Center for American Progress

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Not Again

The Summer Vacation Gas Price Roller Coaster on the Move Again

Why Energy Price Volatility Hurts Families, Businesses, and the Economy

Christian E. Weller and Jaryn Fields May 2011

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Introduction and summary

Families across the country are now planning their summer vacations, eager for this weekend's Memorial Day kickoff of the spring and summer driving season to the beach, the mountains, fresh water lakes and streams, or any number of tourist sites in cities large and small. But on this coming three-day weekend, rising prices at the pump will be hard to miss. Like many past springs, prices for regular gasoline soared by almost 30 percent between the end of 2010 and May 16, 2011.[1]

Unfortunately, there is no end in sight over the next several months. The Energy Information Administration at the U.S. Department of Energy projects that the average retail price of regular-grade gasoline will average $3.86 per gallon during the holiday driving season—from April 1 to September 30—up $1.10 from last summer, and increase almost 40 percent. And prices of futures and options contracts for gasoline—the way financial markets measure future expectations of major buyers and sellers of gasoline—predict there is a 33 percent chance that the national monthly average retail price for regular gasoline could exceed $4.00 per gallon this July.[2]

High and rising prices mean that families will spend more on fueling up their cars to go to work just as more and more people are finding jobs again. And businesses will have to spend more on transporting goods, hurting consumers again with higher prices and pinching businesses, especially smaller ones, putting a damper on investments and hiring.

Rising gasoline prices are obviously a big problem, but it is not the only one that will haunt consumers and businesses this summer. The other problem is increasingly volatile gasoline prices. The upswing in gas prices this spring is reminiscent of several springs in the past. Prices at the pump also soared by more than 30 percent in the spring of 2002, the first year of such large price increases in the spring, and then again in 2004, 2006, 2007, 2008, and 2009—not even taking a break for the Great Recession.[3] And then, in almost all cases, prices fell precipitously, occasionally even to their earlier levels, once the summer was over.

This year, it's looking like déjà vu all over again. The New York Mercantile Exchange, where many energy prices are determined, even halted trading of gasoline and crude oil futures on May 11, 2011, for the first time in more than two years, because of large downward price drops on futures that priced gasoline and crude oil several months, typically two to six months, forward.[4]

Now, falling gasoline prices after sharp run-ups at first glance may seem like a good thing, not a problem. After all, gasoline and other fossil fuels are the biggest energy item for households and play a major role for businesses. Other energy prices, particularly for natural gas, are also volatile, but not as much as gasoline and related fuel prices. The bottom line, though, is that families and businesses are exposed to massive price swings for the vast majority of their energy spending. These large price swings for gasoline and other energy prices make it even more difficult for families, businesses, and ultimately the economy to plan for the future.

Rising gasoline and energy prices should signal to families, businesses, and government policymakers that it is time to invest in energy efficiency and alternative energy sources. Higher gas and energy prices should lead to less demand and increased searches for alternatives. Yet the combination of high prices followed by increasing volatility quickly obscures these basic responses to higher prices.

This confusing energy price dynamic makes it difficult for families to budget expenses, estimate commuting costs, and make the informed economic decisions that will impact their households since families cannot really see where prices are heading amid the massive volatility. Many families consequently wait to buy a more fuel efficient car, or move closer to public transit, among other things, until they get a better sense of where prices are really headed. Businesses will similarly delay energy saving investments in more fuel efficient car and truck fleets, as will state-and-local governments and the federal government. And both consumers and businesses hold off on other energy-saving investments such as energy efficiency repairs or upgrades to homes, office buildings, and factories.

And now the cycle begins anew. What's more, families, businesses, and governments could be once again caught off-guard by rapidly rising prices at the pump next vacation season after watching prices fall in the autumn and winter, leaving our economy still heavily dependent on petroleum. In this paper we summarize past data on gasoline and energy price volatility, and consumer and business spending, and then make recommendations on how to avoid this very predictable and debilitating cycle in the future. We find that:

- **Consumers will delay purchasing a car after experiencing a period of high gasoline price volatility.** There is a 73.1 percent chance that consumers will spend a below-average share of their after-tax income on vehicles after they have just experienced a period of high gasoline price volatility. Consumer spending on cars is 4.3 percent below average in the year following a year-long bout of elevated price volatility.

- **Families spend less on home improvements and home purchases following a period of high energy price volatility.** Families' investment in residential structures, which includes new home purchases and upgrades to homes, is on average 0.5 percent of gross domestic product lower than is typical, following high volatility, or about $75 billion in the current economy.

