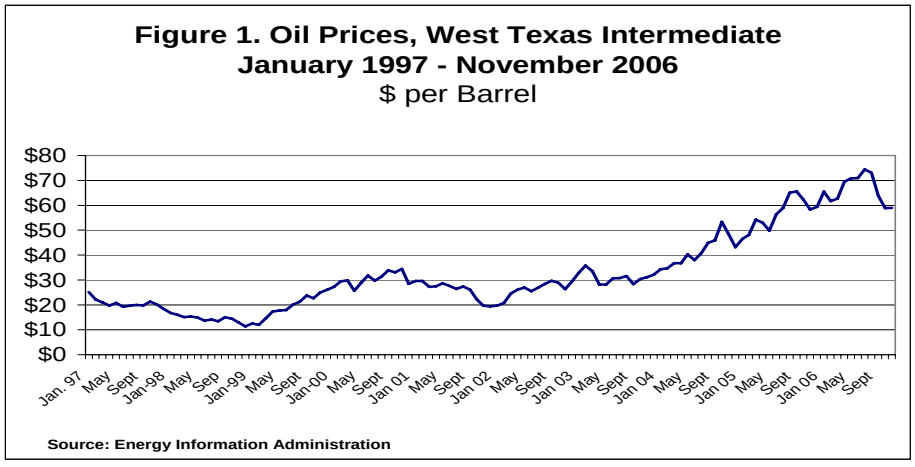
PURPOSE OF THE STUDY

In the last several years, the rise in oil and natural gas prices has renewed interest in examining what the effects of these higher prices might be on the overall economy. The Energy Information Administration (EIA), Global Insight, Inc., the Federal Reserve, Stanford's Energy Modeling Forum, and Congress' Joint Economic Committee (JEC) have published findings in recent months[2]. While the results of these exercises are not exactly the same, they are similar: Model simulations suggest that the economy is much more resilient today to higher energy prices than it was in the past—although the economy still pays a price for more expensive energy.

This study goes beyond the standard macroeconomic results to provide estimates about what higher energy prices might mean to industrial output and jobs in specific industries and where these impacts will be felt at the state level.

ENERGY PRICE GROWTH AND THE ECONOMY

Between January 1997 and the end of 2003, oil prices fluctuated in a range of between $20 and $30 per barrel. (See Figure 1.) Beginning in January 2004, however, oil prices began trending upward. By April of 2006, oil prices had more than doubled—from about $34 per barrel in January 2004 to almost $70 per barrel in April of 2006. Prices peaked in July 2006 at over $74 per barrel, but have declined since then. By October, oil prices dropped to $59 per barrel.

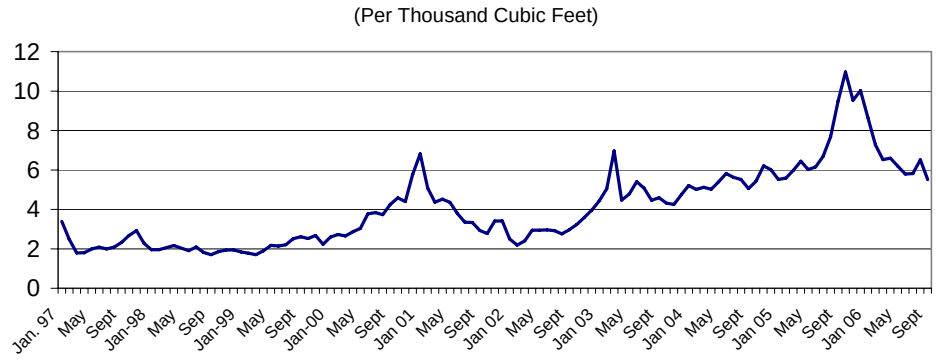


[2] *Annual Energy Outlook, 2006*, Energy Information Administration, February 2006, "Economic Effects of Higher Oil Prices," pages 33-36; Ibid., Global Insight, Inc., page 35; Ibid., Federal Reserve, page 35; *The Economic Consequences of Higher Crude Oil Prices*, Energy Modeling Forum, Stanford University, Stanford, CA, October 2005; and *Energy Prices and the Economy*, Joint Economic Committee, January 2006.

