THE IMPACT OF THE INCREASED PRICE OF CRUDE OIL ON THE TRANSPORTATION SECTOR

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Introduction

The main causes for the recent price increase were the rising demand in developing countries combined with scarcity of inexpensive oil in stable and secure locations. Other factors include the devaluation of the U.S. currency and financial speculation. In past crises the price of oil was driven by events mostly external to the oil market. This time, with the exception of the war in Iraq, the major events behind this crisis have been of an economic and financial nature.

Each sector of the economy and each mode of transport given their heavy reliance on liquid fuels was affected by rising oil prices and increases in the price of oil have the potential to have profound impacts on the transportation system

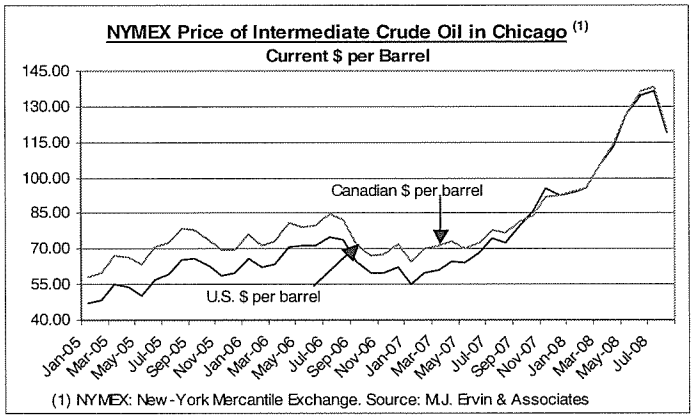
The purpose of this paper is to provide an overview of the recent situation created by rising oil prices and analyze how the transportation sector was affected. The paper looks at the historical path of the price of crude and the events behind its increase as well as its forecast and at the impact of the price increase of oil on the

[1]The views expressed in this paper are those of the author and do not necessarily reflect those of Transport Canada. Thanks are given to Christian Beauregard, Vijay Gill and Louis-Paul Tardif who contributed to and commented on the paper.

economy, on consumers, and on the modes of transport. The actions taken to alleviate the effect of fuel price increase are discussed. The paper also looks at the general importance of fuel in the cost structure of transportation firms, at the importance of transportation costs in the distribution and production of goods in Canada.

The Price of Crude Oil and the Price of Transportation Fuels

In 2004, the West Texas Intermediate (WTI) price of crude oil increased by 32.7%, from a 2003 average of $31.53 U.S. per barrel to $41.85 U.S. on the New York Mercantile Exchange (NYMEX). This increase was fuelled by world demand, coupled with uneasiness on the markets about future supply of cheap crude oil. There were also pressures from demand in China and India. These factors pushed the price of crude oil on the NYMEX to $59.48 U.S. per barrel in July 2005 and then after Hurricane Katrina the price reached a record of



$66.12 U.S. per barrel. With the arrival of winter, the price reached $63.44 U.S. in March 2006. The fear of new hurricanes causing damage to oil installations pushed the price to an all-time monthly high of $74.88 U.S. in July 2006. Through 2007 and in the first half of 2008, the price climbed steadily and steeply to reach an average price of $134.54 U.S. in June 2008 and peaked at $145.55 US on July

11, 2008. The increase in the value of the Canadian currency reduced significantly the price differential between Canadian and U.S. prices.

The retail price of road gasoline rose dramatically in 2007 and 2008, from 87.1¢ per litre in January 2007 (Canadian average) to $1.357 in June 2008. Similarly, the retail price of diesel rose from 95.5¢ per litre in January 2007 to $1.58 in June 2008. However, the price to commercial users is somewhat lower than that as the federal GST and provincial sales taxes, where applicable are refundable to commercial users. The price net of sales taxes rose from 87.7¢ per litre to $1.464 over the same period.

The spot price of jet fuel in New-York harbour almost doubled between January 2007 and May 2008, going from 52.56¢ to 99.87¢, when translated to Canadian dollars. The price of marine fuel more than doubled over the same period.

The price of crude oil accounted for around 64% of the retail price of gasoline and 60% of the price of road diesel in June 2008, up from 45.5% and 35.9% in January 2008. Refinery margins were much higher for diesel, 15% to 16% versus 6.5% to 8.9% for motor gasoline, reflecting the fact that diesel is in direct competition with heating oil for refinery time and equipment. Taxes accounted for 40% of the price of gasoline and 31% of that of diesel in January 2005; these percentages fell to 25% and 20% respectively.