- **Businesses also reduce their investment spending after periods of high energy price volatility.** There is a 78.9 percent chance that business investment in transportation equipment as a share of GDP will decline after high energy price volatility. Businesses will buy 7.5 percent fewer vehicles than is typical, putting off purchases due to unstable and unpredictable prices.

- **The oil industry, in comparison, profits from periods of high volatility.** The so-called profit rate (profits to assets) of the oil industry is significantly higher during times of high energy price volatility, likely because the price spikes underlying increased volatility result in higher retail prices and more consumer spending, without an equal offsetting effect when prices go down again.

In this paper we examine the relationship between various categories of consumer and business spending patterns and energy price volatility. We also propose ways that policymakers can address the impact of extreme price volatility on the economy, among them an array of ways to diversify our sources of energy so that gasoline prices and the prices for other forms of energy become less volatile, more predictable, and over time less expensive.

What is price volatility?

Many Americans have experienced abrupt fluctuation in energy prices as they fill up their gas tanks and pay various utility bills this spring. This is not new, but rather a regularly recurring phenomenon of rising gas prices each spring amid rising gas price volatility, which has increased substantially since 2004. Gasoline prices have been trending upwards since about 1999, even after accounting for the upward trend of prices in general, as Figure 1 shows.

The trend is moving sharply upward, suggesting that on average gasoline prices in the middle of 2011 are more than three times the prices that they were in early 1999. The actual prices at the pump, though, have fluctuated widely around this trend line, particularly after 2004. Prices have exceeded $4 per gallon and fallen well below $2 per gallon in the past seven years, making the underlying trend hard to detect when filling up at the gas station.

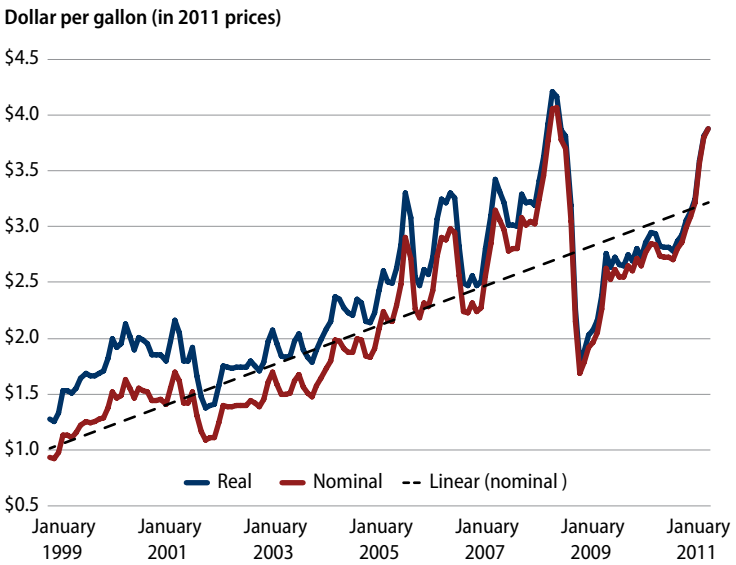
The reasons for price volatility are varied. They include weather-related disruptions, geopolitical changes in key oil producing regions, such as the recent protests in the Middle East, and speculation in energy-related markets. The analysis here does not depend on the specific causes of increased volatility, but is intended to showcase the impact of energy price volatility on families and businesses.

FIGURE 1

The price of volatility

Nominal and real regular gasoline prices, 1999 to 2011

The red line shows the nominal (non-inflation adjusted prices) and the blue line shows the real (inflation-adjusted) prices for a gallon regular gasoline. The dotted black line is the trend line for nominal (non-inflation adjusted) gasoline prices, which would not look much different if we calculate the trend line for real gasoline prices.



Notes: Data are from Energy Information Administration, U.S. Department of Energy, "Nominal and Real Gasoline Prices" (2011). Trend line added by authors.

Defining volatility, family and business responses, and expected changes

Gasoline prices are not the only prices that exhibit such fluctuation. This is especially important since families and businesses spend a lot more money on utilities than on gasoline.[5] The Department of Labor's U.S. Bureau of Labor Statistics calculates a number of prices for consumers, including a price index that tracks energy prices, going back to 1957.[6]

There are a number of ways to calculate price volatility, but all of them will produce the same picture. We choose a measure called relative volatility, which measures the volatility around the trend, allowing for downward- and upward-trending energy prices over time. We first calculate the standard deviation of the seasonally adjusted energy price index for a 12-month period, shortening the starting period of available data for our calculations from 1957 to 1958. The standard deviation is the typical fluctuation of prices around the average price in that 12-month period.