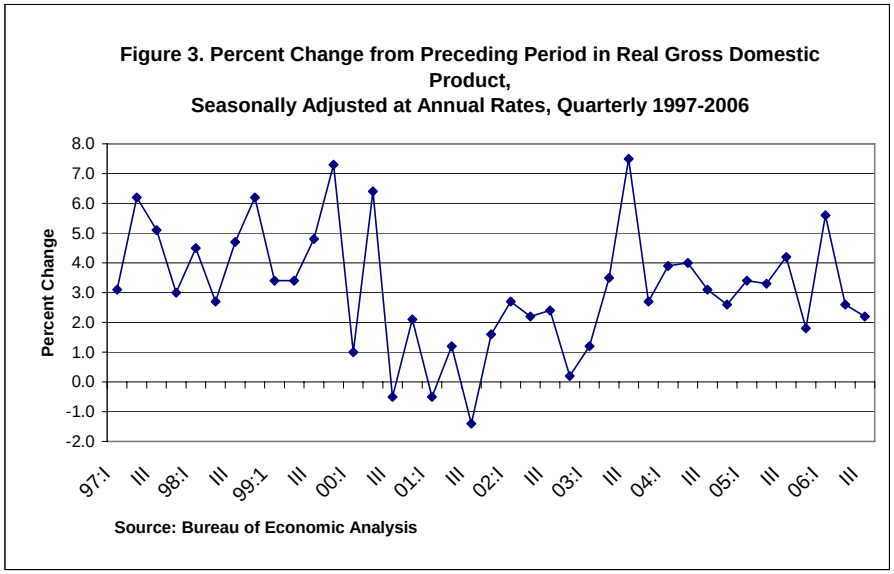
Natural gas prices—except for the price spike in the winter of 2001—were also relatively stable between January 1997 and January 2003, trading in the range between $2 and $4 per thousand cubic feet (mcf). (See Figure 2.) Beginning in January 2003, prices of natural gas began a chaotic climb to over $10 per mcf in the fall of 2005. Since then, prices have dropped to below $6 per mcf (as of September 2006).

The rise in natural gas and oil prices during this period have been accompanied by a pick-up of economic growth since 2003, a trend that has continued through the third quarter of 2006. (See Figure 3.) Between the first quarter of 2003 and the third quarter of 2006, the period when natural gas prices increased sharply, soon to be followed by oil price increases, real GDP grew at the very respectable average annual rate of 3.4%. Indeed, most economists feel that faster economic growth around the world is at least partly responsible for recent increases in energy prices.

Figure 2. Natural Gas Wellhead Prices, January 1997 to September 2006



Source: Energy Information Administration



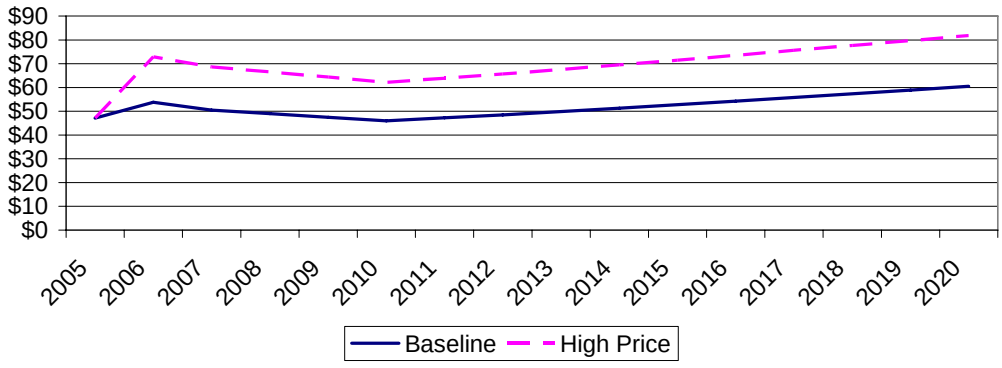
METHODOLOGY

We used the LIFT (Long-term Interindustry Forecasting Tool) model of the U.S. economy to perform the simulations. This model is developed and maintained by the Inforum research group at the University of Maryland. LIFT is an Interindustry-Macroeconomic (IM) model that combines input-output structure with econometric equations in a dynamic and detailed framework. It is a 97-sector general equilibrium representation of the U.S. economy that employs a "bottom-up" approach to macroeconomic modeling; that is, macroeconomic results in the model are determined in large part through the aggregation of sectoral-level variables. A more complete description of the LIFT model can be found on http://www.inforum.umd.edu/Lift.html.

Inforum's February 2006 forecast provided the baseline GDP, industry, and energy forecasts for the simulation. The Inforum baseline energy price forecast is similar—but not identical—to the energy price forecast of the EIA through 2020. In the Inforum baseline forecast, oil prices decline at a slower 0.5% annual average rate between 2005 and 2010. Between 2010 and 2015, in the Inforum forecast, oil prices rise at an annual average rate 2.8% per year, and between 2015 and 2020 oil prices rise at an annual average rate of 2.7%. The Inforum baseline shows that the natural gas price forecast declines by less than 0.5% per year between 2005 and 2010 and then increases by 2.7 to 2.8% per year through 2020.

In the simulation, we assumed that oil prices would increase $20 per barrel above the baseline price in 2006, an increase of about one-third and that the increase over baseline remains in place through the end of the simulation period in 2020. (See Figure 4.)