Impact of Oil Price Increases on the Economy

The rise in the price of crude oil was a factor in the rise in the value of the Canadian dollar which rose 60% from January 2002 to reach parity with the U.S. dollar in late 2007. While a major reason behind the recent rise in the Canadian dollar was the weakness of the U.S. dollar, reflecting the large U.S. trade deficit, another major reason was the rise in the price of oil.

Higher energy prices have had a major impact on the structure of Canada's exports. In 2004, energy was Canada's fourth largest export category. After rising to third place in the 2006 and 2007, in 2008

energy became Canada's largest export earner. Energy exports more than doubled from 2002 to reach $126 billion in 2008. As a result of higher prices and output, energy as a share of total exports has jumped from 7% in 1971 to 12% in 2002 and to 26% 2008. Crude oil dominates Canada's exports of energy products.

High prices for energy reduce consumer expenditures on other goods, which in turn reduces aggregate demand in the economy. The effect on the global economy was muted compared to the oil price increases of the 1970's for several reasons: the price rise was gradual until mid 2008; the rise in oil prices was primarily demand driven rather than supply driven; less intensive use of oil in the economy; and inflation pressures were held under control by strict monetary policies and by the competitive pressures of from developing countries. However, the negative joint effects of high energy prices, the housing crisis in the U.S. and the credit crunch contributed to the current global economic slowdown.

Since Canada is a net exporter of energy including crude oil, the overall effect of high energy prices was generally neutral at the national level but it affected regions differently. The rise in the Canadian dollar adversely affected the export competitiveness of Canada's manufacturing sector which is concentrated in Central Canada. High energy prices also increased costs of production and caused automobile manufacturers to shift production to more fuel efficient models. The increase in energy prices and demand meant increased activity in the energy sector particularly in the West.

Impact of Oil Price Increases on Consumers

The rise in the price of energy and particularly gasoline has been a significant factor in the rise of the Consumer Price Index since 2002. From January 2002 to July 2008 the Consumer Price Indexes for all-items, transportation, public transportation, energy and gasoline rose by 19.4%, 33.1%, 33.0%, 87.8% and 122.8% respectively.

Statistics Canada, using its Input-Output model, estimated that a doubling of oil prices could result in a 2.9% increase in the consumer

price index. Most of the impact is within the transportation component.

Motor fuels have since 2002 made up an increasing proportion of consumer expenditures. In 2002, consumer expenditures on motor fuels were $20.3 million out of total consumer expenditures of $655.7 billion or 3.1%. As the price of gasoline rose, total consumer expenditures on motor fuels rose 57% to $31.8 billion in 2007 while total consumer expenditures rose 30% to $854 billion and in 2007 motor fuels made up 3.7% of consumer expenditures.

Statistics Canada Household Spending survey shows that the average household in 2007 spent $2,222 dollars on gasoline and other fuels for vehicles or 3.2% of their total expenditures. This percentage rose from 3.0% in 2004 and was around 2.7% for the years 1997 to 2003.

Evidence of the change in driving habits is shown by the decline in the consumption of gasoline. In Canada the consumption of motor gasoline in terms of petajoules plateaued in 2005 and 2006 after increasing by 2% in 2003 and in 2004, but grew by 4.4% in 2007. Canadian figures for 2008 are not yet available but in the U.S. motor gasoline consumption declined by 3.4%, after averaging 0.7% growth for the three previous years.

The US Federal Highway Administration reported that vehicle-miles travelled (VMT) fell by 3.4% in 2008 and in fact, the growth of VMT had slowed down significantly since 2004.

Data from both Canada and the U.S. show that imported vehicles, which tend to be smaller and more fuel-efficient than North American produced models, are gaining market share. Also they both show a decline in trucks sales and increase automobile sales. In Canada, after five years of decline, the share of passenger cars rose to 53.6% in 2008.

Higher fuel prices prompted commuters to use public transit and this is shown by the data on transit ridership: Statistics Canada's data for passenger-trips for the top 10 large urban transit systems show a

steady increase in ridership since 2003. Ridership was rose 3.1% in 2008, 3.6% in 2007 and 3.9% higher in 2006.