We then divide that standard deviation by the average energy price index for that same period. This division adjusts for the prevailing price level during the 12-month period, which may have been low or high, depending on the period. This gives us the standard variation in prices, which is better for comparing swings around the average price over time because it better captures the volatility that families and businesses experience in the short run than if we reported just the standard deviation.[7]

We then compare energy price volatility to trends in other economic data, specifically families' consumption and savings as well as business investment. We break time periods into periods of high and normal volatility. We define periods of high volatility as periods, specifically quarters in any year, when the ratio of the standard deviation to the average energy price index over the preceding quarter was at least twice as large as the long-term average ratio from 1968-2010 for households and at least 1.5 times as large as the long-term average for businesses.[8] All other periods are considered periods of normal volatility. We find that 12.7 percent of all 12-month periods from 1968-2010 were periods of high price volatility for consumers and 11 percent of all 12-month periods during this time were periods of high volatility for businesses.[9] Figure 2 shows our energy price volatility indicator for consumers.

Several bouts of high volatility characterized much of the 1970s and the early part of the 1980s. Volatility then subsided in the late 1980s and throughout the early part of the 1990s as energy prices declined and settled down, just to start up again and eventually exceed the volatility of 1970s and 1980s by 2008.

These bouts of volatility amid rising energy prices played havoc with family budget planning and business investment decisions. We find this to be the case by looking at families' and businesses' spending after high energy price volatility to determine the impact of energy volatility on consumption and investment. We examine personal savings, or money not spent on consumption, and consumer spending on homes and cars, which are the two most energy dependent consumption products, to determine families' reactions to high price volatility. We also consider business investment, both in equipment, such as machinery and trucks, and structures, such as office buildings and factories, following a period of high price volatility, to determine businesses reaction to spikes in price volatility.

We use several measures of families' and businesses' responses to high energy price volatility. First, we report the probability that spending on particular consumption or investment items will decline after volatility.[10] A high probability indicates that the size of the responses we discuss is typical and is not influenced by a few large outsized responses. Second, we calculate the average percent response in consumption, saving, and investment, following high volatility. This measure shows us how relevant the change in spending, saving, and investment is. This measure also controls for the effect of recessions and economic expansions by relating spending to after-tax income, which typically falls during a recession and grows during an economic expansion.

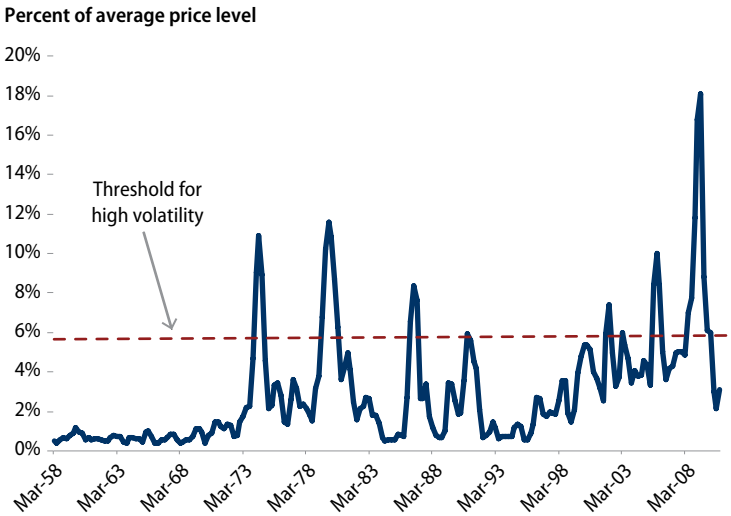
Third, we measure the change in the units of cars and trucks that are bought after high volatility to make sure that any change in spending actually reflects

FIGURE 2

Measuring energy price volatility

Standard deviation of energy prices to average energy prices over four quarters, 1968 to 2010

The red horizontal line shows the threshold for high volatility. If the indicator goes above the line, we find ourselves in a period of high volatility. Indicator points below the horizontal red line are considered periods of normal volatility. There are substantial changes in volatility over time.



Notes: See text for discussion of calculation. Authors' calculations based on Bureau of Labor Statistics, "Consumer Price Index for Urban Consumers, Energy" (2011). Calculations are based on seasonally adjusted data.

a behavioral change and not coincidental price declines. These three measures together give us a comprehensive sense of how families and businesses respond to high volatility.

