How Falling Gas Prices Fuel the Consumer

Evidence from 25 Million People

October 2015

JPMorgan Chase & Co.

INSTITUTE

About the Institute

The global economy has never been more complex, more interconnected, or faster moving. Yet economists, businesses, nonprofit leaders, and policymakers have lacked access to real-time data and the analytic tools to provide a comprehensive perspective. The results—made painfully clear by the Global Financial Crisis and its aftermath—have been unrealized potential, inequitable growth, and preventable market failures.

The JPMorgan Chase Institute is harnessing the scale and scope of one of the world's leading firms to explain the global economy as it truly exists. Its mission is to help decision-makers—policymakers, businesses, and nonprofit leaders—appreciate the scale, granularity, diversity, and interconnectedness of the global economic system and use better facts, real-time data and thoughtful analysis to make smarter decisions to advance global prosperity. Drawing on JPMorgan Chase's unique proprietary data, expertise, and market access, the Institute develops analyses and insights on the inner workings of the global economy, frames critical problems, and convenes stakeholders and leading thinkers.

The JPMorgan Chase Institute is a global think tank dedicated to delivering data-rich analyses and expert insights for the public good.

Acknowledgments

We thank our research team for their hard work and fabulous contribution to this report, including David Wasser, Pascal Noel and Phoebe Liu.

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Executive Summary

The decline in gas prices since 2014 will save the average American household $700 in 2015 according to U.S. government projections (EIA 2015d). At a time of slow wage growth, this boost in discretionary income is significant. A big question, though, is how individuals are spending that money, if at all.

Until now, the answer to that question has come from surveys or estimates based on aggregate data and has indicated that less than half of the money saved at the pump was spent. However, this report by JPMorgan Chase Institute shows that individuals are spending roughly 80% of that extra money. With lower gas prices expected to last through the year, this extra disposable income is fueling consumer spending on categories other than gas.

Data

From a universe of over 57 million anonymized debit and credit card account holders nationwide, we created samples of 25 million regular card users and 1 million core Chase customers.

Drawing from a universe of over 57 million anonymized customers, we created samples of 25 million regular debit and credit card holders and 1 million core Chase customers to shed new light on the effects of gas price decreases on consumer spending. We examined spending behavior as prices dropped 45% to their recent trough in January 2015 to determine who experienced the biggest increase in spending power, how much money they spent, and what they bought. Answers to these questions are good indicators of what we can expect going forward if gas prices remain at these lower levels, as projected.

57 Million

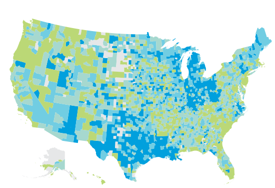
DEBIT OR CREDIT CARD ACCOUNT HOLDERS

25.6 Million

REGULAR USERS OF A CHASE CREDIT OR DEBIT CARD

5+ Average of 5+ monthly transactions

Used for Geographic Analysis



1 Million

DEBIT CARD HOLDERS WHO ARE CONSIDERED CORE CHASE CUSTOMERS

5+ 5+ monthly transactions from checking account

NO They do not hold a gas station specific card

Live in a zip code with 140+ other individuals in our sample.

376 Million Credit and Debit Transactions

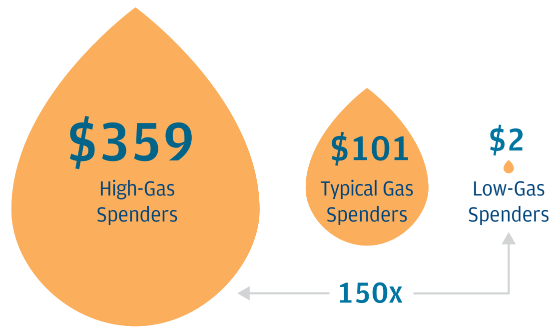
GAS SPENDING
Spending at gas stations

NON-GAS SPENDING
Spending that does not occur at gas stations

Finding One

Gas spending and the savings associated with gas price declines varied dramatically among U.S. individuals.

Median Americans spent on average $101 per month on gas between December 2013 and February 2014 when gas prices were high. High-gas spenders (the top 20% of gas spenders) spent $359 per month on gas using their credit and debit cards, more than triple the typical American, and low-gas spenders (the bottom 20% of gas spenders) spent only $2 per month, less than 2% of the typical American.

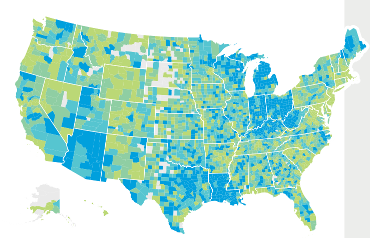


A year later, when gas prices hit their low point, the average American saved $22 per month on gas, but there was significant variation among individuals. Twenty-three percent of the population decreased their gas spending by 50% or more, and 16% increased their gas spending by 50% or more.

Finding Two

People in the South and Midwest spent more on gas and saw larger increases in disposable income when gas prices declined relative to those on the East and West coasts.

People in the South and Midwest spent more on gas and saw larger increases in disposable income when gas prices declined relative to those on the East and West coasts. In the Midwest and South, "higher-impact states," people saw the largest percentage declines in gas prices and gas spending as a fraction of income. In the East and West, "lower-impact states," people saw smaller drops in gas prices and gas spending as a fraction of income. Initially, people in higher-impact states typically paid lower gas prices and consumed more gas than people in lower-impact states.

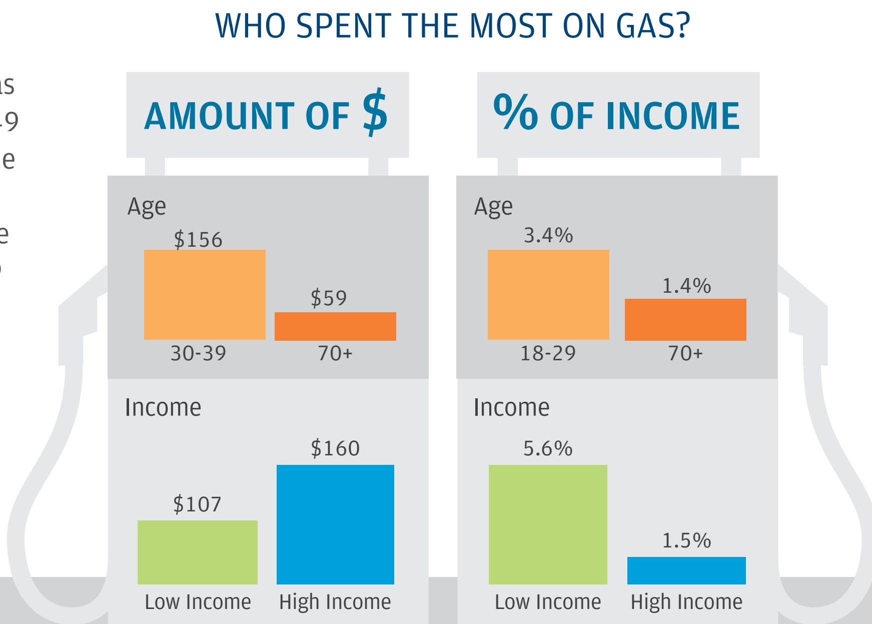


		Initial Gas Prices	Initial Quantity of Gas Consumed	Drop in Gas Prices
Higher-Impact States Large Drop in Gas Spending	**Midwest** IA IN KS MI MO OH SD **South** AL KY LA MS OK TN TX	$ (small)	(large car)	% (large)
Lower-Impact States Small Drop in Gas Spending	**East** CT DE DC FL MA MD NC NY PA **West** AK CA HI NV OR WA	$ (large)	(small car)	% (small)

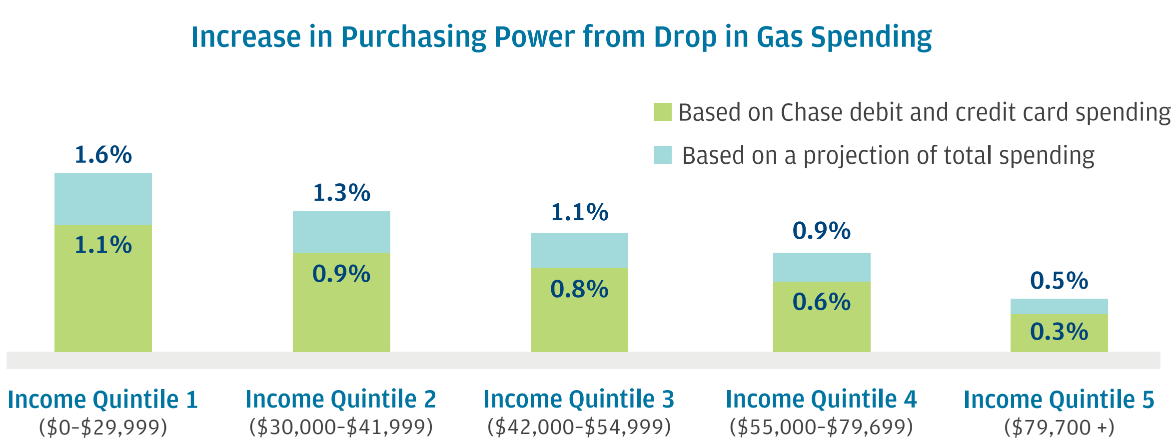
Finding Three

Savings at the gas pump represented more than 1% of monthly income for low-income individuals and disproportionately impacted younger Americans.

Although gas spending was highest among men, 30–49 year-olds, and high-income earners, spending on gas represented a larger share of income for men, 18–29 year-olds and low-income earners than for other individuals as a whole.

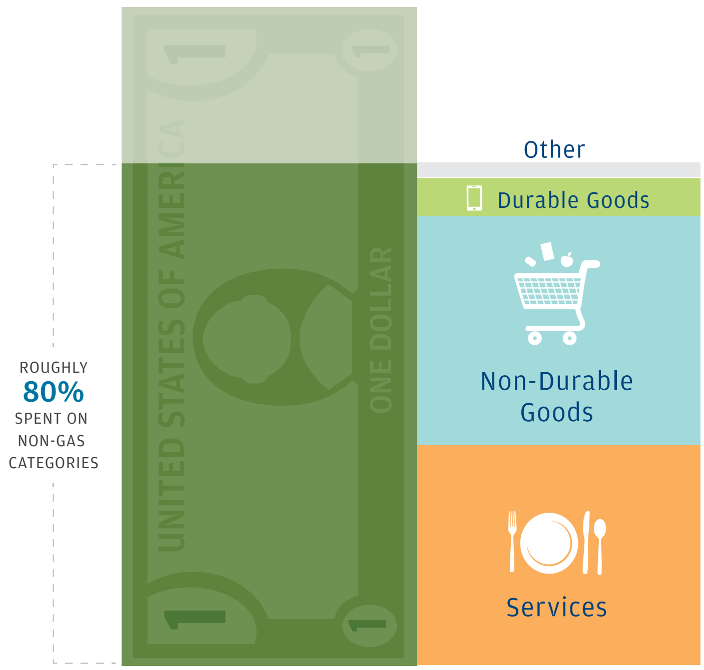


Notably, the recent low point in gas prices in January of 2015 yielded gas savings that represented 1.1% of monthly income for low-income individuals, equivalent to 1.6% of monthly income when projecting total gas spending and not just credit and debit card transactions.



Finding Four

Individuals spent roughly 80% of their savings from lower gas prices.



Individuals spent roughly 80% of their savings from lower gas prices. For every dollar less spent at the gas pump, individuals spent roughly 80 cents (72-89 cents) on other things. Almost 20% of the gas savings were spent at restaurants, but department stores, entertainment and electronics and appliances also saw significant gains.

Conclusion

We conclude that people are spending their savings from the pump to a greater extent than previously thought, and that the recent gas price declines are fueling growth in personal consumption in non-gas categories. This boost to consumers spending could be here to stay and even strengthen with time if gas prices remain low or continue to decrease as predicted. On the other hand, a substantial increase in gas prices might proportionately dampen consumer spend. We present evidence that the gains in discretionary spending from lower gas prices disproportionately accrue to low-income individuals, young people, and the Midwest and South, where people tend to spend more on gas. These regional and demographic differences are important inputs as policy makers consider gas tax reforms. Notwithstanding the environmental and infrastructure impacts from increased gas consumption, lower gas prices are good news for the U.S. consumer.

Introduction

The U.S. government projects that American households will save on average $700 this year on gasoline, as the price of a gallon of gas has fallen by nearly $1.50 from its peak of $3.70 in April 2014 and is projected to remain low through 2015 (U.S. EIA 2015d). But who feels the biggest increase in spending power? How much of that extra money do consumers spend, and what do they spend it on?

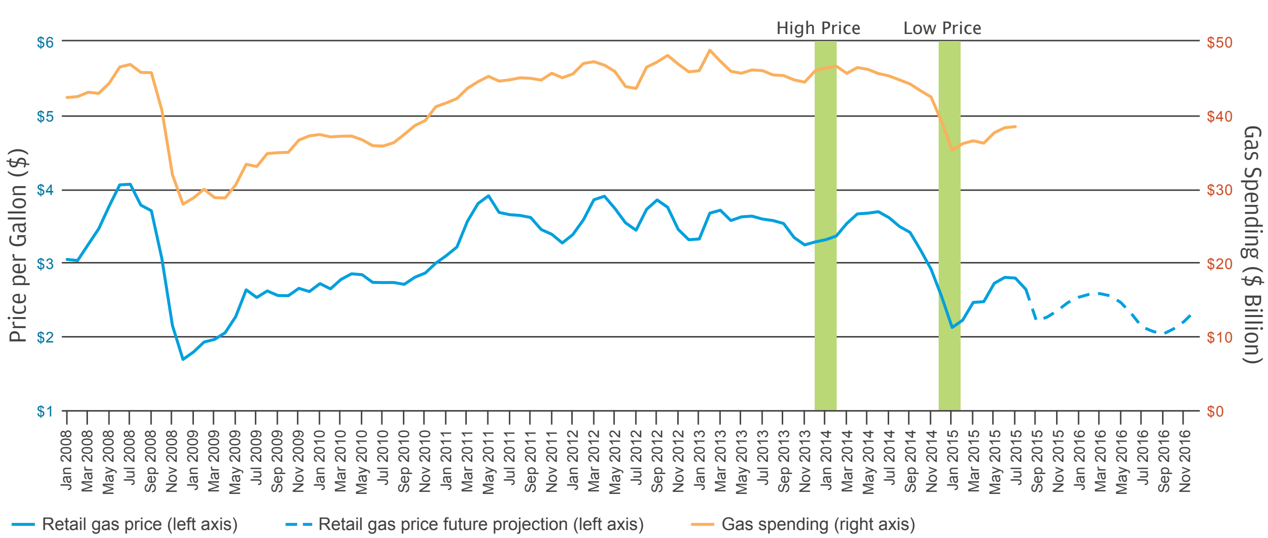
These questions have vexed policymakers and economists in the past, as information regarding the impact of gasoline prices is largely based on consumer surveys and not on actual spending data. The most recent government estimates based on aggregate data comparing the first quarters of 2014 and 2015 suggest that consumers spent only 45 cents for every dollar saved on energy (Furman 2015).