Impact on Transportation Companies by Mode

Using the 2006 cost and revenue structures of key transportation industries, Economic Analysis evaluated the impact of current fuel prices on total operating expenses as shown below. In 2006, the price of road diesel before sales taxes averaged 91.7 cents per litre and rose to $1.448 in June 2008, a 57.8% increase. This proportional increase in fuel costs was applied to all modes.

This analysis shows a significant deterioration in the net revenues of all the four modes considered.

Estimated Financial Impacts of Fuel Price Increase

	Trucking	CN&CP	Urban Transit	Airlines Levels I-III
Operating revenues-2006	28,771	9,303	2,736	15,269
Total operating costs – 2006	26,906	6,757	5,020	14,537
Net revenues – 2006	**1,806**	**2,545**	**(2,283)**	**732**
Fuel costs – 2006	3,388	1,169	421	3,549
Fuel in% of operating costs	12.6%	17.3%	8.4%	24.2%
Increase in fuel costs	1,960	676	244	2,053
% Increase	57.8%	57.8%	57.8%	57.8%
New fuel costs	5,347	1,846	665	5,603
New fuel operating expenses	28,865	7,434	5,263	16,590
New fuel costs in% of operating expenses	**18.5%**	**24.8%**	**12.6%**	**33.8%**
Increase in operating expenses	**7.3%**	**10.0%**	**4.9%**	**14.1%**
New net revenues	(94)	1,869	(2.257)	(1,321)
% Change in net revenues without fuel surcharges	-105.0%	-26.6%	10.7%	-280.3%

Trucking based on financial data for firms with $1 million or more in revenues
Sources for 2006: Canadian Urban Transit Association database and from Statistics Canada: *Aviation Services Bulletin*, *Rail in Canada* and *Trucking in Canada*

The increase in the crude oil means that **airlines** have higher expenses and they moved to increase fares which has the effect of lowering demand. As well, higher fuel prices reduce disposable

income that could be spent on air travel. However air travel in Canada remained healthy despite the economic slowdown and higher fuel prices for the first five months of the 2008, as it was up 6.1% year-over-year. It is believed that the fuel surcharges may not have had a major impact on passenger seat sales since many tickets were purchased before the surcharge announcements. During the 2008, fuel costs represented over 30% of Air Canada and of Westjet's revenues, compared to 16% to 19% five years ago. In the case of Porter Airlines the high fuel prices were buffered by the use of a fuel-efficient Q400 fleet.

The International Air Transport Association predicted that the air transport industry would have lost US$ 2.3 billion in 2008 if the price of oil remains at US$107 per barrel and if the price remained at US$ 135 per barrel the loss would have been US$ 6.1 billion.

Both Canadian Pacific (CP) and Canadian National (CN) **railways** have been adversely affected by the increase in the price of petroleum products. In 2004, fuel represented 14% of CP's operating costs. By 2007 this figure rose to 21% when the price of oil was approximately $90 per barrel. At $135, it was expected to rise to 30%. For the second quarter 2008 CP reported that revenues increased 2% mainly due to pricing, inclusive of fuel recoveries while operating expenses increased by 7% with fuel up 34%. CN reported that revenues increased 4% due primarily to freight rate increases, of which approximately two-thirds were due to a higher fuel surcharge, while operating expenses increased 14% reflecting fuel cost increases.

There is some evidence of a shift for long-haul movements from trucking to rail **trailer-on-flat-car** (TOFC). In Canada there was a 3.9% increase in TOFC traffic in the first six months of 2008 compared to a year earlier.

Traditionally an increase in fuel prices was accompanied by an increase in the number of **trucking** bankruptcies. In the first three quarters of 2008 the number of trucking company bankruptcies was 22% higher than in the first three months of 2007.

Rising oil prices have had a significant impact on **ferry, lakers and ocean carriers**. In the case of Marine Atlantic, fuel accounts for about 25 % of total costs. It is estimated that for ocean carriers, fuel cost represent about 64% of all ship costs in 2008. In 2004, this cost represented 40% of the total costs.

As a percentage of total costs, fuel is less significant in **public transit** than it is for most of the other modes. While fuel costs have been rising, there has been increased ridership and this has countered the increase in fuel costs.