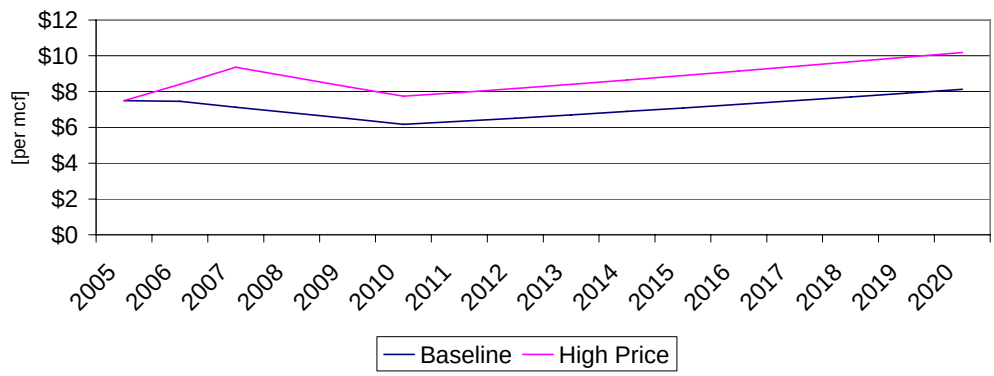
Figure 4. Higher Oil Prices
$20 per Barrel Above Baseline Forecast



Source: Inforum baseline with alternative high price.

We made a parallel assumption for natural gas prices. We assumed that, in 2006, natural gas prices are $1 above the baseline price and that, beginning in 2007 and through 2020, the natural gas price is $2 above the baseline. (See Figure 5.)

Figure 5. Higher Natural Gas Prices
$2 per mcf Above Baseline



Source: Inforum baseline with alternative high price.

Since any change to global oil prices will be of global scope, we adjusted the model to allow for the impact of higher oil prices on U.S. trading partners.[3] The LIFT model of the U.S. economy is linked to similar models of its major trading partners and the rest of the world through Inforum's Bilateral Trade Model (BTM).[4]

Using the models jointly ensures that changes in the relative cost competitiveness of U.S. industries are captured. For example, if the U.S. chemical industry is less energy efficient than the trade-weighted world average, then in response to run-up in global energy prices the domestic production price for chemicals will rise faster than the world price for chemicals. Consequently, the domestic chemical industry becomes less cost competitive.

The industry-specific impacts vary, with some U.S. industries becoming less competitive due to energy price increases, while other become more competitive. On balance, we found that the U.S. economy becomes slightly less cost competitive with our major trading partners, primarily developed countries, a situation which would eventually lead to depreciation in the value of the dollar.

[3] Since natural gas prices are country specific, we did not incorporate a natural gas price rise similar to the increase in the U.S. in these foreign countries.

[4] Specifically, the BTM links Interindustry Macro Models (i.e., similar to LIFT) for several countries including: Austria, Belgium, Canada, China, France, Germany, Italy, Japan, Mexico, Spain, South Korea and the United Kingdom. The BTM model also includes trade modules for the Rest of the OECD and the Rest of the World.

Moreover, since changes in energy prices will have impacts, usually negative, on the industry-level economic activity of U.S. trading partners, the BTM also supplies the LIFT model with estimates of changes in the demand for U.S.exports.

MACROECONOMIC IMPACTS

Table 1 summarizes the macroeconomic impact of higher energy prices. A $20 per barrel permanent rise in the cost of oil and a $2 per mcf permanent increase in the cost of natural gas combine to reduce the growth of real GDP 0.5 percentage points in the first year and 0.2 percent percentage points in the second year.[5] The level of GDP is between 0.5 and 0.6 percent below the below the baseline between 2006 and 2010.[6] Real GDP remains 0.4 percent below baseline levels in 2015 and 0.3 percent below by 2020.

Higher energy prices push up the unemployment rate by 0.5 percentage points by the second year. Starting in the third year, the impact on the unemployment rate begins to dissipate. Inflation (as measured by the PCE deflator) increases by one percent above the baseline PCE deflator in 2006 and about 1.5 percent above baseline through 2010. The core inflation rate, i.e., the PCE deflator less food and energy, increases by about a half of a percent above the baseline in 2006 and 1.1 to 1.2 percent above the baseline through 2010. Real disposable income is reduced by around one percent throughout the forecast period.

[5] In the *2006 Annual Energy Outlook*, the EIA estimates an annual average loss of GDP growth of 0.2 percentage points per year between 2005 and 2010 for a $16 per barrel (2004 dollars) increase in crude oil (comparing their reference case to their high price case scenario).

[6] In the Energy Modeling Forum report called *Economic Consequences of Higher Crude Oil Prices* (October 2005), they provide a range of -0.15 to -0.80 percent below the baseline GDP level in the first year for a $10 per barrel rise in oil and from -0.20 to -1.61 in the second year. This range was developed from seven separate macroeconomic model estimates.