However, research by the JPMorgan Chase Institute shows that consumers spent nearly twice that amount—about 80 cents per dollar saved at the gas pump, and over half of that spending went to restaurants, other services and non-durables. In addition, this research reveals that the Midwest and the South saw the biggest declines in gas spending, primarily because they saw the biggest drops in price and because individuals in these regions consume the most gas. For low-income earners, savings at the pump represented 1.1% of monthly income, equivalent to 1.6% when projecting total spending, or more than half of the growth in income seen by low-income earners between 2013 and 2014. These insights into consumer spending habits shed new light on the effects of price decreases at the gas pump, and help us better understand the role such price declines play in fueling consumer purchases on non-gas categories.

Background

Before we take a closer look at our findings, we review recent trends and projections in gas prices and spending in Figure 1 as reported by the U. S. Energy Information Administration (EIA) and the Census Bureau, respectively. Between April 2014 and January 2015, U.S. gas prices declined 45% from a peak national price of $3.71 per gallon on April 28, 2014, to a low of $2.04 per gallon on January 26, 2015.

Figure 1: National trends in gas prices and spending, with reference to high and low price periods



Source: U.S. Energy Information Administration and U.S. Census Bureau

The last time the U.S. saw a large drop in gas prices was in the last quarter of 2008. Since then gas prices climbed steadily and remained relatively constant between 2012 and the beginning of 2014, fluctuating seasonally between roughly $3.25 and $3.75 per gallon. Prices then fell consistently, dropping by 45% from a peak of $3.71 on April 28, 2014, to a low of $2.04 per gallon on January 26, 2015. Although gas prices have since risen, the EIA forecasts that gas prices will remain below $3.00 through 2015 and 2016.

With the EIA projecting that households will save on average $700 on gasoline in 2015, the gains in disposable income from gas price declines are substantial when compared with recent policy interventions designed to stimulate the economy, as well as ongoing tax policy debates.[1] For example, the Recovery Rebates authorized by the Economic Stimulus Act of 2008 paid between $300 and $600 to each eligible individual. Recent monetary policy interventions generate savings for households in the form of lower interest rates, yielding an annual estimated savings of roughly $600 in lower interest payments on mortgages.[2] The recent fall in gas prices has resulted in a surge in debate and support for gas tax increases.[3]

Low-income individuals experienced the equivalent of a 1.6% increase in income from the fall in gas prices.

As noted above, two critical questions emerge regarding the impact of gas price decreases on the economy: first, who is impacted the most by changes in gas prices; and second, do people spend their savings at the gas pump when gas prices drop, and if so, what do they purchase? In answer to the first question, evidence from the 2014 Consumer Expenditure Survey conducted by the Bureau of Labor Statistics indicates that people spent roughly $205 a month, or roughly 3.7% of their income (before taxes) on gasoline in 2014. Gasoline spending in absolute terms is highest among individuals who are 45–54 years old, live in rural areas and in the West and South regions of the country, and who are high-income earners. However, as a fraction of income, individuals below 30 years old, who live in rural areas and in the Midwest and South, and who are lower-middle income earners (second income quintile) spend the highest fraction of their income on gas.[4] These groups are thus likely to be disproportionately impacted when gas prices fall—they experience the largest increase in discretionary income.

On the second question relating to how consumers react to gas price declines, current research suggests that these price decreases have not generated as much spending as expected. The Council of Economic Advisers estimates that while the recent gas price declines resulted in a 1.1 percentage point decline in energy consumption as a percent of disposable income, this drop only resulted in a 0.5 percentage point increase in non-energy consumption as a percent of disposable income (a 0.6 percentage point increase in personal savings and 0.1 percentage point increase in interest and transfer payments as a share of disposable income) (Furman 2015). This implies a marginal propensity to consume of roughly 45%, much lower than estimates based on past price declines which show that the consumption response exceeds the increase in discretionary income, implying a marginal propensity to consume of greater than 100%.[5]

A recent Gallup poll suggests an even smaller consumer response (Swift, 2015). Although 57% of respondents feel that lower gas prices are making a noticeable difference in their household finances, only 24% say they are spending their gains; the rest are using their gains to pay down bills (42%) or save (28%) (Swift, 2015). Such varying estimates have left policymakers puzzled as to the impact of the recent gas price declines. Federal Reserve Chair Janet Yellen's comments on June 17, 2015, reflect commonly held skepticism on existing data: "I'm not convinced yet by the data that we have seen the kind of response to [the decline in oil prices] that I would ultimately expect. It's hard to know at this point whether or not that reflects a very cautious consumer that is eager to add to savings and to work down borrowing [or that consumers are] not yet confident that the decline in the need to spend [on gasoline] will be permanent" (Federal Reserve Board of Governors, 2015).

It turns out that consumers are spending more of their savings at the pump than has been recently estimated. As described above, existing evidence is suggestive but incomplete. The individual-level surveys have limited sample sizes and are based on self-reported actions rather than economic transactions, and the macro evidence is hard to disentangle from other underlying changes in the economy.

In contrast, the JPMorgan Chase Institute has a rich source of data that offer new, more precise insights into this question. These data include geographically specific, high-frequency, anonymized individual debit and credit card spending from a sample of over 25 million individuals. We analyze these data to describe who is most impacted by gas price changes, and how spending patterns changed after the most recent gas price decline in the second half of 2014.

Our data include debit and credit card spending over the course of 33 months from October 2012 through June 2015. We examine spending during the trough in gas prices, from December 2014 to February 2015, when prices averaged $2.31 per gallon. We compare this spending behavior to one year prior, December 2013–February 2014, when gas prices averaged a dollar higher at $3.31 per gallon. Throughout this paper we will refer to these periods as the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015). We chose these periods to maximize the high-to-low variation in gas prices while also allowing us to control for seasonality in gas spending. We explore the impact of gas price declines on consumer behavior across the nation, recognizing the multiple factors that differ by region.

We identify gas and non-gas consumer spending using anonymized data from debit and credit card transactions among Chase customers. We classify all spending at gas stations as gas spending, and spending on everything else as non-gas spending. For most individuals, we know area of residence by zip code, income, age and gender, which allows us to examine consumer behavior across different demographic and geographic groups. Although we do not observe the quantity of gas purchased or the price of gas for each transaction, we use state-specific price data to explore the impacts of gas price declines on the average per capita quantity of gas purchased in each state.[6] The Data Asset and Methodology section provides a more in-depth description of the data and methods used in this report.

Our four key findings are summarized here and described in detail below:

- **Finding 1:** Gas spending and the savings associated with gas price declines varied dramatically among U.S. individuals. The median American spent $101 per month on gas between December 2013 and February 2014 when gas prices were high. High-gas spenders (the top 20% of gas spenders) spent $359 per month on gas using their credit and debit cards, more than triple the typical American, and low-gas spenders (the bottom 20% of gas spenders) spent only $2 per month, less than 2% of the typical American. A year later, when gas prices hit their low point, the average American saved $22 per month on gas, but there was significant variation among individuals. Twenty-three percent of the population decreased their gas spending by more than 50% or more, and 16% increased their gas spending by 50% or more.
- **Finding 2:** People in the South and Midwest spent more on gas and saw larger increases in disposable income when gas prices declined relative to those on the East and West coasts. In the Midwest and South, "higher-impact states," people saw the largest percentage declines in gas prices and gas spending as a fraction of income. In the East and West, "lower-impact states," people saw smaller drops in gas prices and gas spending as a fraction of income. Initially, people in higher-impact states typically paid lower gas prices and consumed more gas than people in lower-impact states.
- **Finding 3:** Savings at the gas pump represented more than 1% of monthly income for low-income individuals and disproportionately impacted younger Americans. Although gas spending was highest among men, 30–49 year-olds, and high-income earners, spending on gas represented a larger share of income for men, 18–29 year-olds and low-income earners than other individuals as a whole. Notably, the recent low point in gas prices in January of 2015 yielded gas savings that represented 1.1% of monthly income for low-income individuals, equivalent to 1.6% of monthly income when projecting total gas spending and not just credit and debit card transactions.
- **Finding 4:** For every dollar less spent at the gas pump, individuals spent roughly 80 cents (72–89 cents) on other things. Almost 20% of the gas savings were spent at restaurants, but department stores, entertainment, electronics and appliances also saw significant gains.

Consumers report that they are using their gains at the pump to pay down debts and save. Our data show they are spending them.

Findings

Finding One

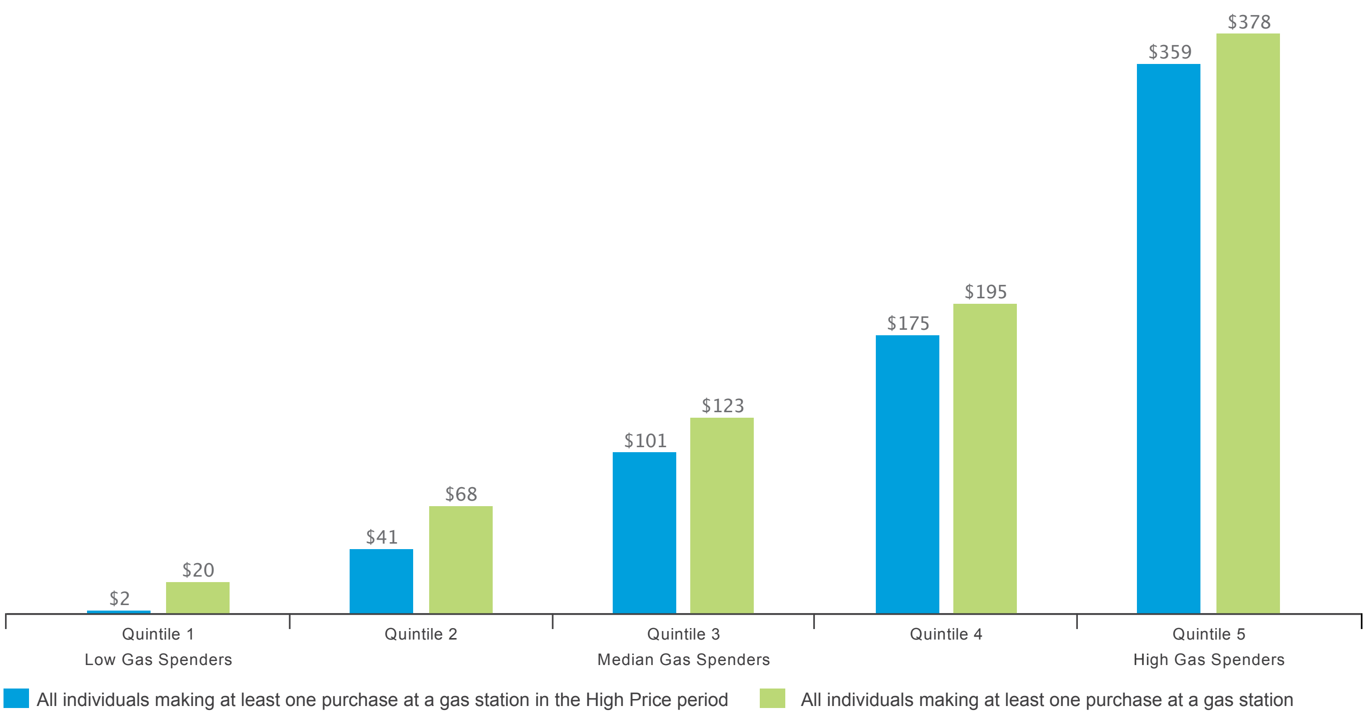
Gas spending and the savings from gas price declines varied dramatically among individuals.

Individual gas spending varies by almost 150-fold between low-gas and high-gas spenders

Before the fall in gas prices, average gas spending for the whole population was $136 per month (in the High Price period). Figure 2 below displays average monthly per person gas spending on Chase credit and debit cards in the High Price period, one year before the national trough in the price of gas. This figure segments the population into quintiles of gas spend. We refer to the bottom quintile as "low-gas spenders," the third quintile as "median-gas spenders," and the top quintile as "high-gas spenders." Median-gas spenders spent on average $101 per month on gas. In contrast, low-gas spenders spent only $2 per month on gas, less than 2% of the typical American, and high-gas spenders spent $359 per month on gas, more than triple the typical American and almost 150-fold that of low-gas spenders.