Most consumers and businesses have few alternatives to compensate for quick changes in prices. When prices spike, many families feel the sudden pinch in their wallets. People, for instance, typically drive to go to work. With just over three quarters of United States workers driving to work alone, a quick surge in gas prices will create an unavoidable burden on the wallets of many American commuters.[11] This is especially true today in the current environment of accelerating job growth, when many people are finally finding employment again after long periods of unemployment, and often are cash strapped because of the hardships of the weak labor market of the past several years.[12]

Moreover, families still have to heat and light their homes even if fuel and energy prices go up. The same goes for businesses, which still need to rely on energy in all its forms—gasoline for trucks, heat, cooling, and lighting of offices and factories—to get their goods and services out the door. There are often few options to reduce energy consumption in the short run for families and businesses.

Energy price volatility leaves families and businesses with little time to adjust, largely because a price spike will often be offset by a price decline, albeit smaller in magnitude than the price increase, in the future. As a result, consumers and businesses aren't sure which price is the "actual" price of energy. Prices consequently cannot properly fulfill their signaling function, which means consumers and businesses will not invest as much in energy savings and alternatives as they would if they had a full understanding of the underlying upward trend of energy prices. So let's look first at the response of consumers to high energy price volatility, and then businesses.

Consumers delay car purchases and investments in their homes following volatility

Energy prices determine how much consumers will have to spend on other goods. As energy prices increase, consumers will have to spend more money to cover the additional costs.

Energy price volatility adds another wrinkle to this problem, as we have already discussed. Consumers will take the time and money to invest in energy savings

and alternatives if energy prices increase in a relatively predictable fashion. But consumers will likely not undertake these investments if they cannot easily discern the long-term trend in energy prices.

We analyze consumer spending data from the Bureau of Economic Analysis's National Income and Product Accounts to get a better sense of how consumers respond to energy price volatility. We specifically look at the relative change in saving and consumption as a share of after-tax income in the 12-month period following a period of high energy price volatility, and the probability of a particular change—in this case a decline—in spending and saving occurring after high volatility.[13] We use this time lag, as opposed to examining spending, saving, and volatility during the same period, because the lag accounts for the time it takes for consumers to react to the price volatility. And we report the probability of a decline in spending and saving to make sure that our average change is not determined by a few rather large changes and instead reflects a regularly recurring pattern following high volatility.

Consumers spend less money on cars in the year following a period of high energy price volatility. Spending on vehicles and parts following high volatility decreased in 73.1 percent of the periods after high volatility between 1958 and 2010, suggesting that spending is a lot more likely to fall than to increase after volatility. Spending on motor vehicles and parts as a share of personal after-tax income on average dropped by 4.3 percent in the 12-month following high price volatility between 1958 and 2010. (see Table 1)

TABLE 1

The consequences for consumers of high energy price volatility

Changing consumer spending on motor vehicles and their homes, and changing savings rate following high energy price volatility

	Motor vehicle and parts spending to after-tax income	Quantity index for personal vehicles	Residential investment spending to gross domestic product	Personal saving to after tax income
Average percent change after high volatility	-4.3	-2.2	-10.2	14.9
Probability of decline after high volatility	73.1	57.7	80.8	26.9

Notes: Authors' calculations based on Bureau of Economic Analysis, "National Income and Product Accounts" (2011) and Bureau of Labor Statistics, "Consumer Price Index, All Urban Consumers (Chained Series)" (2011).

The decline in automobile spending is also reflected in fewer cars and parts being bought and not just lower prices. To reach this conclusion, we use the quantity index, which counts the number of cars over time and controls for price effects. The number of cars and parts that consumers bought fell on average by 2.2 percent during periods following high volatility from 1958 to 2010. This suggests that consumers purchased fewer cars instead of simply purchasing less expensive ones, following a period of high price volatility.

We similarly observe less spending on homes following high volatility. We calculate the change in residential investment spending relative to gross domestic product, rather than after-tax income, since spending on homes is considered an investment and not a consumption item because families will often dip into their savings or increase their borrowing for their homes but not for other consumption. The data show an 80.8 percent chance that spending on homes and renovations will fall during the 12 months following a period of high volatility. Residential investment spending as a share of GDP drops on average by 10.2 percent after high volatility.

The decline in spending on homes deserves a little more explanation. Families may not necessarily feel the volatility in their utility or home heating bills as some forms of energy, such as electricity, are not as volatile as heating oil, for instance. Families' spending on long-lasting items, such as cars and homes, will be affected by higher energy price volatility if families hold off on making spending decisions and rather increase their savings.

This is in fact the case. Saving as a share of after-tax income increases by 14.9 percent, with a 73.1 percent chance that saving will increase following high volatility. The data suggest that the drop in spending on cars and parts and homes is a result, in part, of consumers becoming more cautious and waiting to spend money, reflected in more saving.