Table 1. Macroeconomic Impact of Higher Energy Prices

	2006	2007	2008	2009	2010	2015	2020
GDP Level (% Change from Base)	-0.5	-0.6	-0.6	-0.5	-0.5	-0.4	-0.3
GDP Growth (Percentage Change from base, average annual change 2010-15 & 2015-20)	-0.5	-0.2	0.1	0.1	0.0	0.0	0.0
Unemployment Rate (Percentage Point Difference)	0.3	0.5	0.4	0.3	0.2	0.2	0.1
PCE* Deflator (Percent Difference from Baseline)	1.1	1.6	1.6	1.5	1.5	1.7	1.9
Core**Deflator (Percent Difference from Baseline)	0.6	1.1	1.1	1.1	1.2	1.3	1.4
Real Disposable Income (Percent Difference from Baseline)	-1.0	-1.4	-1.4	-1.2	-1.1	-1.1	-1.1
Interest Rates (Percentage Difference from Baseline)	0.3	0.3	0.2	0.3	0.2	0.1	0.1
Exchange Rates (Percentage Point Difference from Baseline)***	0.0	0.0	0.0	0.0	-1.0	-1.0	-2.0
Real Export Growth (Percentage Point Difference in Growth Rate)	-1.0	-0.1	0.2	0.4	0.2	0.1	0.2
Real Import Growth (Percentage Point Difference in Growth Rate)	-1.0	-0.3	0.1	0.3	0.1	0.0	0.0

*Personal Consumption Expenditures
**PCE deflator minus food and energy
***Trade weighted exchange rate, where a negative means that the dollar is weaker.

Source: ESA estimates using the Inforum LIFT model.

Interest rates in the higher energy price simulation rise by 20 to 30 basis points between 2006 and 2010 and by 10 basis points in 2015 and 2020. These increases reflect a Federal Reserve balancing inflationary pressures against falls in economic activity in an environment of restrained inflationary expectations. In this case, only a very modest upward adjustment in interest rates is needed to reduce inflation back to the baseline over the intermediate term.

Over the long term, the trade-weighted exchange rate depreciates by 2.0 percent by 2020. This depreciation reflects a slight deterioration in average cost competitiveness (based on relative U.S. to partner tradable prices) induced by the higher energy prices. Note that while the loss of competitiveness occurs relatively quickly, exchange rate changes are drawn out over the entire forecast horizon.

Real export and import growth are depressed by 1 percentage point in 2006, the first year of higher energy prices. Export growth increases by 0.1 to 0.4 percentage points through 2020 while import growth increases by 0.0 to 0.3 percentage points.

The box, below, discusses the role of movement in petro dollars in the world economy.[7]

According to a report of the International Monetary Fund (IMF), large global trade imbalances have persisted in recent years—where increased crude oil prices have played a major role. In particular, the large current account deficit in the U.S. is matched by surpluses in other advanced economies, particularly in Asia and, more recently, countries that are fuel exporters. Fuel exporters must recycle their enhanced revenues either by higher purchases of imports from oil importers or by larger purchases of international assets. According to the IMF report, for now, oil exporters are saving a considerable share of their income which raises the question on how these funds are being recycled and their impact on exchange rates and interest rates.

Once international financial considerations are taken into account, the actual response of the dollar exchange rate, especially over the short run, is ambiguous. If, for example, the cause of the oil price increases were global financial or political insecurity, a "flight to quality" could induce a large inflow of international funds into U.S. assets leading to an appreciation of the dollar. By assuming that the dollar will move with changes in relative trade prices (i.e., purchasing power parity), we have implicitly assumed, in our simulation, that this "portfolio effect" is neutral with respect to the dollar, at least over the long run.

There is not only a dollar effect, but a potential interest rate effect. The size of the interest rate effect – assuming that there is a global capital market – should be related to the size of the relative saving propensities of oil producers and oil consumers. The dollar may rise, and interest rates fall depending on how petro dollars are recycled.

IMPACT ON CONSUMER SPENDING

Long-term higher crude oil and natural gas prices have an immediate and long-term impact on consumer spending on energy goods and services. (See Table 2.) Total real personal consumption is reduced by 0.5 to 0.8 percent throughout the simulation period, as a result of higher energy prices. In addition, consumers are estimated to reduce their real spending for gasoline and oil from between 2 to 3 percent between 2006 and 2010, and 3- to 4 percent by 2015 and 2020, respectively. (Since these impacts are in inflation adjusted dollars, their impact in nominal terms would be smaller.) Likewise, spending for fuel oil and coal and natural gas utilities are adversely affected. On the other hand, consumer spending for electric utilities rises as the cost for this energy service does not rise at the same rate as petroleum products and natural gas.

[7] See World Economic Outlook, International Monetary Fund, Chapter 2, Oil Prices and Global Imbalances, http://www.imf.org/external/pubs/ft/weo/2006/01/pdf/c2.pdf, April 2006.

Table 2. Change in Real Personal Consumption Expenditures (PCE) And PCE for Energy Goods and Services

	2006	2007	2008	2009	2010	2015	2020
	(Percent Change From Baseline)						
Total PCE	-0.5	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8
Gasoline and oil	-2.2	-2.3	-2.3	-2.4	-2.6	-3.3	-4.1
Fuel oil and coal	-9.4	-4.4	-2.8	-2.7	-2.8	-3.0	-3.3
Electric utilities	3.9	5.7	4.9	4.4	3.9	3.8	3.7
Natural gas utilities	-3.4	-7.5	-7.0	-6.4	-6.0	-5.8	-5.7

Source: ESA estimates using the Inforum LIFT model.