To ensure that this individual variation is not merely driven by variation in the degree to which people purchase gas using their Chase debit or credit card versus other payment instruments, we calculate this same distribution restricting our sample to the 78% of people who show any gas purchase in the High Price period. As shown in Figure 2 below, within this subsample, we still see almost a 20-fold gap between low-gas and high-gas spenders.[7]

Figure 2: Average monthly gas spending by quintile of gas spend, High Price (Dec 2013–Feb 2014)



Source: JPMorgan Chase Institute

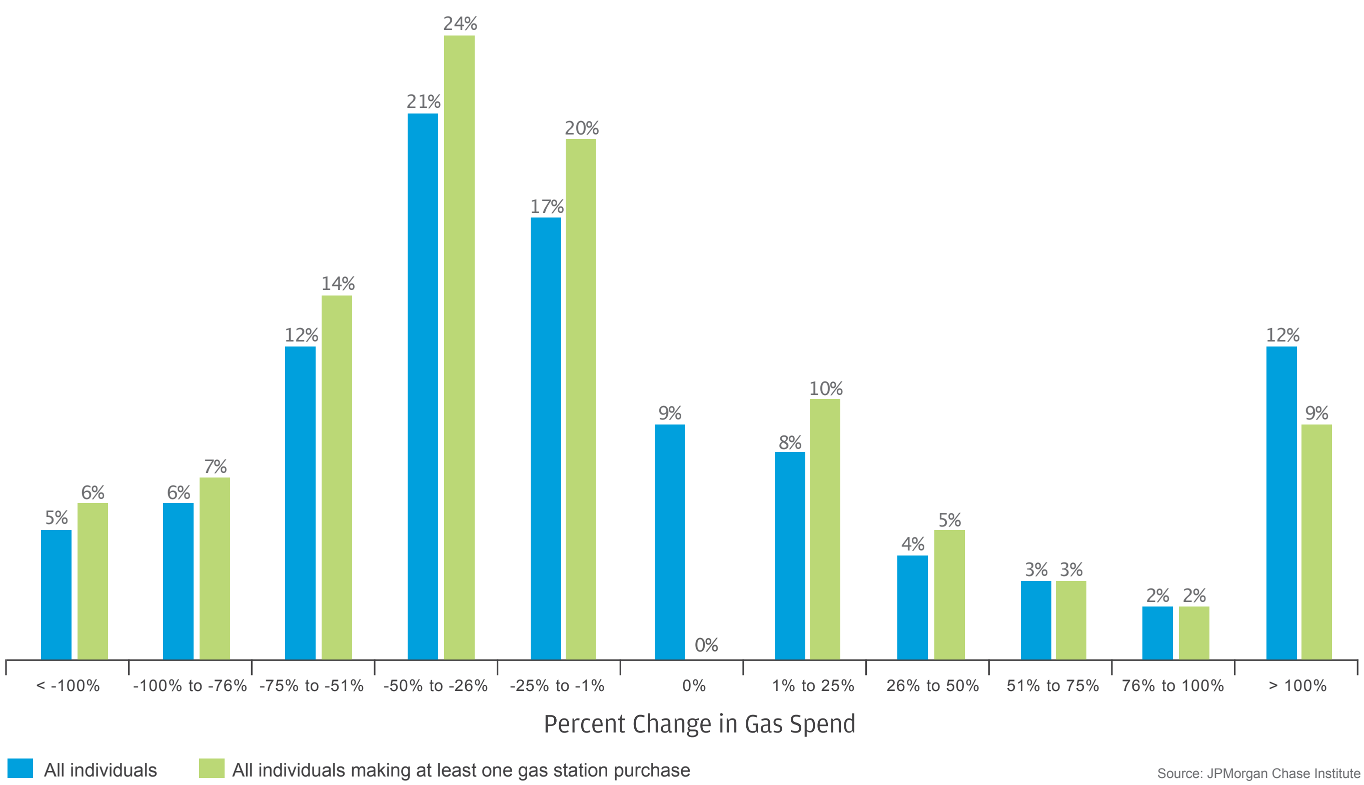
The levels of monthly gas spending that we observe are significantly lower in the Chase sample for 2014 ($146) than the $206 reported in the 2014 Consumer Expenditure Survey. This gap likely exists because people may pay for some of their gasoline using cash, check or a non-Chase card. In addition, the gap could be partially due to differences between the Chase sample and the nation. This gap will also explain why, for 2014, we estimate that individuals spent only 2.9% of their income on gas compared to the national average of 3.7% of income, according to the Consumer Expenditure Survey.[8]

High-gas spenders spend $359 per month on gas, more than triple the typical American and almost 150-fold that of low-gas spenders.

Between the High Price period and the Low Price period, the average person saw a $22 decrease in gas spending, but there was again significant variation among individuals. As shown in Figure 3 below, 62% of all individuals decreased their gas spending, including 23% of people who decreased their gas spending by 50% or more. Nine percent of people saw no change in their gas spending, and 29% increased their gas spending, including 16% of people who increased their gas spending by more than 50%. Again, we find similar degrees of variation in the change in spending on gas when we examine only individuals who showed any gas spending in the High Price period. Among this sample, 71% of people spent less on gas in the Low Price period compared to the High Price period, and 27% decreased their gas spending by more than 50%. The remaining 29% increased their gas spending, including 14% who increased expenditures on gas by more than 50%.

Taken together, Figures 2 and 3 convey not only the variation among individuals in terms of gas spending but the degree of volatility of gas spending due in part to the gas price decline. Next we explore regional and demographic differences in levels and changes in gas spending.

Figure 3: Distribution of the percent change in monthly gas spending between the High Price period and the Low Price period



Source: JPMorgan Chase Institute

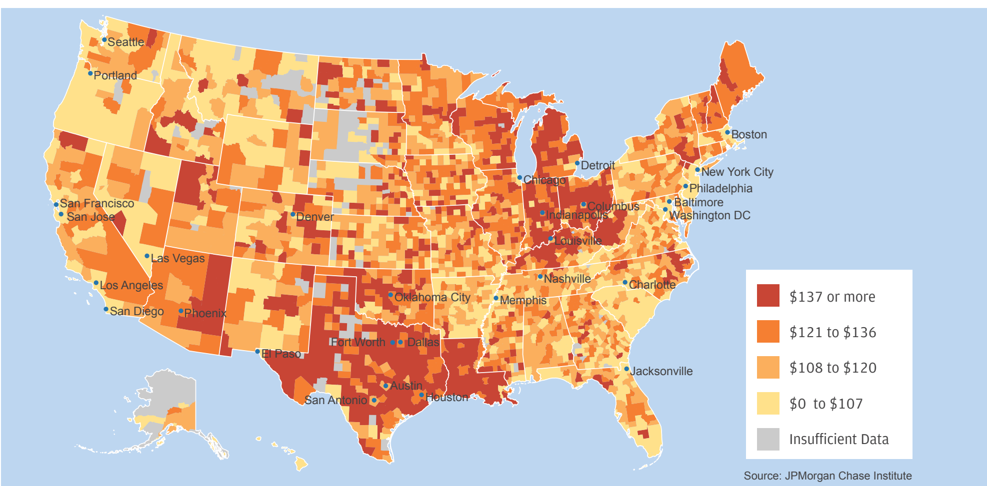
Finding Two

People in the South and Midwest spent more on gas and saw larger increases in disposable income when gas prices declined relative to those on the East and West coasts.

People in the Midwest and South spent the most on gas

Gas spending varies tremendously by geography. Although Chase's branch footprint covers 23 states, we are able to observe spending behavior across the nation by aggregating observed spending on both debit and credit cards. As described in the Data and Methodology section, the mix of debit and credit holders in any given state varies significantly.[9] Figure 4 maps the different levels of observed average monthly gas spend by county in the High Price period, based on 25.6 million frequent Chase credit or debit card users. Figure 5 shows observed spend levels as a percent of income. Evident from these maps is that people in the Midwest and the South spent the most on gas both in absolute terms and as a fraction of income. In addition, the brighter spots around major cities indicate that people in urban areas spent less on gas, particularly as a fraction of their income.[10]

Figure 4: Average gas spend by county in the High Price period (Dec 2013–Feb 2014)



Top 5 Counties*

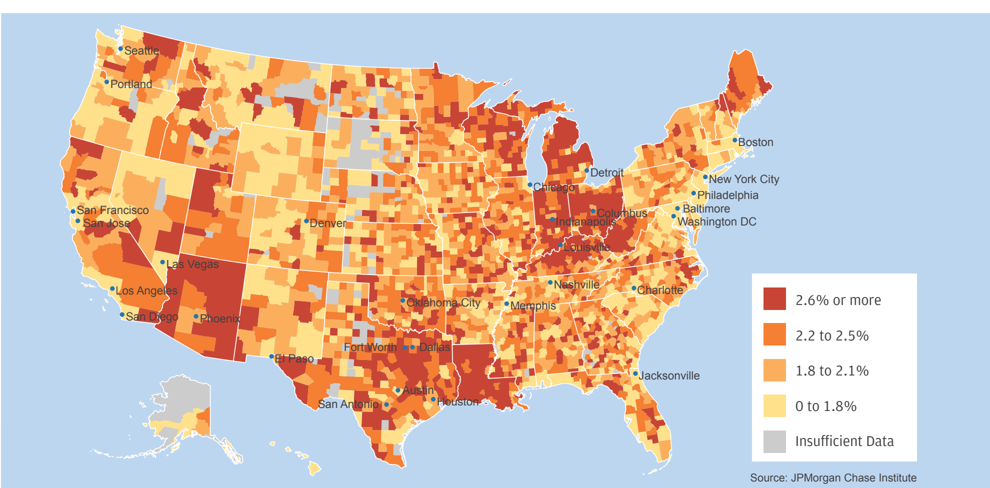
Allen, Louisiana
Armstrong, Texas
Cameron, Louisiana
Greenlee, Arizona
La Salle, Texas

Bottom 5 Counties*

Bronx, New York
District of Columbia
Hudson, New Jersey
Kings, New York
New York, New York

* Counties within each list are displayed in alphabetical order

Figure 5: Average gas spend as a percent of income by county in the High Price period (Dec 2013–Feb 2014)



Top 5 Counties*

Clay, West Virginia
Crawford, Indiana
Greenlee, Arizona
Lincoln, West Virginia
Morrow, Ohio

Bottom 5 Counties*

District of Columbia
Hudson, New Jersey
Maui, Hawaii
New York, New York
San Francisco, California

* Counties within each list are displayed in alphabetical order

We further explore this geographic variation by ranking states according to gas spend, both in levels and as a percent of income, in Figure 6 below. Individuals in West Virginia spent the most on gas both in absolute terms and as a fraction of their income. The top 10 states in terms of gas spending were all in the South (Kentucky, Louisiana, Oklahoma, Texas, West Virginia) and the Midwest (Indiana, Ohio, Wisconsin), with the exception of New Hampshire and Maine. The top 10 states in terms of spending as a percent of income were again all in the South (Kentucky, Louisiana, Oklahoma, Texas, West Virginia) and the Midwest (Indiana, Michigan, Ohio, Wisconsin), with the exception of Arizona.

The bottom 10 states in terms of spending on gas are all in the East (District of Columbia, Maryland, New Jersey, New York, South Carolina, Virginia) and the West (Alaska, Hawaii, Montana, Oregon). Individuals in the bottom 10 states in terms of percent of income spent on gas are similarly mostly in the East (New Jersey, New York, Massachusetts, Connecticut, District of Columbia, Maryland) and the West (Alaska, Hawaii, New Mexico), with the exception of Virginia and South Carolina.

Figure 6: Average gas spend by state in the High Price period (Dec 2013–Feb 2014)