The data thus indicate a systematic behavioral change following high volatility, such that families buy fewer cars and spend less money on car parts, possibly delaying such purchases until prices stabilize.

Businesses delay purchases of trucks and other transportation equipment after volatility

The same trends are evident in business investment amid high energy price volatility. The data show that business investment decreases after periods of high energy price volatility. There is a 73.7 percent chance that business investment relative to GDP declines in the 12 months following a period of high energy price volatility. Business investment as a share of GDP on average declines by 4 percent following high volatility. (see Table 2)

Business investment spending falls into two large subcategories. Businesses either spend money on equipment, such as machinery and trucks, and software; or on structures, such as office buildings, factories, and mines. The data show that there is a 68.4 percent chance that equipment and software investment falls after high volatility. The average decrease amounts to 2.9 percent relative to GDP.

It is especially transportation equipment—trucks, tractors, and ships—in the equipment category that falls with a probability of decline of 78.9 percent, and an average decrease of 7.5 percent relative to GDP, following high volatility. As with cars, businesses are actually buying fewer trucks, tractors, and other transportation equipment rather than shifting to less expensive ones since the quantity index for transportation equipment shows a drop of 3.6 percent on average after a period of high energy price volatility.

Business investment in structures also shows a substantial decrease following volatility. There is a 63.2 percent chance that business investment drops after a period of high volatility with an average decrease relative to GDP by 5.5 percent.

What do these spending and investment trends related to high energy price volatility mean to the larger economy? To this we now turn.

TABLE 2

The consequences for businesses of high energy price volatility

Changing business investment in transportation, offices, and factories following high energy price volatility

	Total business investment relative to GDP	Total equipment investment to GDP	Transportation equipment investment to GDP	Quantity index for transportation equipment	Structural investment to GDP
Average percent change after high volatility	-4.0	-2.9	-7.5	-3.6	-5.5
Probability of decline after high volatility	73.7	68.4	78.9	68.4	63.2

Notes: Authors' calculations based on Bureau of Economic Analysis, "National Income and Product Accounts" (2011) and Bureau of Labor Statistics, "Producer Price Index – Commodities" (2011).

High energy price volatility contributes to slower economic growth

Decreased consumer spending and business investment spell bad news for the economy. Generally, if businesses aren't sure that the economy is growing, they will hesitate to spend money on projects and products. Less business investment means that businesses are buying fewer goods and economic demand falls, which leads to lower economic growth and fewer jobs.

Consumers then grow even more wary about spending because they begin to worry about their jobs, which in turn feeds businesses' concern about investing in new equipment and employees. Thus energy price volatility also has a negative effect on jobs. Increased volatility creates a feeling of uncertainty that forces companies to postpone their investments,[14] and leads them to delay hiring.[15]

There may be long-term fallout from lower business investment, too. Data going back to 1947 show a systematic relationship over time between business investment and productivity growth. Accelerations in productivity growth—how fast the amount of goods and services that a worker can produce in one-hour increases—have generally followed periods of increased business investment. The opposite is also true—periods of elevated productivity growth were preceded by periods of increased business investment.[16] This relationship, though, occurs with an almost 20-year relationship such that the higher volatility of the past few years, after 2004, possibly has contributed to less business investment in the present, but won't show up as slower productivity growth for another decade or more.

The upshot: Researchers conclude that high energy price volatility contributes to slower productivity and thus less economic growth, largely because of its adverse effect on business investment decisions.[17] But there is one industry that does well during times of high volatility—the oil-and-gas industry.

Oil companies experience higher profits during periods of higher volatility

Oil-and-gas companies tend to reap the benefits of increased volatility. Demand for petroleum products (and many other energy products) is inelastic, meaning it changes little in response to price changes. Families and businesses often still have to buy energy for their car, home, or business.

Moreover, because consumers and businesses seem to postpone energy-relevant purchases due to increased volatility, demand for petroleum and other energy products remains inelastic over time. This means that oil companies can more easily pass on higher raw material prices to end users—consumers and businesses—than would be the case with more elastic energy demand. That is, greater raw material volatility hurts families and consumers, but not energy producers. Higher prices translate into more sales and possibly more profits, assuming that profits are at least a fixed margin above the input price—the cost of raw materials.[18]

We consider the profit rate—profits to assets—of oil-and-gas companies and coal companies following a period of high volatility.[19] We still use a lagged measure, profits following price volatility, to allow the entire period of high volatility to pass. The data show that the profit rate of the petroleum and coal industry increases in 65.4 percent of the periods after high price volatility. The profit rate on average increases by 23.8 percent following high volatility. The profit rate of the petroleum and coal products industry, for instance, had risen to a very high 14 percent in the middle of 2008, when gasoline prices soared.