IMPACT BY INDUSTRY

Table 3 shows the estimated growth impact on real output for the major sectors of the economy. The greatest impacts—about one percentage point—occur in the Manufacturing Durables and Transportation sectors. Even in these, the hardest hit sectors, higher energy prices cause growth to slow—but growth continues. For example, the Inforum baseline forecast growth of 3.4% in the Manufacturing Durables sector in 2006. With higher energy prices, this sector's growth is projected to be a slower, but still positive, 2.4%.

Table 3. Industrial Output Effect of Higher Energy Prices
By Aggregate Industry Sectors

	05-06	06-07	07-08	08-09	09-10	AAG* 10-15	AAG 15-20
	(Percentage Change in Growth From Baseline)						
Agriculture, forestry & fisheries	-0.2	-0.2	0.0	0.2	0.0	0.1	0.1
Mining	-0.4	-0.4	0.1	0.4	0.1	-0.1	-0.1
Construction	-0.6	-0.1	0.4	0.3	0.0	0.0	0.0
Manufacturing							
Nondurables	-0.8	-0.2	0.0	0.2	0.0	0.0	0.0
Durables	-1.0	-0.3	0.2	0.4	0.2	-0.1	0.1
Transportation	-1.0	0.0	0.1	0.2	0.1	0.0	-0.1
Utilities	0.1	-0.2	-0.1	0.0	0.0	0.0	0.0
Trade	-0.6	-0.3	0.0	0.2	0.0	-0.1	0.0
Services	-0.6	-0.3	0.0	0.2	0.1	0.0	0.0

* average annual growth

Source: ESA estimates using the Inforum LIFT model.

These impacts illustrate two general points. First, all industries—not just energy intensive sectors in manufacturing—are affected by higher energy prices. Second, while higher energy prices slow output and employment across all industries, the economy, as a whole, and all major sectors continue to grow.

The economy keeps growing because the decline in income is relatively small. The annual growth in real disposable income drops by one percentage point in the first year and less than half of a percentage point in the second. With more money being spent on energy, there is less to spend on everything else—but enough income remains to maintain some income growth.

The economy also keeps growing because producers have become much more energy efficient since the spike in energy prices in the late 1970s. According to the EIA, the industrial sector in 2004 consumed approximately the same amount of energy as it did in 1980. Both energy use per dollar of GDP and energy use per dollar of shipments fell substantially between 1980 and 2004. Those trends are expected to continue through 2030, but at a slightly reduced rate of decline.

INDUSTRIAL EMPLOYMENT (JOBS) IMPACTS

In 2006, the first year of the energy spike, the number of jobs added to the economy is lower by about 477,000. Thus, instead of adding 1.9 million jobs between 2005 and 2006, the higher energy prices imposed on the economy in this simulation reduce

employment growth to 1.4 million. (See Figure 6.) In 2007, the total number of jobs is 710,000 lower than in the baseline. After 2007, the difference declines, as the economy moves back to full employment. By 2020, the number of total private sector jobs is reduced, below the baseline, by about 146,000.

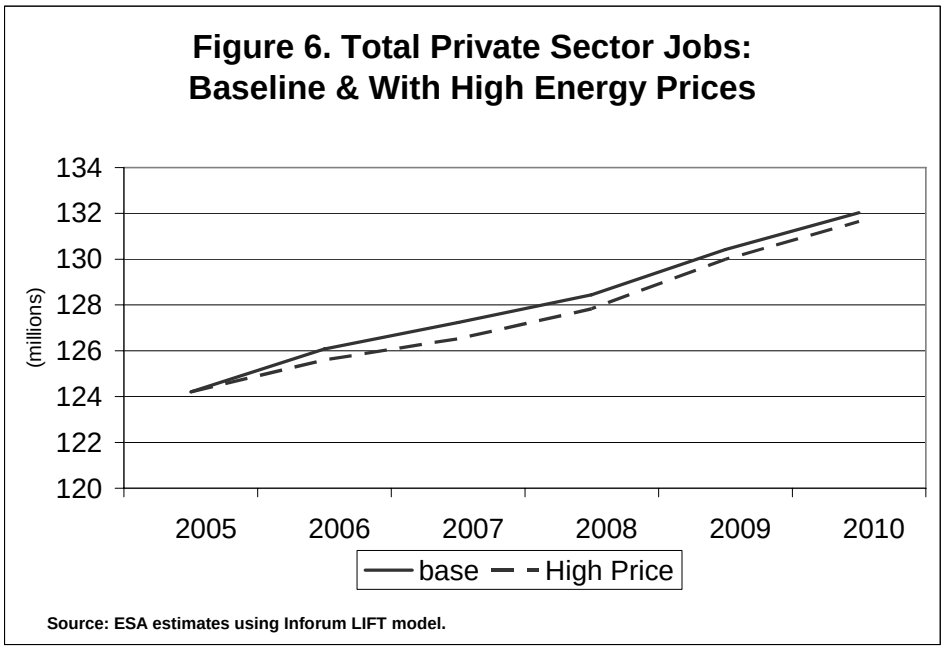


Table 4 shows jobs impacts by industry for 2006 and 2007. Employment is affected across the economy, with the greatest number of jobs lost—about one-third of the total impact— in Wholesale and Retail Trade. The number of jobs lost in Durable Goods Manufacturing sector almost triples between 2006 and 2007 as the loss of disposable income in 2006 begins to affect durables purchases—particularly purchases of motor vehicles.