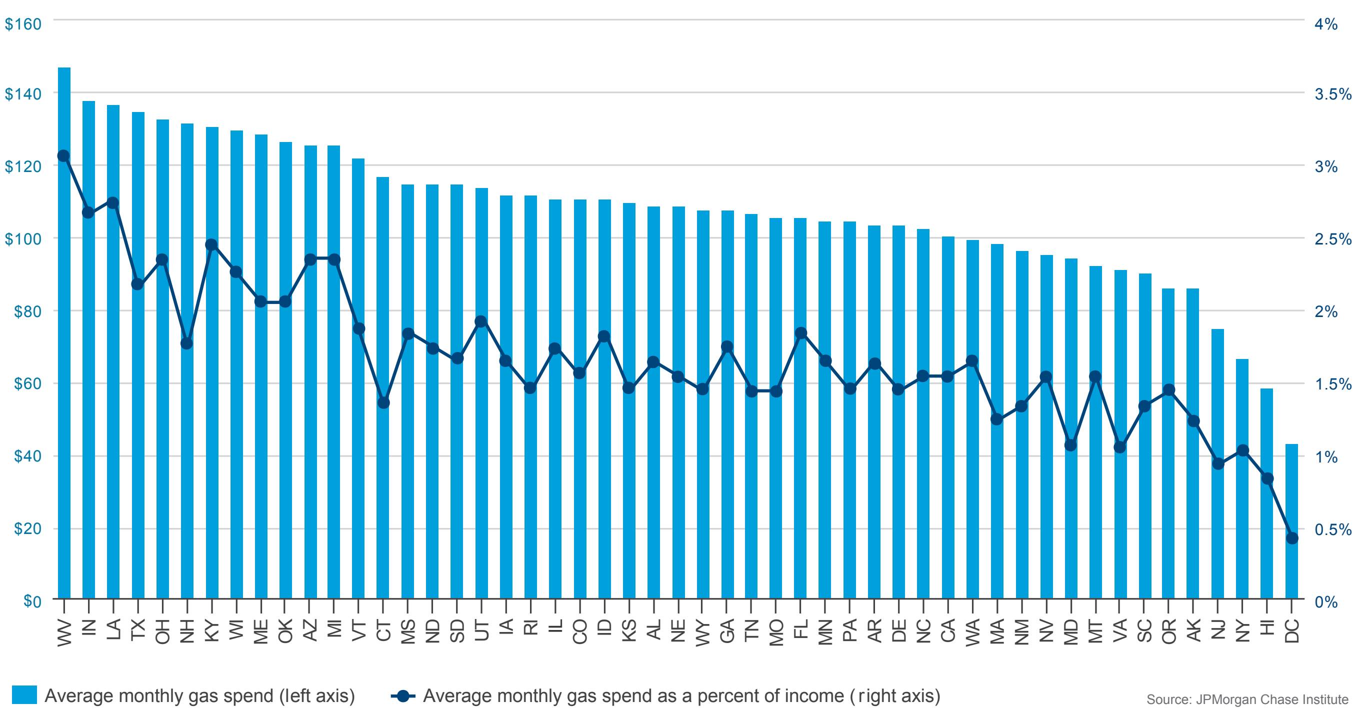
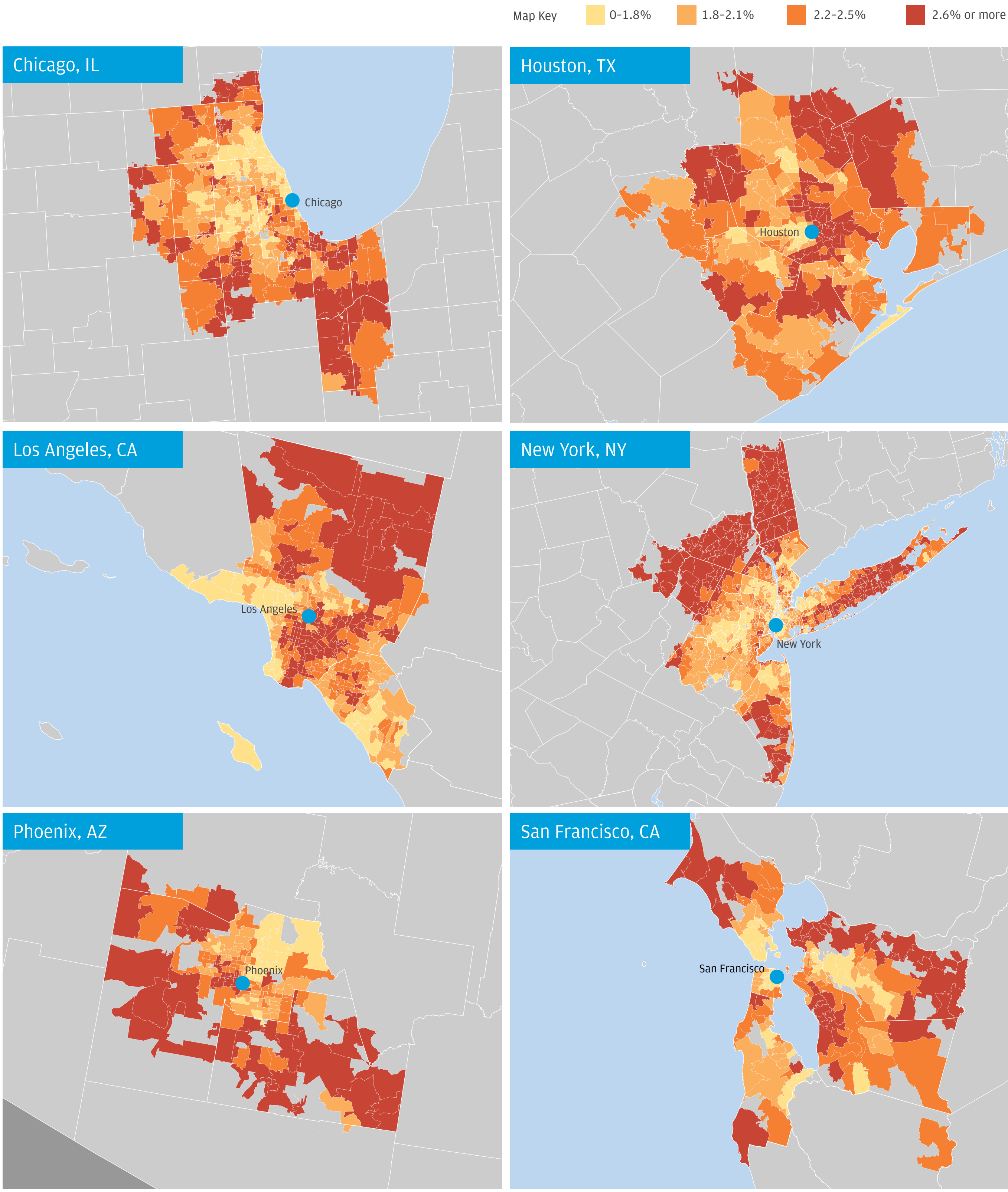


Figure 7 zooms in on six major cities—Chicago, Houston, Los Angeles, New York, Phoenix and San Francisco—and displays average monthly spending on gas as a percent of income by zip code. Evident from these more granular maps is that gas spending as a fraction of income is significantly higher in suburban as well as lower-income areas within metropolitan areas.

Gas spending as a fraction of income is significantly higher in suburban areas surrounding inner-city cores.

The recent gas price declines put more discretionary income into the pockets of people in the Midwest than anywhere else.

Figure 7: Average gas spend as a fraction of income by zip code within 6 metropolitan areas in the High Price period (Dec 201–Feb 2014)

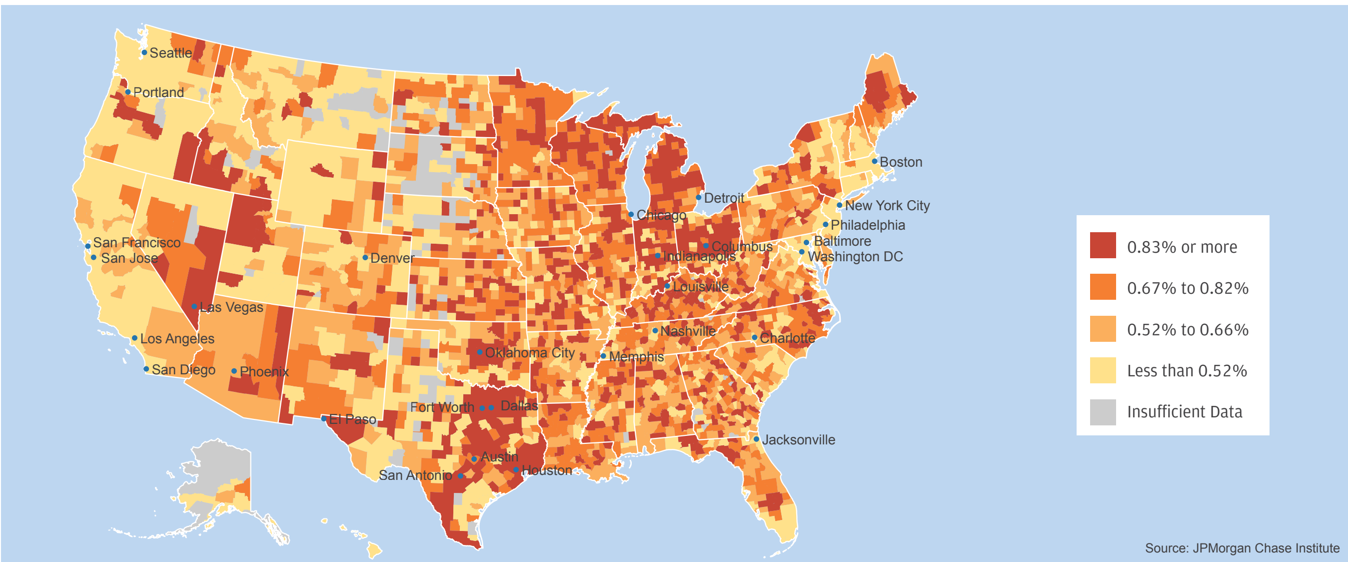


Source: JPMorgan Chase Institute

The Midwest saw the largest drops in gas spending

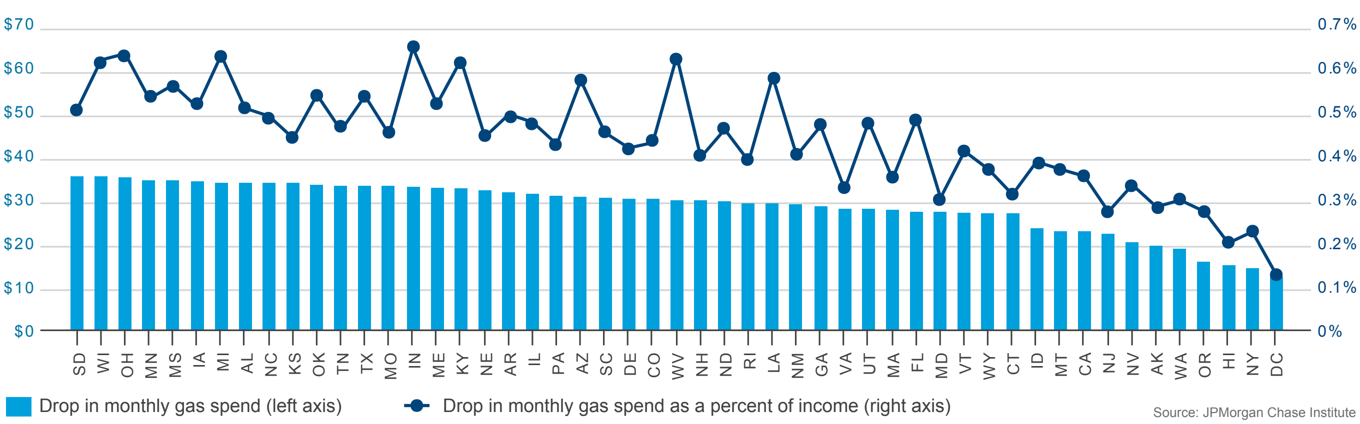
Having explored how gas spending varies by region, we now examine which areas of the country saw the largest drop in gas spending and the largest equivalent increase in disposable income as a result of the gas price declines. The map below shows the change in gas spending between the High Price and Low Price periods as a fraction of income. Counties that saw the highest increases in disposable income from lower spending on gas are concentrated within the Midwest and southern Plains states.

Figure 8: Drop in average monthly gas spending as a percent of income by county between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015)



The recent gas price declines put more discretionary income into the pockets of people in the Midwest than anywhere else. As shown in Figure 9, the 10 states that saw the largest drops in gas spending are all in the Midwest (Iowa, Kansas, Michigan, Minnesota, Ohio, South Dakota, Wisconsin) and the South (Alabama, Mississippi, North Carolina). In terms of spending on gas as a fraction of income, the top 10 states are again all in the South (Kentucky, Louisiana, Mississippi, Oklahoma, West Virginia) and the Midwest (Indiana, Michigan, Ohio, Wisconsin). The 10 states that saw the smallest drop in gas spending are all in the East (District of Columbia, New Jersey, New York) or the West (Alaska, California, Hawaii, Montana, Oregon, Washington). Gas spending as a fraction of income fell the least in many of these same states (Connecticut, District of Columbia, Maryland, New Jersey, New York, and Virginia in the East; and Alaska, Hawaii, Oregon, and Washington in the West).

Figure 9: Drop in gas spending between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015), by state



Overall, Midwestern and Southern states were "higher-impact" states while Eastern and Western states were "lower-impact" states

In any given state, the change in gas spending is determined by the initial price of gas and quantity of gasoline purchased in the High Price period as well as the changes in price and quantity purchased after gas prices dropped. These four factors are interrelated. We observe spending on gas, which we combine with state-level gas prices in order to infer average monthly quantity of gas consumed by each state.[11] We find several important geographic differences, both in levels and in changes in gas prices and quantity consumed, which underpin differences in gas spending across states.

2x

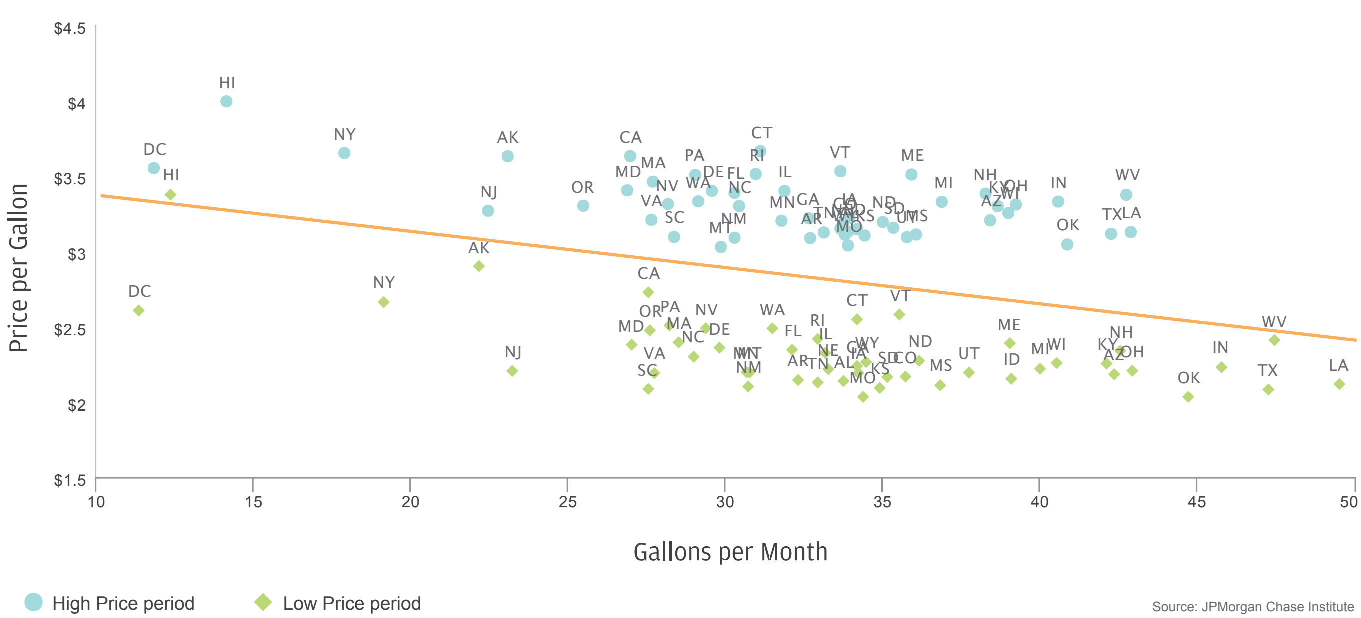
There was more than a two-fold spread in the percent change in price that states observed as gas prices fell nationally.

First, states varied significantly in terms of price levels. According to the EIA, in the High Price period, and in general, prices in California ($3.68 per gallon) and New York ($3.73 per gallon) were significantly higher than in Texas ($3.19 per gallon) and Colorado ($3.23). State differences in gas prices are largely due to differences in state gas tax rates, which vary from as high as 70 cents per gallon in Pennsylvania to as low as 31 cents per gallon in Alaska, as estimated by the American Petroleum Institute (2015).[12]

Second, there was more than a two-fold spread in the percent change in price that states observed as gas prices fell nationally between the High Price and Low Price periods. Six states experienced a price decline of more than one-third (Ohio, Michigan, Oklahoma, Texas, Missouri), whereas Hawaii saw only a 15% drop in gas prices. Moreover, states with higher relative gas prices saw smaller percent changes in gas prices (e.g., 25% price decline in California) during this period than states with low prices (e.g., 32% price decline in Texas). This is likely because differences in state gas prices are driven by gas taxes, which are largely implemented on a per gallon basis. This fixed-rate tax structure tends to dampen price fluctuations in percent terms in states with high gas taxes.