Actions to Alleviate the Impact of Increased Fuel Costs

Fuel Surcharges

Fuel surcharges are now a major component of freight and passenger costs as they were introduced to mitigate the unpredictability of fuel costs and allow transport firms to recover from shippers/consumers the proportion of costs caused by abnormally high fuel prices. Fuel surcharges have become the norm over the past decade. The majority of shippers are paying now fuel surcharges.

Fuel surcharges in the **air industry** are well publicized and therefore better known than fuel surcharges in most other modes. Air Canada levied a fuel surcharge of $20 one-way for short haul of 483 kilometres or less, $30 for medium haul (between 484 kilometres and 1,609 kilometres) and $45 for long haul (1,610 kilometres or more) for domestic travel. The fuel surcharge applied on transborder flights was set at $60 irrespective of the distance. Regarding international flights, fuel surcharges were applied and varied according to the final destination. Since May 13, 2008 WestJet Airlines Ltd. maintained fuel surcharges of $20 CDN for short haul, $30 for medium haul and $45 for long haul. Baggage fees designed to keep the total weight of an aircraft in check and makes for a less energy intensive flight are common.

Via Rail Canada Inc. raised most of its fares in June 10, 2008 to counter the soaring price of oil. According to Via Rail, they had

initially planned to raise prices by a lesser amount, but believed that that amount wouldn't offset the higher cost of diesel fuel.

CP Rail first introduced its fuel surcharge program in June 1, 2004 to adjust its rates more quickly as fuel prices change and has adjusted it since then. The fuel surcharge depends on the WTI crude oil monthly average price and on refining costs defined as the MACS[2]. When the WTI monthly average price equals or exceeds $25.00, the applied fuel surcharge will be 3.5% of the line haul freight charge. For each additional dollar per barrel of WTI above $25.00, the fuel surcharge will increase by an incremental 0.25%. Additionally, should the MACS equal or exceed $10.00 per barrel, 0.25% will be applied to the surcharge for every dollar increase in MACS above $10.00, an additional 0.25% fuel surcharge will apply For September 2008 the surcharge was 34.5%.

At **CN Rail**, the surcharge is mileage-based and calculated monthly, based on the Energy Information Administration (EIA) U.S. No. 2 Diesel Retail Sales by all Sellers (cents per gallon) On-Highway Diesel Fuel (HDF), starting from a base rate of $2.30 a gallon. The fuel surcharge will vary based on the two following types of commodities moved: bulk commodities (coal, fertilizer, and grain) and all other carload commodities.

Most **trucking** companies set their fuel surcharge on a weekly basis. These surcharges apply to the base freight rate. The Freight Carriers Association (FCA) recommendation for fuel surcharges were 20.4% TL 47.9% and heavy TL 53.7%. The fuel surcharge formula applied by trucking fleets is often the one borrowed from the FCA and depends on the percentage of fuel cost in total costs by type of operation. Not all trucking companies use this formula but it provides for a guide. It is an imprecise formula as it averages cost and the relevance of fuel as percentage of total costs for a fleet

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[2].Monthly Average Crack Spread which is calculated as the difference between the monthly average price of No. 2 Fuel Oil / Heating Oil (New York Harbor) relative to the monthly average price of WTI.

Marine Atlantic announced a new fuel surcharge of 27.7% of the fare cost, paid on top of the base rate. This percentage came into effect for bookings made after July 1, 2008 replacing the then current surcharge which was in effect until the end of June and which was 9.9%. **B.C. Ferries** was allowed to charge fuel surcharges ranging from 10% to 18% on its routes beginning August 1, 2008. A contract had kept the price of fuel relatively low until 2006. Fuel accounted for 15% of the ferry corporation's total costs in 2007-08

For **international shipping**, for containers shipped between North European ports and U.S. Atlantic and Gulf ports shipping lines introduced fuel surcharges (bunker surcharges) in accordance to guidelines issued by the Trans-Atlantic Conference Agreement (TACA)[3] and since the TACA ceased operations carriers are setting surcharges according to their own formulas. On the Pacific routes, two organizations issue guidelines for fuel surcharges: the Transpacific Stabilization Agreement (TSA.) and the Westbound Transpacific Stabilization Agreement (WSTA). TSA's recommendations called for a fuel surcharge of $1,192 U.S. for a 20-foot container and $1,490 U.S. for a 40-foot container. The WTSA's recommendations were for a surcharge of $796 U.S. for a 20-foot container and $995 U.S. for a 40-foot container.