This is good for Big Oil, but as we've demonstrated high energy price volatility is clearly detrimental to families, businesses, and the economy. Families delay spending, especially for large ticket items, such as cars and homes, in the wake of high energy price volatility. This makes sense since families do not know where energy prices will be in the future, given past energy price swings. They consequently do not know how much money they will have to spend on gasoline in the future and how sensible energy efficiency investments are. Spending on cars and homes consequently drops, while savings rates increase, following a bout of high energy price volatility.

A similar story emerges for businesses. Businesses invest less in everything from factories to offices, computers, and trucks and other transportation equipment. Business investment for transportation equipment drops the most following periods of high volatility, again signaling that businesses delay making large purchasing decisions, when it is unclear where prices are heading. The economy suffers because of less spending and investment, but also because necessary upgrades to energy efficiency and energy alternatives are delayed.

Energy alternatives and efficiency protect consumers and businesses

What would happen if U.S. families and businesses used more renewable energy alternatives and became more energy efficient? The answer depends on many factors, but two basic aspects will help to understand the probable results. First, greater diversification of energy sources will reduce the chance of energy price volatility since price spikes in fossil fuels will influence a smaller share of total energy spending. And second, increased energy efficiency will lower the total amount of money spent on energy and thus reduce the economic effect of energy price spikes on families and businesses.

So if the share of household and business spending that is dedicated to energy is smaller to begin with, the share of spending that can go toward other things grows. That's good for family budgets and savings, and business investments and profits alike.

There are no hard data on the prices for alternative energy sources, which means we have to make do with an illustrative example. Assume that alternative energy sources have no volatility, or least no volatility that is systematically related to other energy price movements.[20] Then, let's assume that these additional alternative sources of energy would have made up one-fourth of all energy spending from 1957 to 2010. The energy price index that consumers would have experienced in this hypothetical example would have been a weighted average consisting of three-quarters of the original energy price index, with all of its volatility, and one-fourth of a new price index with a steady volatility. Table 3 summarizes this hypothetical example.

Each cell in Table 3 shows the chance of having experienced a period of high volatility between 1957 and 2010 under different assumptions about what a period of high volatility is and how much energy could have come from alternative, renewable sources. The chance of exceeding twice the relative standard deviation would have fallen from 12.1 percent between 1957 to 2010, to 7.4 percent during the same time—a relative drop in high volatility incidences by 38.9 percent—if 25 percent of energy would have come from alternative sources. The table shows that the incidences of high volatility fall with greater energy diversification.

TABLE 3

The power of energy diversification

What would have happened if alternatives to oil and gas had been available in the U.S. economy, 1957 to 2010, by percentages

The four vertical columns show different additional shares of alternative energy, ranging from 0 to 75 percent. The first column sets the additional share equal to zero and thus shows the chance of high volatility under the original price index in Figure 2 on page 6. The second column assumes an additional 25 percent of energy comes from alternative energy sources, the third column an additional 50 percent, and the fourth column an additional 75 percent of all energy. The horizontal rows allow the threshold of high volatility to change, ranging from one time the relative standard deviation to twice the standard deviation. The result: The table shows that the incidences of high volatility fall with greater energy diversification.

	Additional share of alternative energy			
High volatility threshold	0%	25%	50%	75%
Two times relative standard deviation	12.1	7.4 (-38.9)	2.8 (-76.6)	0.0 (-100.0)
One and a half times standard error	22.4	12.5 (-44.0)	6.6 (-70.6)	0.0 (-100.0)
One time standard error	37.6	29.6 (-21.3)	17.1 (-54.6)	5.6 (-85.0)

Notes: All figures are in percent. Figures in parentheses show the relative change in the chance of high volatility compared to the original energy price index.

Our results show families and businesses reacting to energy price volatility. Energy price volatility only partially depends on the level of energy consumption in the United States since prices for fuel are determined in global markets. That is, families and businesses would likely have experienced similar energy price volatility as they did from 1957 to 2010 even if they had consumed less energy.

Consumer spending and business investments, though, would have been hurt less by high volatility. Take the example of family spending on gasoline. Families spent 3.3 percent of their after-tax income on gasoline and other fuels by the end of 2010.[21] Let's say, for instance, that families may have been able to drop this share to 2.2 percent of after-tax income if families had used more efficient cars. This would have lowered the impact of high volatility on families substantially.