Third, in terms of quantity of gas, there is almost a four-fold spread in the amount of gas consumed per capita across states, with Louisiana, West Virginia and Texas at the top and New York, Hawaii and the District of Columbia at the bottom. As shown in Figure 10 below, in states that have higher prices, individuals consume less gas. This correlation reflects many factors other than price that influence gas consumption both across states and within each state over time.

Figure 10: Quantity of gas consumed and price of gas in the High Price period and the Low Price period, by state

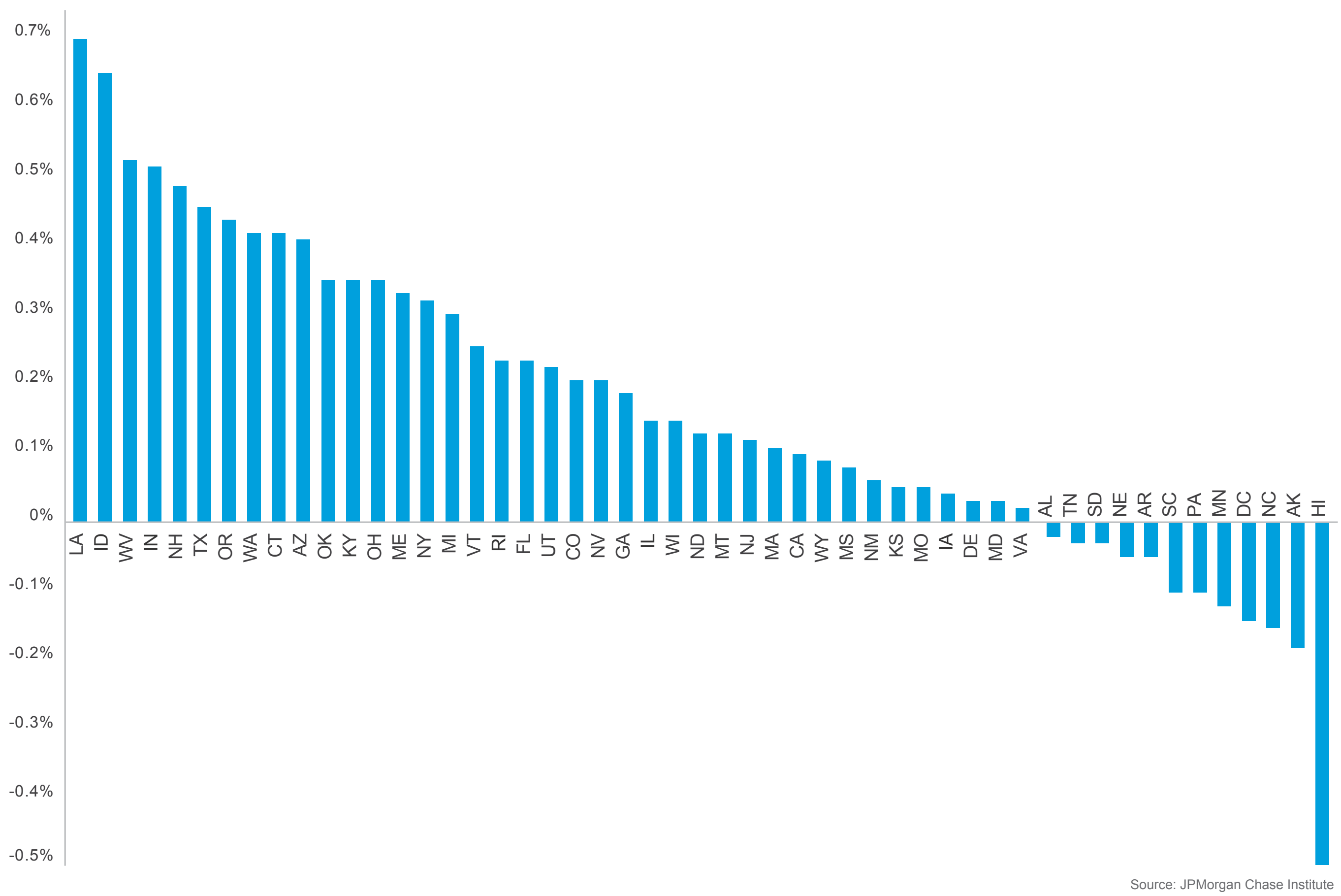


Source: JPMorgan Chase Institute

Finally, in Figure 11, we explore changes in the quantity of gas consumed in each state. On average, the quantity of gas consumed increased by almost 4% between the High Price period and the Low Price period. Fifteen states experienced more than a 0.3% increase in gas consumed for every 1% drop in gas prices between the High Price period and the Low Price period.[13] These are states where people already consume a lot of gas. Individuals in these states increased their gas consumption significantly when prices declined. Twenty-four states saw more moderate quantity drops as a fraction of price changes between the High Price and Low Price periods.[14] In the remaining 11 states and the District of Columbia we observed a decrease in gas consumption between the High Price period and the Low Price periods. These states had relatively low absolute levels of spending on gas and relatively low gas consumption when gas prices were higher. Individuals in these states further decreased their gas consumption even as gas prices declined. It is worth noting that all of these states are outside of Chase's branch footprint, which may influence their results.

The quantity of gas consumed increased by almost 4% between the High Price period and the Low Price period.

Figure 11: Percent change in quantity associated with a 1% decrease in price between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015)



Bringing these four pieces together—gas price and consumption levels before the fall in gas prices and the resulting changes in each—allows us to break down the differences across states in the drop in gas spend displayed in Figure 9. Although price changes account for most of the change in spending, substantial quantity changes also occurred in some cases. Two segments of states emerge from these complex dynamics.

Figure 12: Higher-Impact states and Lower-Impact states during the gas price decline

	Initial Gas Prices	Initial Quantity of Gas Consumed	Drop in Gas Prices
Higher-Impact States Large Drop in Gas Spending **Midwest** IA IN KS MI MO OH SD **South** AL KY LA MS OK TN TX	$ Low	High	% High
Lower-Impact States Small Drop in Gas Spending **East** CT DE DC FL MA MD NC NY PA **West** AK CA HI NV OR WA	$ High	Low	% Low

Source: JPMorgan Chase Institute

First, there are the higher-impact states. These states consumed a lot of gas, tended to have lower prices, and saw larger drops in prices (e.g., more than a 30% drop). Most of these states saw relatively large drops in gas spending (Figure 9) despite that people in these states were more likely to use some of their gas savings to purchase more gas (i.e., they increased consumption more significantly for every 1% drop in price as shown in Figure 11). In Figure 10 these states moved both down and to the right significantly between the High Price and Low Price periods. Seventeen states fall into this segment, including much of the South (Alabama, Kentucky, Louisiana, Mississippi, Oklahoma, Tennessee, Texas) and the Midwest (Indiana, Iowa, Kansas, Michigan, Missouri, Ohio, South Dakota).

In the Midwest and South, higher-impact states, people saw the largest percentage declines in gas prices and gas spending as a fraction of income.

Then there are the lower-impact states. These states tend to be places where gas consumption is relatively low, prices are relatively high, and the change in price was relatively low (e.g., less than 30% drop). In Figure 10 these states moved down between the High Price and Low Price periods but not much to the right. Fifteen states fall into this segment, including much of the East (Connecticut, Delaware, District of Columbia, Florida, Maryland, Massachusetts, New York, North Carolina, Pennsylvania) and the West (Alaska, California, Hawaii, Nevada, Oregon, Washington). Perhaps not surprisingly they are precisely the areas that show the lowest change in gas spending, namely the East and West coasts of the country, as illustrated in Figure 9.

The states not included in either of these groups were in the middle in terms of drop in gas spending; this is because they were in the mid-range in terms of price, change in price, quantity and change in quantity. Bringing to light—for the first time to our knowledge—state-level data on all four of these dimensions illuminates how important these components are as state governments consider gas tax changes.

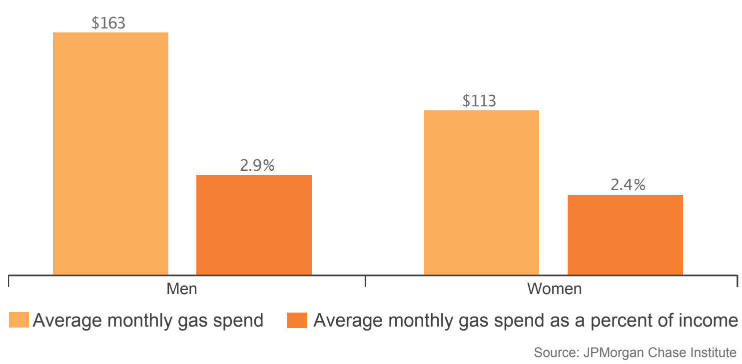
Finding Three

Savings at the gas pump represented more than 1% of monthly income for low-income individuals and disproportionately impacted younger Americans.

Men, individuals under 30 and those with low incomes spent the highest share of their income on gas

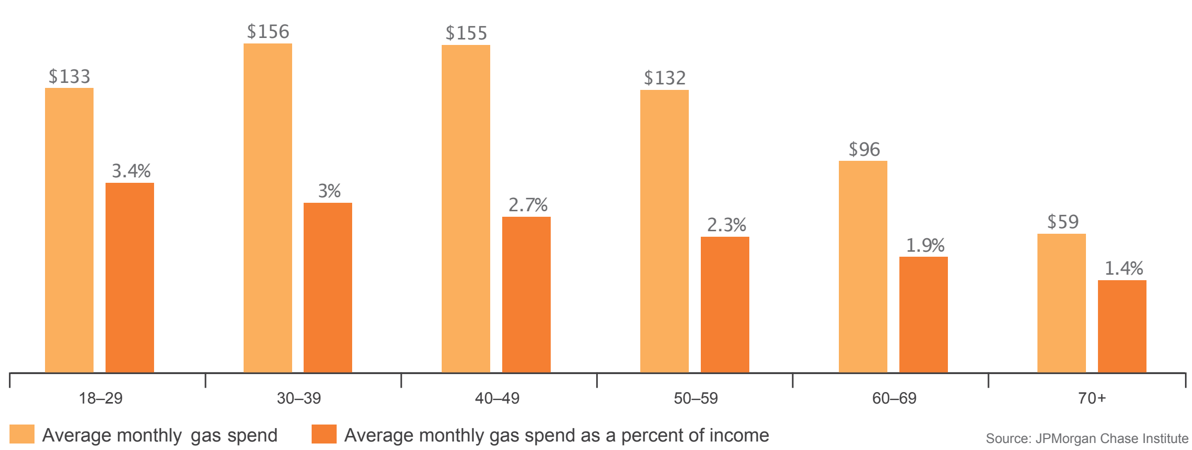
Next we examine demographic differences in gas spending behavior. We shift from our sample of 25 million consumers we used for our geographic analysis to a random sample of 1 million Chase customers whom we consider to be “core” and in whom we have greater confidence that we are seeing most of their spending activity (see the Data Asset and Methodology section for a description of the sampling criteria and characteristics of this sample). In absolute terms, men, individuals in their 30s and 40s, and high-income individuals spent the most on gas, but individuals under 30 and those with low incomes spent the largest share of their income on gas. The figures below show average gas spend in dollars and as a percent of income by gender, age and income. Men spent on average $163 per month on gas compared to $113 per month for women. As a fraction of their income, men spent slightly more (2.9%) on gas than women (2.4%).

Figure 13: Average monthly individual gas spend in the High Price period (Dec 2013–Feb 2014), by gender



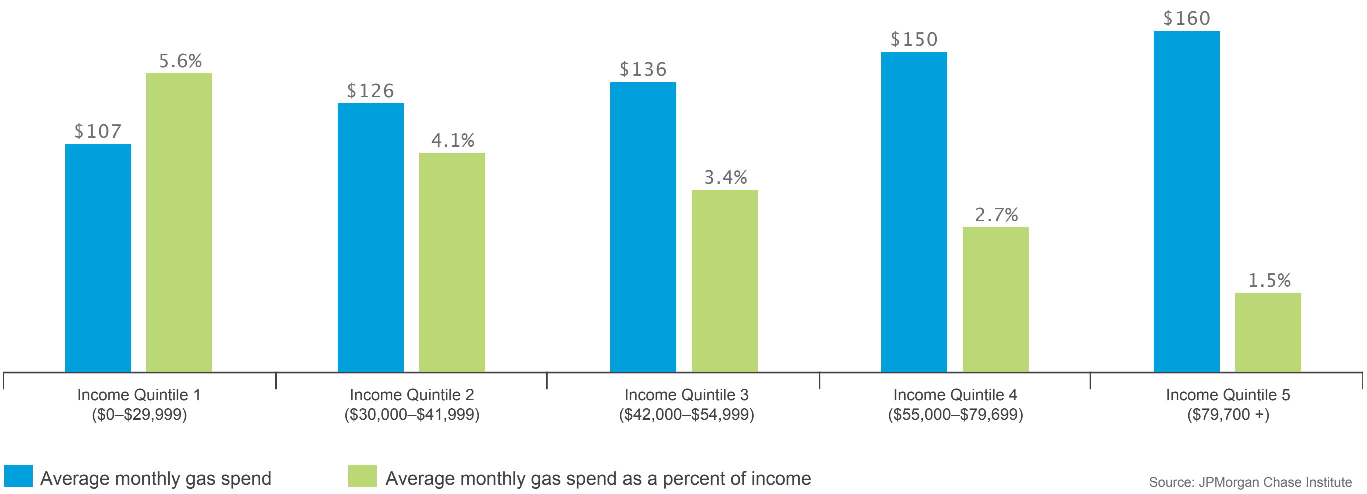
Gas spending is highest among individuals in their 30s and 40s, who spent around $155 per month on gas compared to less than $140 per month for all other age groups. In relative terms, individuals under 30 years old spent the most on gas as a fraction of their income (3.4%). Gas spending as a fraction of income declines steadily with age after age 30.