Table 4. Employment Impact of Higher Energy Prices:
Aggregate Industry Sectors, 2006 and 2007

Sector	2006 Number of Jobs Lost	2006 Jobs Lost As Share of Jobs in Sector	2006 Share of Total Jobs Lost	2007 Number of Jobs Lost	2007 Jobs Lost As Share of Jobs in Sector	2007 Share of Total Jobs Lost
Agriculture,forestry,and fisheries	-4,335	-0.1%	0.9%	-9,687	-0.3%	1.4%
Mining	-3,371	-0.6%	0.7%	-6,058	-1.1%	0.9%
Construction	-49,826	-0.6%	10.5%	-53,957	-0.6%	7.6%
Manufacturing						
Non-Durables	-24,120	-0.4%	5.1%	-51,037	-0.8%	7.2%
Durables	-40,035	-0.4%	8.4%	-114,807	-1.2%	16.2%
Transportation	-45,248	-0.9%	9.5%	-48,515	-1.0%	6.8%
Utilities	798	0.0%	-0.2%	-2,148	-0.1%	0.3%
Trade	-152,843	-0.5%	32.1%	-255,192	-0.8%	35.9%
Finance,Insurance & Real Estate	-59,340	-0.7%	12.5%	-52,044	-0.6%	7.3%
Services	-98,305	-0.2%	20.6%	-116,589	-0.2%	16.4%
Total	-476,624	-0.4%	100.0%	-710,034	-0.6%	100.0%

Source: ESA estimates using the Inforum LIFT model.

Tables 5 and 6 shows the specific detailed industries that were the most affected in terms of number of jobs lost and in terms of the share of that industry's baseline employment, respectively. In terms of the number of jobs, Retail Trade ranks at the top, followed by Wholesale Trade, Finance and Insurance, and Construction. The distribution of the remaining industries across the aggregate industry sectors is notable—a number of Medical services industries, Trucking, Computer services, and even Agriculture round out the industries with the largest absolute employment impacts. Only two of these industries, Lumber and Metal Products, are in manufacturing—and these industries are not known as being particularly "energy intensive."

Table 5. Employment Impact of Higher Energy Prices:
Top 15 Industries, Ranked by Jobs Lost in 2007

Industry	2006 Number of Jobs Lost	2006 Jobs Lost As Share of Jobs In Sector	2007 Number of Jobs Lost	2007 Jobs Lost As Share of Jobs In Sector
1 Retail trade	-104,616	-0.6%	-158,154	-1.0%
2 Wholesale trade	-43,980	-0.6%	-71,118	-1.0%
3 Finance & insurance	-58,475	-0.8%	-54,833	-0.8%
4 New construction	-49,319	-0.6%	-52,231	-0.6%
5 Private hospitals	-34,644	-0.8%	-51,167	-1.1%
6 Nursing homes	-26,769	-1.3%	-40,075	-1.9%
7 Other medical services & dentists	-26,799	-0.7%	-40,009	-1.0%
8 Trucking, highway passenger transit	-29,194	-1.0%	-31,299	-1.1%
9 Lumber	-5,487	-0.7%	-29,508	-3.7%
10 Restaurants and bars	-3,853	0.0%	-24,502	-0.3%
11 Computer & data processing	-1,983	-0.1%	-21,680	-1.1%
12 Printing & publishing	-9,132	-0.6%	-14,518	-1.0%
13 Metal products	-8,511	-0.6%	-14,283	-1.0%
14 Physicians	-7,220	-0.4%	-10,619	-0.5%
15 Agriculture, forestry, and fisheries	-4,311	-0.1%	-9,553	-0.3%
Top 15 Subtotal	-414,295		-623,547	
Total Jobs Lost	-476,624		-703,939	
Top 15 Industries as a Percent of Total	86.9%		88.6%	

Source: ESA estimates using the Inforum LIFT model.

Table 6 shows the top 15 detailed industries in terms of the impact as a share of total employment in that industry. Only Lumber and Nursing Homes appear on both lists. Otherwise, the industries with the largest percentage declines in their workforces relative to the baseline include a large number energy industries—Petroleum Refining, Gas Utilities, Pipelines, and even Crude Petroleum and Natural Gas. Nine of the 15 industries on this list are in manufacturing.