Fuel Hedging

Carriers often engage in hedging programs in order to reduce the volatility of fuel costs due to changes in the price of fuel. These activities generally consist of entering into contracts that specify delivery of a certain amount of fuel at a fixed price for a given date (such as crude oil swaps), or the purchase of futures contracts on related commodities (such as options to purchase heating oil). Fuel hedging is not necessarily mutually exclusive to the introduction of fuel surcharges (although it often is in practice). Hedging manages the cost side of the equation while fuel surcharges impact the revenue side. Hedging can be particularly useful for carriers who sell obligations to provide services to customers at a specific point in time in the future.

[3] The TACA ceased operations on June 30, 2008.

Since 2006, the Class I freight rail carriers have abandoned their fuel hedging programs. At the same time, they have begun using fuel surcharges to lessen the overall impact and uncertainty on operating profit. However, VIA Rail continues to hedge their fuel costs using both crude oil swaps and options. This has allowed VIA to significantly reduce the impact of rising fuel costs over the past few years.

Air Canada has offset the volatility of fuel prices by a small margin over the past few years through the use of fuel hedging. Air Canada disclosed in August 2008 that it has hedged 49% of its fuel requirements for the rest of the year at oil prices that average between $94 U.S. and $101 U.S. per barrel. While Westjet was more active in terms of hedging activity in previous years, they currently do not employ hedging in order to reduce the impact of the fuel costs.

Operational and Fleet Changes

All transportation carriers made making changes to how they undertake their operations with a view to reducing fuel costs that have risen sharply. Environmental concerns are also factor in moving to more fuel efficient operations

One way carriers can reduce their fuel costs is by turning over their fleet more rapidly. This requires the carrier to make an assessment of their future fuel costs, discount the savings (from shifting to a newer fleet) to a present value, and compare this amount to the increased capital costs. The increased capital costs are an issue of timing. The fleet would have to be replaced eventually, so the marginal capital costs stem from financing the capital expenditures at an earlier, rather than later date. The average age of the carrier fleets is relevant in terms of assessing the potential to reduce fuel costs due to new vehicle purchases. Carriers with fleets that are already relatively new will be limited in their potential to do so.

Airlines have worked to increase yields through capacity cuts and a series of extra charges, in addition to fuel surcharges, for services such as checking bags, seat selection, collecting points or getting a

soft drink on board, and by reducing fuel used through the move to newer more fuel-efficient airplanes.

Air Canada announced a 7% capacity cut and 2,000 layoffs. It closed two flight attendant bases, drop four stations, suspended service to Madrid and Sacramento for the winter and reduced frequencies on other markets, especially US sun destinations. Air Canada also terminated its dedicated freighter service. WestJet did not anticipate any changes.

The average age of the Canadian air carrier fleet is approximately 11 years old. Air Canada planned to remove from its fleet of all B767-200 and replace some A319, A320 and A340 by more fuel-efficient E175/190 and B777. Westjet has already retired it's older, first-generation.

Foreign carriers have shrunk their presence in Canada, as several foreign airlines have all reduced their capacity on the Canadian market, and some has pulled out all together. While fuel price may not be the only factor to explain all these changes, it certainly was an important consideration

The **railways** have moved to improve fuel efficiency through investing in more fuel-efficient locomotives and other operational improvements such as scheduling trains based on capacity to minimize congestion, better matching of horsepower to tonnage, improved train handling techniques and the use of fuel-saving devices on locomotives.

Since 1985, Canadian railways have purchased 1,061 higher horsepower locomotives. Of these, 898 now meet the stringent U.S. Environmental Protection Agency (EPA) Tier 0, Tier 1 or Tier 2 locomotive emissions standards. The combination of reduced fuel consumption and reduced emissions from the EPA compliant locomotives has resulted in lower emissions per revenue ton-mile despite increased traffic.

Trucking companies are opting for slower truck speeds and various fuel-saving technologies. Trucks are being equipped with automatic shutoffs to prevent excessive idling, with speed governors and with auxiliary power units and are being given daily tire-pressure checks. Since drivers hold the key to better fuel efficiency some companies are putting into place better training techniques such as simulation technologies.

In order to reduce fuel costs **shipping lines** are reducing the ship speed. Slowing down by 10% can lead to a 25% reduction in fuel use. There have been some comments that some shipping lines are looking at altering their routes in order to pass the burden of the increased costs on the surface modes which could impact their choice of ports.