Figure 14: Average monthly individual gas spend in the High Price period (Dec 2013–Feb 2014), by age



Higher-income individuals spent more on gas in absolute terms, but low earners spent the most as a percent of their income. Those in the top income quintile (annual incomes greater than $79,900) spent $160 per month on gas, which translates to 1.5% of their monthly income. In contrast, those in the bottom income quintile spent only $107 per month on gas; yet, as a fraction of their monthly income they spend 5.6% on gas.

Figure 15: Average monthly individual gas spend in the High Price period (Dec 2013–Feb 2014), by income quintile



Gas savings represented more than 1% of monthly income for low-income individuals and disproportionately impacted younger Americans

Next we explore who was most impacted by the price declines by examining how the change in gas spending varied across various demographic groups. Men, individuals in their 30s and high-income individuals saw the largest dollar value drop in gas spending. As a fraction of their income, men, individuals under 40, and low-income individuals saw the largest proportional increases in discretionary income as a result of spending less on gas.

Figure 16: Change in monthly gas spend between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015), by gender

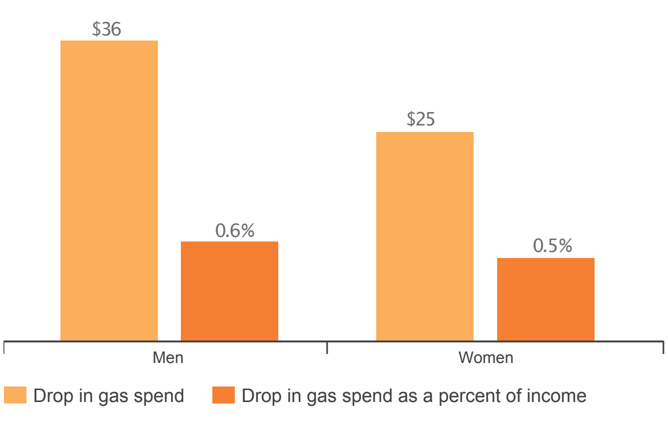
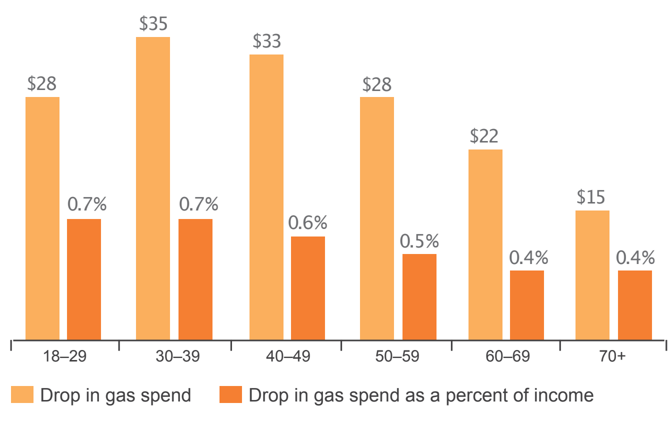
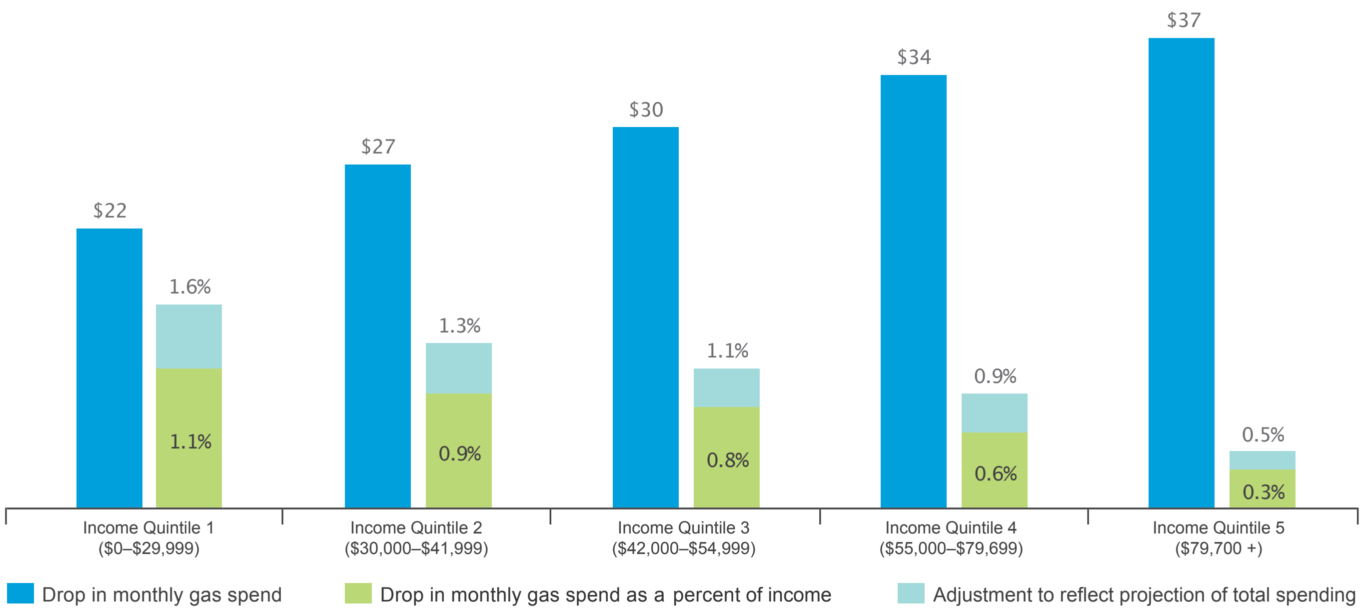


Figure 17: Change in monthly gas spend between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015), by age



Low-income individuals saw the equivalent of a 1.1% increase in monthly income as a result of the decline in their gas spending, and middle-income individuals (quintiles 2 and 3) experienced the equivalent of a 0.9% and 0.8% increase in monthly income, respectively. Given that we estimate that we observe only 71% of gas spending, we adjust these figures to reflect a projection of total spending. Figure 18 below displays the drop in monthly gas spending as a percent of monthly income based on Chase credit and debit card spending as well as a projection of total spending. With this adjustment we see that low-income individuals experienced the equivalent of a 1.6% increase in income.[15] To put these numbers in perspective, between 2013 and 2014 bottom quintile individuals saw a 2.1% increase in income, according to the Current Population Survey. In other words, the increase in purchasing power lower-income people felt as a result of the decline in gas prices (1.6%) was equivalent to three-fourths of the increase in monthly income they experienced between 2013 and 2014 (2.1%).

Figure 18: Change in monthly gas spend between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Feb 2015), by income



Source: JPMorgan Chase Institute

In summary, we find that gas prices had disparate impacts across the United States. When gas prices decline, people living in the Midwest, men, those under age 40, and lower-income individuals experience the largest boost to their purchasing power.[16] We next explore whether and on what people spent their savings from lower gas prices.

Finding Four

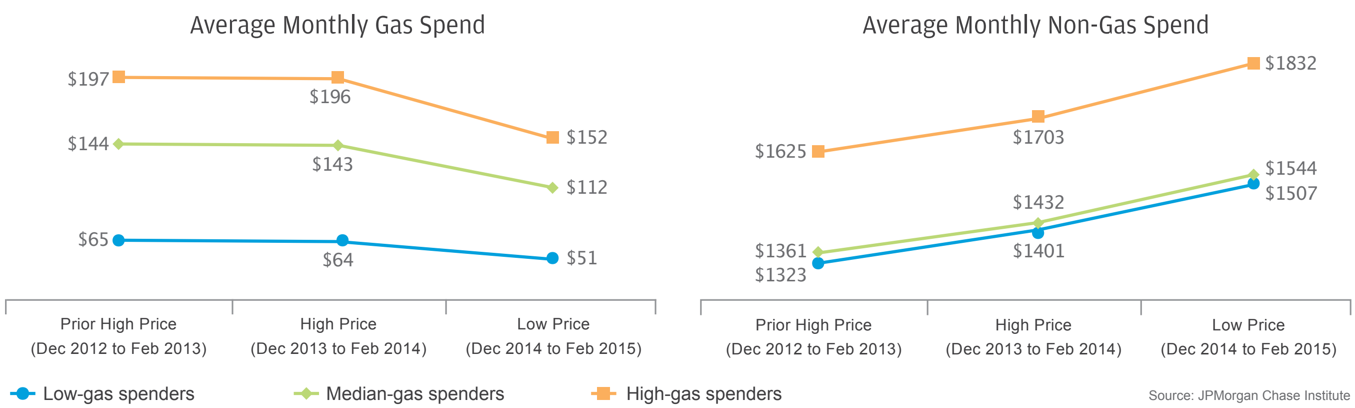
Individuals spent roughly 80% of their savings from lower gas prices.

The estimated marginal propensity to consume a dollar saved on gas is 73–89 cents or roughly 80%

Measuring the impact of the fall in gas prices on consumer spending is difficult to do with aggregate data because changes in non-energy consumption are potentially affected by many other economic factors. We isolate the causal impact of lower gas prices on non-gasoline spending by using anonymized individual-level spending data and comparing high-gas spenders to low-gas spenders.[17] We measure gas spending on debit and credit card transactions at gas stations and non-gas spending as all other transactions. Low-gas spenders are less impacted by gas price declines than high-gas spenders, yet they are affected similarly by other macroeconomic trends and market dynamics.[18] We validate low-gas spenders as a control group for high-gas spenders by comparing the spending behavior of these groups when gas prices were constant, between the High Price period (Dec 2013–Feb 2014; average price per gallon of $3.31) and one year prior (Dec 2012–Feb 2013; average price per gallon of $3.42), which we refer to as the Prior High Price period. In making these comparisons, it is worth noting that people who spend a lot on gas are not necessarily higher-income individuals. As shown in Figure 22 in the Data Asset and Methodology section, low-gas and high-gas spenders have comparable incomes.

In short, we expect many economic factors to affect everyone, but the decline in gas prices to disproportionately impact high-gas spenders.[19] This difference is evident in Figure 19 below, which displays average monthly gas and non-gas spending for high, median and low-gas spenders. When gas prices were steady, between the Prior High Price and High Price periods, there was little change in gas spending, while non-gas spending was increasing similarly for all groups.[20] In contrast, when gas prices dropped between the High Price and Low Price periods, gas spending dropped significantly more for high-gas spenders than for low-gas spenders ($45 compared to $13). Over the same time period, and facing similar economic conditions, high-gas spenders increased their non-gas spending by $23 more than low-gas spenders ($130 compared to $107). We use these figures to create our baseline estimate of the marginal propensity to consume (MPC)—for every additional dollar not spent on gas, individuals spent 73 cents ($23 of the $32 less in gas spending) on other things.

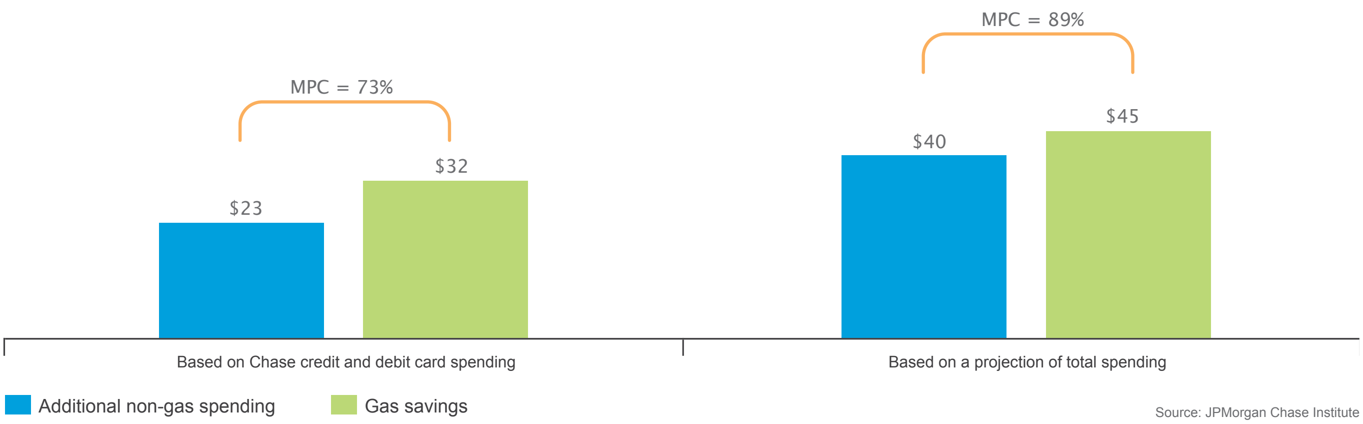
Figure 19: Levels of gas spending for low-gas spenders and high-gas spenders



We perform a number of robustness checks to this baseline MPC estimate of 73%, which we describe in the Data Asset and Methodology section. The bottom line, presented in Figure 24, is that our baseline MPC estimate of 73% is robust to a range of specifications, ranging from 60% to 74%. It increases to 89% when we adjust for the share of spending we observe on Chase debit and credit cards (estimated at 71% for gas spending and 58% for non-gas spending).[21] Even so, our results may underestimate the full extent to which people are spending their gains from lower gas prices, since we only consider spending categories that would ever appear on credit or debit cards. The range of these MPC estimates are higher than what has been implied by existing recent evidence, widely held beliefs and self-perceptions that people were not spending most of their gains at the pump. They are more in line, though, with historical evidence of a marginal propensity to consume that can even exceed 100%.[22]

The evidence suggests that gas price fluctuations indeed have a significant effect on consumer spending. Although the MPC that we measure is the individual consumption response to gas price declines, it may reflect not only individual consumer spending decisions but also short-term general equilibrium impacts within the local economy. For example, lower gas prices not only impact disposable income directly (as estimated in this report), but they also boost consumer confidence, decrease the operating costs of vehicles, drive down costs for businesses, and generate increased demand for, and therefore the production of, gasoline. To the extent that high-gas and low-gas spenders are concentrated geographically, and that these additional effects reverberate within these geographies in the short term, our estimate will include them as well.[23]