Table 6. Employment Impact of Higher Energy Prices:
Top 15 Industries, Ranked by
Jobs Lost as a Share of Jobs in Sector

Industry	2006 Number of Jobs Lost	2006 Jobs Lost As Share of Jobs In Sector	2007 Number of Jobs Lost	2007 Jobs Lost As Share of Jobs In Sector
1 Petroleum refining & fuel oil	-1,393	1.1%	-5,482	4.5%
2 Lumber	-5,504	0.7%	-29,558	3.7%
3 Gas utilities	-1,650	1.1%	-3,830	2.5%
4 Pipeline	-185	1.7%	-261	2.4%
5 Office equipment	-138	0.4%	-782	2.3%
6 Service industry machinery	-1,953	1.1%	-3,911	2.1%
7 Motor vehicles	-3,607	0.7%	-9,563	1.9%
8 Nursing homes	-26,859	1.3%	-40,376	1.9%
9 Furniture	-4,271	0.9%	-9,269	1.9%
10 Textiles and knitting	-3,844	1.2%	-6,233	1.9%
11 Apparel	-2,709	0.9%	-5,954	-1.7%
12 Non-metallic mining	-1,206	1.1%	-1,788	1.6%
13 Other chemicals	-3,069	0.7%	-7,130	1.6%
14 Crude petroleum & natural gas	-2,418	0.7%	-5,275	-1.4%
15 Stone, clay & glass	-2,880	0.5%	-7,385	1.3%
Top 15 Subtotal	-61,686		-136,797	
All Jobs Lost	-476,624		-710,030	
Remaining Industries	12.9%		19.3%	

Source: ESA estimates using the Inforum LIFT model.

Finally, in view of the across-the-board-industry impacts, the four states with the largest jobs losses are those with the largest employment—California, Texas, New York and Florida, in that order. (See Table 7.) Pennsylvania, Ohio, and Illinois are practically tied for the fourth spot, in terms of number of jobs lost as a result of energy prices.

Table 8 shows the number of jobs lost as a percent of total private employment in the states. Since the impacts are primarily as a result of income loss, the share of jobs lost tends to be similar for all states.

Table 7. Employment Impact Of Higher Energy Prices:

By State, 2006-2020

(Deviations from baseline values in thousands of jobs)

	2006	2007	2008	2009	2010	2015	2020
Total private employment	-476.6	-710.0	-616.3	-427.7	-384.7	-306.3	-141.8
Alabama	-7.0	-11.5	-9.8	-6.8	-6.1	-5.1	-2.4
Alaska	-1.1	-1.5	-1.3	-0.9	-0.9	-0.6	-0.3
Arizona	-8.7	-12.2	-9.8	-6.1	-5.5	-3.7	-1.7
Arkansas	-4.5	-7.1	-6.1	-4.2	-3.8	-3.1	-1.4
California	-54.6	-81.2	-70.7	-48.3	-43.0	-30.9	-14.3
Colorado	-8.3	-11.7	-9.7	-6.2	-5.6	-4.0	-1.9
Connecticut	-6.4	-8.9	-7.8	-5.4	-4.9	-3.7	-1.7
Delaware	-1.5	-2.1	-1.7	-1.2	-1.1	-0.8	-0.4
District of Columbia	-0.8	-1.0	-0.8	-0.2	-0.1	0.7	0.3
Florida	-28.7	-40.0	-32.7	-21.0	-19.2	-13.5	-6.3
Georgia	-15.1	-22.2	-18.7	-12.6	-11.4	-8.9	-4.1
Hawaii	-1.9	-2.6	-2.3	-1.6	-1.6	-1.3	-0.6
Idaho	-2.3	-3.5	-2.8	-1.8	-1.6	-1.0	-0.5
Illinois	-22.8	-32.6	-28.8	-20.1	-17.6	-13.3	-6.1
Indiana	-11.5	-19.0	-17.5	-13.0	-11.3	-9.8	-4.5
Iowa	-5.8	-8.9	-7.8	-5.6	-4.9	-3.9	-1.8
Kansas	-4.7	-7.0	-6.2	-4.3	-4.0	-3.5	-1.6
Kentucky		-11.4	-10.2	-7.5	-6.7	-5.8	-2.7
Louisiana	-7.0	-10.7	-9.0	-6.3	-5.8	-5.3	-2.4
Maine	-11.6	-16.5	-14.6	-10.2	-9.2	-6.7	-3.1
Maryland	-8.6	-11.8	-9.7	-6.1	-5.4	-3.7	-1.7
Massachusetts	-11.6	-16.5	-14.6	-10.2	-9.2	-6.7	-3.1
Michigan	-16.8	-26.6	-25.2	-18.7	-16.3	-13.8	-6.4
Minnesota	-10.4	-15.5	-13.6	-9.7	-8.7	-6.9	-3.2
Mississippi	-4.1	-6.8	-5.9	-4.3	-3.9	-3.5	-1.6
Missouri	-10.2	-15.3	-13.5	-9.5	-8.7	-7.1	-3.3
Montana	-1.6	-2.5	-2.1	-1.4	-1.4	-1.2	-0.6
Nebraska	-3.5	-4.9	-4.3	-3.0	-2.7	-2.1	-1.0
Nevada	-3.7	-5.7	-5.0	-3.6	-3.5	-3.1	-1.4
New Hampshire	-2.5	-3.8	-3.4	-2.4	-2.1	-1.7	-0.8
New Jersey	-15.2	-21.4	-18.8	-13.4	-12.3	-10.0	-4.7
New Mexico	-2.5	-3.6	-3.1	-2.0	-1.9	-1.7	-0.8
New York	-1.3	-2.0	-1.8	-1.3	-1.2	-1.1	-0.5
North Carolina	-15.1	-23.3	-20.1	-14.0	-12.5	-10.2	-4.7
North Dakota	-1.3	-2.0	-1.8	-1.3	-1.2	-1.1	-0.5
Ohio	-21.3	-33.1	-30.3	-22.2	-19.7	-16.9	-7.8
Oklahoma	-5.8	-8.6	-7.6	-5.3	-4.8	-4.6	-2.1
Oregon	-6.2	-10.4	-8.6	-6.0	-5.3	-4.0	-1.9
Pennsylvania	-22.2	-33.5	-29.6	-21.4	-19.5	-16.8	-7.8
Rhode Island	-1.7	-2.5	-2.2	-1.6	-1.5	-1.2	-0.6
South Carolina	-6.7	-10.1	-8.7	-5.9	-5.3	-4.3	-2.0
South Dakota	-1.5	-2.3	-2.0	-1.5	-1.4	-1.2	-0.5
Tennessee	-11.3	-17.3	-15.3	-11.0	-9.8	-8.0	-3.7
Texas	-38.6	-56.8	-48.6	-33.2	-30.1	-26.3	-12.2
Utah	-4.0	-5.7	-4.8	-3.2	-2.9	-2.2	-1.0
Vermont	-1.1	-1.8	-1.5	-1.1	-1.0	-0.8	-0.4
Virginia	-11.9	-17.2	-14.0	-8.8	-7.7	-5.4	-2.5
Washington	-9.9	-14.9	-12.5	-8.6	-7.9	-5.8	-2.7
West Virginia	-2.7	-4.4	-3.7	-2.7	-2.6	-2.6	-1.2
Wisconsin	-10.6	-16.8	-14.9	-10.6	-9.3	-7.2	-3.3
Wyoming	-0.9	-1.3	-1.1	-0.8	-0.7	-0.7	-0.3