Some **public transit** companies have found that they need to increase their capacity in order to meet the increased demand for their services.

Logistics managers re-evaluated their **supply chains** in the face of soaring fuel costs. Companies looked at network optimization and this could benefit companies by encouraging them to squeeze more efficiency and long-term sustainability from their distribution networks. The strategies that are coming into focus to help bolster shrinking profit margins include: pooling equipment and loads; moving full container and truckloads; looking at renewable energies or going to alternative transportation modes (especially rail and marine); and finding the right mix of warehouse and distribution locations. Rising fuel costs are prompting some companies to think about keeping more inventories on hand.

The Relative Importance of Transportation Costs in the Distribution and Production of Goods in Canada

Impacts of an increase in the price of transportation differ across sectors of the economy. For some sectors, transportation is a major input cost whereas for others it can be rather small. The importance of transportation is shown by two indicators: the cost of distributing industrial output (i.e., goods) as a percentage of commodity prices

and a measure of transportation as an intermediate input to goods-producing industries. Statistics Canada's Input-Output data is used to estimate these costs.

In the distribution of goods, transportation costs have added, on average for the 1997-2000 period, 3.1% to the producers' prices of commodities. This percent is an underestimate because Statistics Canada's data only include transportation within Canadian borders.

Distribution costs are much higher for raw materials, at 9.6% than in the manufacturing sector, where the cost of distributing output adds 2.4% to the producer's price. In fact, raw materials account for 9.6% of domestic production but 30% of transportation costs. On the other hand, fabricated goods represent 90.4% of production and 70% of transportation "margins".

The Cost of Distributing Canadian Goods

Commodity Groups	Transport Margins Rate (%)	Share of Production (%)	Share of Transports Margins (%)
Total Commodities	3.1	100.0	100.0
Raw Materials	9.6	9.6	30.0
Coal & Coke	25.8	0.4	3.0
Grains & Oilseeds	9.5	1.1	3.4
Forestry & Logging	4.4	1.6	2.3
Oil & Natural Gas	11.8	4.8	18.5
Metal Mining	4.7	1.8	2.7
Fabricated Goods	2.4	90.4	70.0
Motor Vehicles	1.1	18.6	6.5
Computer & Electronic products	0.7	6.7	1.5
Metal fabricated products	2.9	8.3	7.8
Pulp & Paper	5.0	4.5	7.3
Machinery & Equipment	1.0	6.9	2.3
Sub-total	1.7	44.9	25.5
Other Fabricated Goods	3.0	45.4	44.6

Source: Transport Canada

For the period under study, the cost of transportation inputs represented 1.7% of producers' prices in the Canadian economy. Transportation inputs account for 1.6% of the price of agricultural

goods, 5.7% for the forestry sector, 1.8% for fishing, hunting and trapping, 1.7% for the manufacturing sector and 0.8% for the mining industry. Within the manufacturing sector, transportation is especially important as an input for paperboard mills (7% of the price of the final product), pulp mills (6.2%), flour milling (also 6.2%) and fertilizer manufacturing (5.2%).

What this means is that, considering the low impact of transportation costs on the cost of Canadian goods, the increases in fuel costs are unlikely to greatly affect the price of these goods, at least for Canadian consumers of goods produced in Canada. We do not know the full impact of transportation on the cost to our foreign customers or on our imports.

Conclusions

The increase in the price of fuel has had significant impacts on the transportation. Throughout the transportation system the increased price of fuel has meant that operators as well as consumers are looking at ways to increase their productivity to make their transportation costs less by moving to more fuel-efficient equipment and methods of operations as well as to pass on increased costs.

The impact was larger for the passenger modes than the freight modes. There are two reasons for this. The first is that as a percentage of the selling price of goods transportation costs represents, particularly for high valued goods, a relatively small amount of the selling price, generally less than ten percent and in many cases around five percent. The second reason is that transportation companies through surcharges or other means can pass through the increased price of fuel to the shippers.

For passenger transportation both private transportation, primarily automobile, and commercial passenger transportation were affected. For private transportation there has been a shift from the use of automobiles to using public transit. For commercial transportation the largest impact has been in the airline industry where service was reduced, including the cutting of routes, and employees laid off.