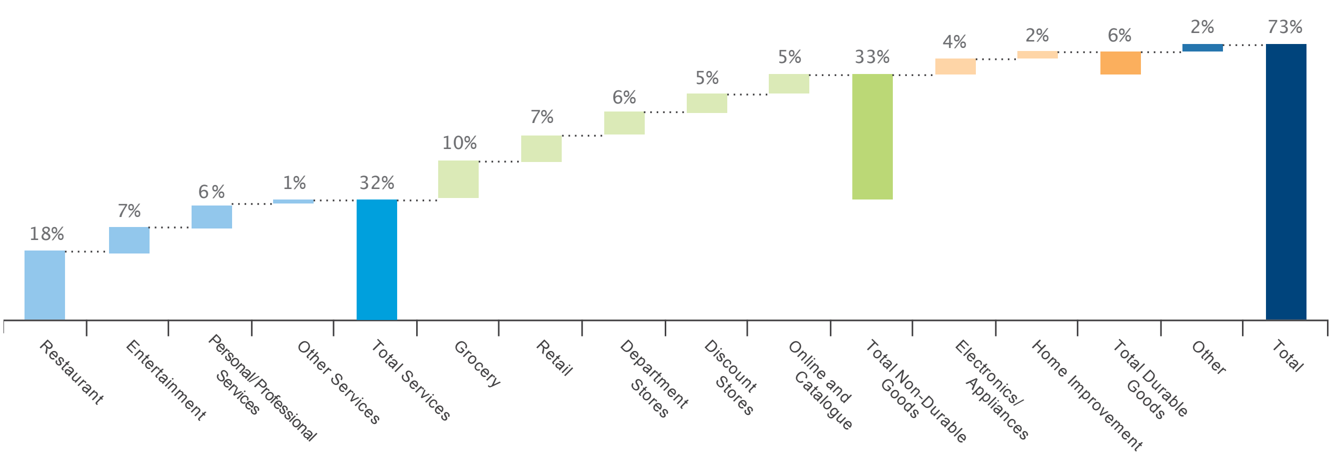
Figure 20: Marginal propensity to consume (MPC) from a $1 less spent on gasoline



People spent almost 20% of their gas savings on restaurants alone

As a final step, we provide a more in-depth look into how people spent their marginal dollars gained from gas price declines. In Figure 21, we show the breakdown of which categories people spent their gas savings on. We see that people spent 18% of their gas savings on restaurants alone and a total of 32% on services. The largest share of savings on gas (33%) was spent on non-durable goods, with 10% spent on groceries alone. An additional 6% was spent on durable goods, and 2% on other categories (e.g., charitable donations). The categories that saw the largest growth in percentage terms were department stores (8% increase), entertainment (7% increase) and electronics and appliances (6% increase). It is important to note that this distribution of observed spending by category may be influenced by the tendency to use credit and debit cards in each category.[25]

Figure 21: Percent of savings from lower gas prices spent on non-gas categories, by spending category



Implications and Conclusions

We believe this study contributes to our understanding of how the recent gas price declines are impacting the U.S. consumer. First, contrary to general perception, people appear to be spending rather than saving their gains at the pump. Our estimates of the marginal propensity to consume are more in line with historical estimates of the impacts of gas price fluctuations on the economy, which show a larger effect of gas price fluctuations. We show a marginal propensity to consume in the range of 73%-89% when projecting total spending on debit and credit card spending categories. This estimate implies that consumers are mostly redistributing their gains at the pump to other spending categories. These estimates run contrary to correlational evidence of the impacts of gas price declines as well as self-reported perceptions of how consumers believe they are responding. Consumers report that they are using their gains at the pump to pay down debts and save. Our data show they are spending most of them.

Given that gas spending represents less than 5% of consumer spending, these impacts are small in absolute dollar terms and easily overshadowed by other economic forces. Nonetheless this boost to other categories of consumer spending could be here to stay if gas prices remain low as predicted. On the other hand, a substantial increase in gas prices might proportionately dampen consumer spend in these categories, if the response to gas price increases is symmetrical with the response to gas price decreases.

In addition, we show how gas price decreases have disparate impacts across the country: people in the Midwest and South, and the young and poor, feel the largest gains relative to their current income. For low-income earners, the recent gas price decline was equivalent to more than 1% of their income. This highlights the fact that gas price fluctuations contribute to spending volatility. Reduced reliance on gas, for example through electrification of the transportation sector, could reduce volatility particularly for low-income earners. In addition, innovative financial services could assist consumers in hedging gas price volatility. For example, to assist consumers in saving, credit cards (e.g., especially gas rewards cards) could develop a savings feature that activates when gas prices drop. Reducing volatility is an important goal, given that, as shown in our previous report *Weathering Volatility*, individuals across the income spectrum experience significant income and spending volatility and lack a sufficient financial buffer to withstand this volatility (Farrell and Greig, 2015).

Finally, the distributional impacts of gas price changes are important considerations for gas tax policy at the national and state level. Across the board, gas taxes are regressive, but gas taxes based on quantity consumed (rather than price) mitigate gas price fluctuations in percentage terms. Efforts to increase gas taxes should consider ways to make these taxes more progressive in order to mitigate the impact on those with lower incomes. We show that states differ dramatically in terms of price levels, price changes, quantity levels and quantity changes. Taken together, states in the Midwest and South were far more impacted by gas price declines than states in the East and West coasts. In the Midwest and South, higher-impact states, people saw the largest percentage declines in gas prices and gas spending as a fraction of income, despite the fact that residents of these states increased their driving the most for each 1% decline in price. In the East and West, lower-impact states, people saw smaller drops in gas prices and gas spending as a fraction of income. Our results imply that increasing the gas tax in higher-impact states might increase tax revenue and also lead people to drive less. Conversely, in the lower-impact states, where people tend to pay high prices and consume less gas to begin with, an increase in the gas tax might yield increased tax revenue without curbing gas consumption. These state-level differences provide a more granular understanding of how gas price fluctuations impact regional economies and should inform good decisions about optimal gas tax rates and structures.

When we embarked on this research project, the prevailing wisdom was that consumers were using their gas savings to repair their balance sheets, perhaps because they viewed the price declines as temporary or were suffering from a “debt overhang.” We present evidence that recent gas price declines resulted in significantly more spending than previously understood, and that the gains in discretionary spending disproportionately accrue to low-income individuals, to young people, and to states where people spend a lot on gas. This is good news for the U.S. consumer as we anticipate sustained low gas prices through the rest of 2015.

The JPMorgan Chase Institute Data Asset and Methodology

In this report, the JPMorgan Chase Institute seeks to inform the public debate on the impact of the recent gas price declines on consumer spending. To develop insights into these topics, we adapted the Bank's internal consumer data on 57 million anonymized U.S. debit and credit cardholders into a groundbreaking data asset. As the first financial institution to channel this wealth of information for the benefit of the public good, JPMorgan Chase & Co. put strong guardrails and strict privacy protocols in place to protect personal information throughout the creation and analysis of this data asset. A description of these protocols are available on our website.

Data Privacy

The JPMorgan Chase Institute has adopted rigorous security protocols and checks and balances to ensure all customer data are kept confidential and secure. Our strict protocols are informed by statistical standards employed by government agencies and our work with technology, data privacy and security experts who are helping us maintain industry-leading standards.

There are several key steps the Institute takes to ensure customer data are safe, secure and anonymous:

- Before the Institute receives the data, all unique identifiable information—including names, account numbers, addresses, dates of birth and Social Security numbers—is removed.
- The Institute has put in place privacy protocols for its researchers, including requiring them to undergo rigorous background checks and enter into strict confidentiality agreements. Researchers are contractually obligated to use the data solely for approved research, and are contractually obligated not to re-identify any individual represented in the data.
- The Institute does not allow the publication of any information about an individual consumer or business. Any data point included in any publication based on the Institute's data may only reflect aggregate information.
- The data are stored on a secure server and can be accessed only under strict security procedures. The data cannot be exported outside of JPMorgan Chase's systems. The data are stored on systems that prevent them from being exported to other drives or sent to outside email addresses. These systems comply with all JPMorgan Chase Information Technology Risk Management requirements for the monitoring and security of data.

The Institute provides valuable insights to policymakers, businesses and nonprofit leaders. But these insights cannot come at the expense of consumer privacy. We take precautions to ensure the confidence and security of our account holders' private information.

Constructing our Sample

For this report we rely on JPMorgan Chase data on consumer clients who are primary account holders. To avoid double counting of financial activity, all joint accounts are captured under one individual, the primary account holder. From a universe of over 57 million anonymized debit or credit card account holders nationwide, we created a sample of 25.6 million individuals who we believe to be regular users of a Chase credit or debit card. We selected individuals who have an average of five transactions a month on either their credit or debit card. We use this vast population to conduct all of our geographic analyses (Finding 2), as it provides broad coverage of the nation. Our maps report statistics for any county in which we have a minimum of 50 customers who have on average five transactions a month—roughly 95% of counties.

As shown in Figure 22, this population of 25.6 million is different from the nation in important ways. First, our sample is skewed slightly in favor of younger individuals: it slightly over represents individuals aged 30–49 and underrepresents individuals over age 70. Second, the JPMC Institute sample includes a high proportion of men. This bias may reflect a tendency for men to be listed as primary account holders on joint accounts rather than an underlying bias in the Chase population in favor of men. Third, our sample is biased geographically by Chase's footprint, which gives us broad coverage of the four Census regions, but with a slight bias in favor of the West, when compared to the nation. Finally, our sample is skewed in favor of higher-income individuals for a number of reasons. In our data asset, we observe only those individuals who have a relationship with Chase. Roughly 8% of Americans do not bank with a U.S. financial institution and tend to be disproportionally lower-income and non-Asian minorities (FDIC 2014).

Figure 22: Demographic characteristics of JPMorgan Chase Institute sample versus the U.S. population

		JPMC Institute Sample					
	U.S. Population[1]	25.6 million sample[4]			1 million sample[5]		
		All	Debit Card Holders	Credit Card Holders	All	Low-Gas Spenders	High-Gas Spenders
18-29	22%	20%	29%	13%	21%	26%	18%
30-39	17%	19%	21%	17%	24%	26%	24%
40-49	17%	19%	20%	19%	22%	20%	24%
50-59	18%	19%	17%	21%	18%	15%	19%
60-69	14%	14%	9%	18%	10%	9%	11%
70+	12%	9%	4%	13%	5%	4%	5%
Men	49%	53%	53%	N/A[6]	53%	49%	56%
Women	51%	47%	47%	N/A[6]	47%	51%	44%
Northeast	18%	19%	19%	22%	19%	73%	3%
Midwest	21%	21%	19%	22%	19%	10%	27%
South	37%	30%	28%	30%	28%	4%	48%
West	23%	30%	34%	26%	34%	12%	22%
Monthly Income	$3,626[2]	$6,020	$4,811	$7,286	$5,085	$5,318	$5,283
Monthly Gas Spend	$206[3]	$105	$124	$74	$146	$65	$210
Monthly Non-Gas Spend	$2,525[3]	$1,295	$1,105	$1,340	$1,524	$1,479	$1,768

Source: JPMorgan Chase Institute

1 Unless otherwise noted, national estimates come from the Census Bureau's American Community Survey 2013 1 Year Estimates.

2 Estimates are from the 2014 Current Population Survey and represent person income estimates.

3 Estimates come from the 2014 Consumer Expenditure Survey. Non-gas spend excludes categories of spending that are unlikely to be conducted using a debit or credit card, specifically: auto purchase, auto finance, gas, shelter, and pension.

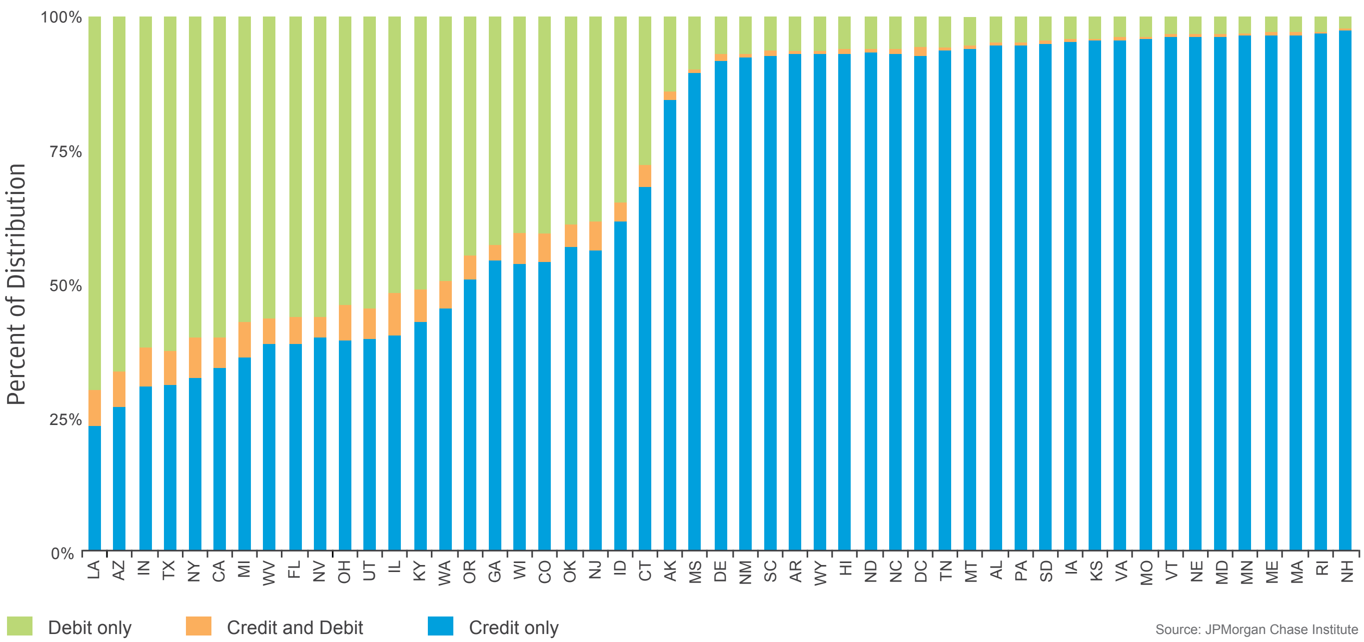
4 The 25.6 million sample includes individuals who have either a credit or debit card and an average of five transactions a month on either one. This sample is used for our geographic analyses in Finding 2.