Currently, families increase their gasoline spending on average by 19.5 percent during high volatility periods, but 19.5 percent of 3.3 percent of after-tax income is much larger than 19.5 percent of 2.2 percent in absolute terms. The difference would have amounted to about $24 billion for 2011 just based on the numbers from the fourth quarter of 2010.[22] This means energy price spikes would have hurt families less because the starting point would have been much less energy spending to begin with and thus a lot less exposure to substantial price spikes. Families simply would feel the pinch of high volatility less in their wallets, leaving them with more resources to buy a new car or invest in a home.

Conclusion

American families and businesses have lived through a period of extraordinary price volatility since 2004. Energy price volatility creates uncertainty in the minds and wallets of businesses and consumers, who may choose to delay decisions to purchase appliances and equipment or make the investments that propel our economy forward.

An analysis of the existing data on energy prices, consumer spending, and business investment decisions show that energy price volatility—wide fluctuations in gasoline and other prices—lead families and businesses to delay investments. Families spend less on homes and businesses invest less following high energy price volatility. Families specifically spend less on home improvements, buy fewer cars, and save a larger share of their after-tax income, suggesting that families are waiting out the period of instability before committing to large spending items. This could mean that families are spending less on improving the energy efficiency of their cars and homes than they would if energy price volatility were lower.

Businesses similarly invest less on equipment, particular on trucks, tractors, and other transportation equipment. Less business investment could hurt productivity growth in the long run since businesses have less physical infrastructure and the one they have is more outdated.

The struggles of families and businesses over the past seven years are linked directly to high profits for oil companies due to high energy price volatility. The so called "Big 5" oil-and-gas companies—BP, Exxon Mobil Corp., ConocoPhillips, Chevron Corp., and Royal Dutch Shell—continue to report massive profits in the face of extraordinary energy price swings. In 2008, when energy price volatility reached a historic high, oil companies showed record profits, yet they invested very little of that additional profit in alternative energy, thus perpetuating the problem for families and businesses, when the next volatility spike occurs, as it seems to have in early 2011.

A 2009 Center for American Progress analysis of oil companies' investments reveals that the Big 5 oil-and-gas companies invested a mere 4 percent of their total 2008 profits in renewable and alternative energy ventures.[23] Instead, as the Citizens for Tax Justice detail, Big Oil used their profits to keep their shareholders happy with dividend payouts and share repurchases. The share of oil-and-gas companies' profits used to pay dividends and buy back stock was 58 percent in 2005, 73 percent in 2006, 72 percent in 2007, 71 percent in 2008, and 89 percent in 2009.[24]

So how can policymakers help alleviate high energy price volatility? They should strive to enact legislation that either lessens the number of extreme price swings as well as better prepare consumers and businesses when those swings occur. Let's look at each in turn.

The recently enacted Wall Street Reform and Consumer Protection Act will give the Commodities Futures Trading Commission more power to regulate the futures market more closely. This may reduce the overall number of energy price fluctuations. The reason: Increased transparency and more regulatory oversight over key markets, where energy prices are determined, will presumably cause speculators to have less influence over commodity prices.

On the legislative side of things, enacting comprehensive energy and climate legislation that fosters more energy efficiency and more alternative sources of energy will make an even larger and sustained difference for families and business. Price fluctuations in nonrenewable energy sources will have a smaller effect on consumers if consumers are spending less of their money on these energy sources and instead invest more in energy efficiency and spend more on renewable sources of energy, where price swings are unrelated to the prices of nonrenewable energy sources.

Sadly, Congress has not acted on such legislation. Instead, Republicans in the House of Representatives embraced the budget proposal put forth by Rep. Paul Ryan (R-WI), which would cut significant funding to the Commodities Futures Trading Commission.[25] As we mentioned, one of the functions of this commission is to curb the influence that oil speculators have over energy prices. Cutting the commission's budget would seriously impair its ability to police oil markets. In turn, decreased regulation gives speculators more power over energy prices, which leads to more volatile prices.

Instead, Congress needs to help diversify the nation's sources of energy. The Center for American Progress recently proposed an 80 percent clean energy standard that would include a requirement that 35 percent of America's energy needs will be met by truly renewable energy and energy efficiency by the year 2035.[26] In addition to creating new markets for energy efficient technologies, CAP's recommendation would also reduce dependency on the existing commodities that are susceptible to extreme volatility.

Endnotes

1 Authors' calculation based on Energy Information Administration, "Weekly Retail Gasoline and Diesel Prices" (2011), available at http://www.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

2 Energy Information Administration, "Short Term Energy Outlook" (2011), available at http://www.eia.doe.gov/emeu/steo/pub/contents.html.