Table 8. Employment Impact of Higher Energy Prices, By State, 2006-2020

(Jobs Lost as a Percent of Private Employment)

	2006	2007	2008	2009	2010	2015	2020
Total private employment	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Alabama	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Alaska	-0.3	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
Arizona	-0.4	-0.5	-0.4	-0.2	-0.2	-0.1	0.0
Arkansas	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
California	-0.3	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
Colorado	-0.4	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
Connecticut	-0.4	-0.5	-0.5	-0.3	-0.3	-0.2	-0.1
Delaware	-0.4	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
District of Columbia	-0.2	-0.2	-0.2	0.0	0.0	0.1	0.0
Florida	-0.4	-0.5	-0.4	-0.2	-0.2	-0.1	0.0
Georgia	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Hawaii	-0.3	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1
Idaho	-0.4	-0.5	-0.4	-0.3	-0.2	-0.1	0.1
Illinois	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Indiana	-0.4	-0.7	-0.6	-0.4	-0.4	-0.2	-0.1
Iowa	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Kansas	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Kentucky	-0.4	-0.6	-0.6	-0.4	-0.3	-0.2	-0.1
Louisiana	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Maine	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Maryland	-0.4	-0.5	-0.4	-0.2	-0.2	-0.1	0.0
Massachusetts	-0.4	-0.5	-0.4	-0.3	-0.3	-0.1	0.0
Michigan	-0.4	-0.6	-0.6	-0.4	-0.3	-0.2	-0.1
Minnesota	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Mississippi	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Missouri	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Montana	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Nebraska	-0.4	-0.5	-0.5	-0.3	-0.3	-0.2	-0.1
Nevada	-0.3	-0.5	-0.4	-0.3	-0.3	-0.2	-0.1
New Hampshire	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
New Jersey	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
New Mexico	-0.3	-0.5	-0.4	-0.3	-0.2	-0.2	-0.1
New York	-0.4	-0.5	-0.4	-0.3	-0.3	-0.2	-0.1
North Carolina	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
North Dakota	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Ohio	-0.4	-0.6	-0.6	-0.4	-0.3	-0.2	-0.1
Oklahoma	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Oregon	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Pennsylvania	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Rhode Island	-0.4	-0.5	-0.5	-0.3	-0.3	-0.2	-0.1
South Carolina	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
South Dakota	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Tennessee	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Texas	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1
Utah	-0.4	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
Vermont	-0.3	-0.5	-0.5	-0.3	-0.3	-0.2	-0.1
Virginia	-0.4	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
Washington	-0.4	-0.5	-0.4	-0.3	-0.3	-0.1	0.0
West Virginia	-0.4	-0.6	-0.5	-0.4	-0.3	-0.3	-0.1
Wisconsin	-0.4	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1
Wyoming	-0.4	-0.6	-0.5	-0.3	-0.3	-0.2	-0.1

Source: ESA estimates using Inforum's distribution of employment by industry by state.