3 Authors' calculation based on Energy Information Administration, "Weekly Retail Gasoline and Diesel Prices" (2011).

4 J. Bunge, "CME Group Halts Trading in Crude Oil, Gasoline," Dow Jones News Wire, 2011.

5 See data from the Bureau of Economic Analysis, "National Income and Product Accounts" (2011), for aggregate gasoline spending compared to spending on utilities by households.

6 See Bureau of Labor Statistics, "Consumer Price Index for Urban Consumers" (2011).

7 The standard deviation already accounts for the average price during a given period, here a specific 12-month period. Our measure only expresses the standard deviation relative to that average, while the standard deviation shows the typical swing in gasoline prices during a given period in dollars.

8 The price index for businesses is inherently more volatile than the price index for consumers since businesses purchase energy closer to the source and thus are more exposed to market fluctuations than consumers. The average volatility for businesses is thus higher than for consumers, while the size of price swings during periods of high volatility is about the same.

9 Volatility increased in early 2011, but did not exceed the threshold. We use data only through the end of 2010, to use complete and final data.

10 We still report the chance of a decline in saving after volatility, even though we expect saving to increase after volatility if consumption declines. We report the chance of a saving increase to be consistent in our reporting.

11 American Community Survey, Table B08301, available at http://factfinder.census.gov.

12 See, for instance, Bureau of Labor Statistics, "Current Employment Statistics" (2011), for information on monthly job growth.

13 We control for the effect of economic recessions and expansions by dividing consumption by after-tax income.

14 Evangelia Papapetrou, "Oil price shocks, stock market, economic activity and employment in Greece," *Energy Economics* 23 (5) (2001): 511-532.

15 See, for example: Ben S. Bernanke, "Irreversibility, Uncertainty, and Cyclical Investment" *The Quarterly Journal of Economics* 98 (1) (1983): 85-106; and Robert Pindyck, "Irreversibility, Uncertainty and Investment," *Journal of Economic Literature* 24 (1991): 1110-1148.

16 Christian E. Weller and Amanda Logan, "Investing for Widespread, Productive Growth" (Washington: Center for American Progress, 2008).

17 See, for example: James D. Hamilton, "What is an Oil Shock?" *Journal of Econometrics* 113 (2) (2003): 363-398; J. P. Ferderer, "Oil Price Volatility and the Macroeconomy," *Journal of Macroeconomics* 18 (1) (1996): 1-26; Rebecca Jiménez-Rodriguez and Marcelo Sánchez, "Oil Price Shocks and Real GDP Growth: Empirical Evidence for Some OECD Countries," *Applied Economics* 37 (2) (2005): 201-228; and Roy Boyd and Tony Caporale, "Scarcity, Resource Price Uncertainty, and Economic Growth," *Land Economics* 72 (3) (1996): 326-335.

18 Prices have risen to some degree because speculators fear supply shortages. Oil companies consequently benefit from the increased fear of speculators as they can increase their profits in absolute terms with a constant share of profits out of retail energy prices. See, Daniel J. Weiss and Valeri Vasquez, "Oil Profits from Pump Pain" (Washington: Center for American Progress, 2011), available at http://www.americanprogress.org/issues/2011/02/profits_v_prices.html.

19 We use current-cost fixed assets of the petroleum and coal industry. The petroleum industry accounts for the vast majority of assets and the numbers thus reflect the profit rate in the oil industry. Data for fixed assets are available only on an annual basis. We linearly interpolate the missing quarters. And, we apply the long-term asset growth from 1947 to 2009 for observations after 2009. The data are taken from the Bureau of Economic Analysis, "Fixed Assets" (2011).

20 We simply assume a steadily growing price index that increases at the average monthly growth rate of the energy price index from 1957 to 2010. One could also think of this as a gradually rising energy tax burden.

21 Authors' calculation based on Bureau of Economic Analysis, "National Income and Product Accounts, Washington" (2011).

22 Ibid.

23 Daniel J. Weiss and Alexandra Kougentakis, "Big Oil Misers" (Washington: Center for American Progress, 2009).

24 Jeff Hooke and Steve Wamhoff, "Congress Should End Oil & Gas Tax Breaks" (Washington: Citizens for Tax Justice, 2011).

25 Daniel J. Weiss and Valeri Vasquez, "Oil Roulette" (Washington: Center for American Progress, April 28, 2011)

26 Center for American Progress, "Response to Bingaman-Murkowski Clean Energy Standard White Paper" (2011).

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