5 The 1 million sample includes checking account holders with a minimum of five outflows per month who do not have a gas station specific Chase credit card, and who live in a zip code with at least 140 other individuals in our sample.

6 Gender information is not available for credit card holders.

In addition to the differences between our population and the nation in aggregate, there may be additional biases at the state level. As shown in Figure 23, the distribution of credit and debit card users varies dramatically across states. This is due to the fact that Chase's credit card presence spans the nation, whereas checking accounts can only be opened within the 23 states in which Chase has physical branches. Given that debit cardholders tend to be significantly younger and have lower incomes than credit card users, the distributions below may influence the levels of gas and non-gas spending observed by state. Figure 22 presents the demographic characteristics separately for debit card versus credit cardholders in our 25.6 million sample used for our geographic analyses.

Figure 23: Distribution of credit and debit cardholders in 25.6 million sample, by state



For all other analyses in this report (Findings 1, 3 and 4), we construct a one million person sample that gives us greater confidence that we are seeing most of an individual's spending activity. We apply a more stringent criteria to identify individuals we believe are "core" Chase customers and conduct most of their gas and non-gas spending behavior using a Chase debit or credit card. Specifically, we take a random sample of 1 million debit cardholders who meet the following additional sampling criteria:

1. They have a checking account and at least 5 outflow transactions from their checking account per month.
2. They do not hold a gas station specific card.
3. They live in a zip code with at least 140 other individuals in our sample.

These additional criteria give us confidence that we are focusing on core Chase clients as we assess the impact of low gas prices on spending behavior. These criteria constrain our sample to the 23-state Chase branch footprint within the nation. As shown in Figure 22, the 1 million sample is even more skewed towards younger individuals than the 25 million geographic sample, but it is more representative of the nation in terms of income.

Drawing from a universe of over 57 million anonymized customers, we sampled 25 million regular Chase credit and debit card users to shed new light on the effects of gas price decreases on consumer spending.

Measuring Spending

We measure spending behavior using debit and credit card transactions, which we refer to as card spending. We focus exclusively on card spending because we are able to clearly distinguish between gas and non-gas spending. Specifically, we analyze merchant information of these transactions and classify all card spending at gas stations, including attached convenience stores, as “gas spending” and all other card spending (i.e., not at gas stations) as “non-gas spending.”[26] Card spending offers clean, albeit incomplete, measures of gas and non-gas spending. Card spending provides a relatively good window into spending on goods and services but less visibility into spending categories where individuals more frequently use cash, checks and electronic transfers, such as rent payments, utility bills and vehicle purchases.[27]

Estimating the marginal propensity to consume

People spent almost 20% of their gas savings on restaurants alone.

We use a “difference in difference” approach to isolate the impact of low gas prices on consumer spending from other economic and market conditions and trends over this timeframe. Specifically, we compare the difference between high-gas and low-gas spenders in their difference in non-gas spending between the High Price period (Dec 2013–Feb 2014) and the Low Price period (Dec 2014–Jan 2015). In this research design, our low-gas spenders serve as a control group for how high-gas spenders would have behaved had gas prices not dropped. We believe low-gas spenders are a valid control group because, as indicated in Figure 19, high-gas spenders and low-gas spenders showed very similar trends between the Prior High Price period (Dec 2012–Feb 2013) and High Price period (Dec 2013–Feb 2014), when gas prices were high and relatively constant. The spending patterns only diverge when we move from the the High Price period (Dec 2013–Feb 2014) to the Low Price period (Dec 2014–Jan 2015).

For this analysis, we assign individuals as either low-gas spenders (bottom quintiles of gas spend) or high-gas spenders (top quintile of gas spend), but categorize each individual based on the mean gas spend in their zip code, excluding their own gas spend. We assign individuals to gas spend quintiles using this zip code level “leave-out mean” in order to prevent our results from being biased by mean reversion in individual gas spending over time.[28] Using the leave-out mean to assign people to quintiles of gas spend does not significantly change the demographic or economic characteristics of the individuals categorized as low-gas versus high-gas spenders.

Figure 24 displays the 95% confidence interval for our “baseline” estimate of the marginal propensity as explained above, as well as a variety of robustness checks and adjustments to this estimate. We estimate the 95% confidence interval for the marginal propensity to consume estimate through an instrumental variable regression approach, in which we use whether a person is a high-gas versus low-gas spender (assigned based on the leave-out mean gas spend in individual i’s zip code) as an instrument for the year-over-year change in gas spend (Equation 1 below). We then regress year-over-year change in non-gas spend on the predicted year-over-year change in gas spend (Equation 2).

$$(1)\ \Delta Gas\ Spend_i = a_i + \beta_1 * I(High\ Gas\ Spender)_i + \varepsilon_i$$

$$(2)\ \Delta Non\ Gas\ Spend_i = a_i + \beta_2 * \Delta \widehat{Gas\ Spend}_i + \varepsilon_i$$

We define the dependent variables in these equations as:

$$(3)\ \Delta Gas\ Spend_i = GasSpend_i^{LowPrice} - GasSpend_i^{HighPrice2}$$

$$(4)\ \Delta Non\ Gas\ Spend_i = NonGasSpend_i^{LowPrice} - NonGasSpend_i^{HighPrice2}.$$

The coefficient of interest is β_2 in equation 2 above, which represents the marginal propensity to consume—the ratio of the difference in the change in non-gas spending for high-gas spenders versus low-gas spenders. This IV estimate is equivalent to simply dividing the difference-in-difference estimate of the impact on non-gas spending by the estimate of the impact on gas spending. We estimate the 95% confidence interval by multiplying the standard error of β_2 by ±1.96.

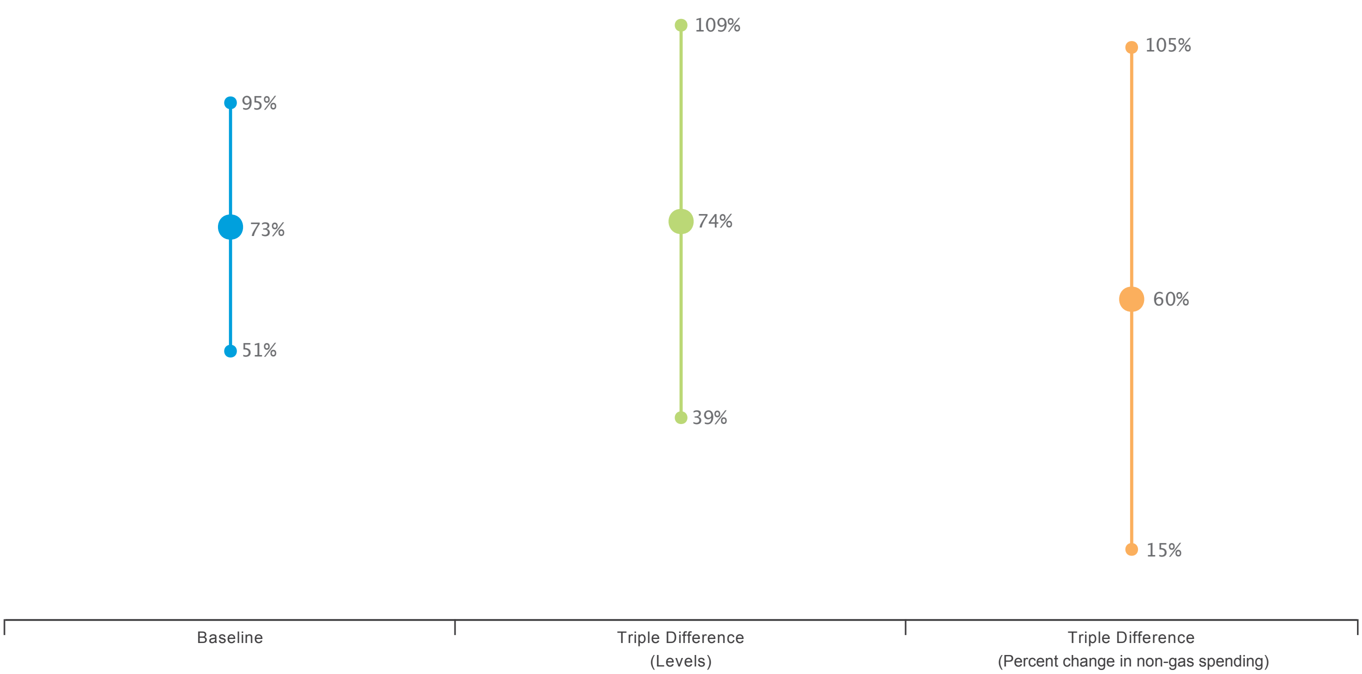
We conduct two different robustness checks to adjust our baseline estimates to account for the trends in gas and non-gas spending that were occurring even while gas prices were stable. When describing these adjustments, we refer to changes in the "pre" period as changes between the Prior High Price period (Dec 2012-Feb 2013) and the High Price period (Dec 2013-Feb 2014), and we refer to changes in the "post" period as changes between the High Price period and the Low Price period (Dec 2014-Feb 2015). The point of the robustness checks is to account for underlying changes between the high-gas and low-gas spending groups during the pre period.

First, our "Triple Difference—Levels" estimate adjusts for these trends in absolute terms. This is done by subtracting the dollar change in spending in the pre-period from our calculation of the dollar change in spending during the post period. This estimate effectively removes the pre-trends in dollar terms, and is valid assuming that these pre-trends would have continued similarly for both groups in the absence of gas price changes.

Second, our "Triple Difference—Percent Change in Non-Gas Spending", estimate recovers the MPC by first estimating the effect on non-gas spending in percent terms.[29] This is done by using the "Triple Difference—Levels" method described above, except with each difference calculated in percent rather than dollar terms. This gives an estimate of the impact on non-gas spending in percent terms. To recover a dollar estimate, we then multiply this by the level of gas spending in the High Price period (Dec 2013-Feb 2014). Finally, to calculate the MPC, we divide this by the difference-in-difference estimate for gas spending calculated in dollar terms (since the percent impact is similar between both groups due to the price change). This estimate removes the pre-trend for non-gas spending in percent terms more directly than the estimate above, but uses the simple difference-in-difference estimate for gas spending.

We believe both of these adjustment approaches are instructive given that high-gas spenders spend 21% more than low-gas spenders on non-gas categories, and that the differences in pre-trends are substantial in percentage terms and still there, though minor, in dollar terms. Below, we show each of the three estimates of the marginal propensity to consume. Unadjusted for the share of total spend on credit and debit cards, the point estimate for the marginal propensity to consume ranges from 60% to 74% with a 95% confidence interval across the three estimates ranging from 15% to 109%.

Figure 24: Estimated marginal propensity to consume and 95% confidence intervals



Source: JPMorgan Chase Institute

In order to more closely represent the impact of low gas prices on the purchase of goods and services generally in the economy, we scale our three estimates to account for the fact that people pay for a higher share of their total gas spending using a debit or credit card (versus checks, electronic payments or cash) relative to non-gas card spending categories. Comparing observed per person spend on Chase cards relative to total expenditures reported in the Consumer Expenditure Survey, we estimate that roughly 71% of gas spending occurs on debit and credit cards and only 58% of non-gas spending occurs on debit and credit cards.[30] This adjustment requires that we multiply all of our point estimates in Figure 24 by 1.2 (the ratio of 71% and 58%), which shifts the MPC range from 60%–74% up to 74%–91%.

For every dollar less spent at the gas pump, individuals spent roughly 80 cents on other things.

Finally, we explore possible heterogeneity in our results by calculating the MPC separately by income quintile and by Census region. Although we find that low-gas spenders and high-gas spenders have similar income levels (see Figure 22), we might expect to see a higher marginal propensity to consume among lower-income individuals. The implied MPCs from the change in mean gas and non-gas spending for the bottom through the top income quintiles were 90%, 27%, 74%, 126%, and 72%, respectively. After adjusting for trends in non-gas spending between the Prior High Price period and the High Price period, each of the MPCs falls between 98% and 114%, with the exception of the second income quintile in which the MPC was negative. Thus we do not find evidence for the hypothesis that lower-income individuals have a higher propensity to consume their savings at the pump. Moreover, due to the instability of the MPCs after adjusting for pre-trends, we do not find these findings conclusive.

Similar problems arise when attempting to estimate MPCs for each Census region. The implied MPC was 56% for the Midwest, 56% for the Northeast, 199% for the South, and 72% for the West. With the exception of the South, each region exhibited stable pre-trends in gas spending between the Prior High Price and High Price periods. In terms of non-gas spending, only the Midwest exhibited pre-trends that would have allowed for a valid difference-in-difference framework. While we do estimate marginal propensities to consume after adjusting for these pre-trends, there is considerable noise associated with these estimates that makes them inconclusive.

In summary, we find robust estimates of a marginal propensity to consume ranging from 60% to 74% for the nation as a whole, which after accounting for the full range of spending beyond credit and debit card transactions scale up to a range of 74% to 91%.

Future enhancements of JPMorgan Chase Institute Data Assets

Our new and evolving consumer finance data asset provides fresh insights into the impacts of the recent declines in gas prices on consumer behavior. The JPMorgan Chase Institute will continue to build and refine this data asset to address an even broader array of important economic and policy questions pertaining to consumers and households. Ultimately, our ability to understand where consumers spend their money and how this varies month to month is an important cornerstone of our data asset. Other planned expansions to the data asset include a more complete view of consumer assets and liabilities to develop a perspective on household balance sheets. Finally, while still preserving the anonymity of our data, we plan to add third-party data on demographics to develop a granular perspective on consumer finance issues by important segments of the population and household characteristics.

In addition to our consumer data asset, the future research agenda of the JPMorgan Chase Institute extends across the portfolio of JPMorgan Chase's lines of business and vast geographic reach. Future data assets and analytics of the JPMorgan Chase Institute will focus on businesses large and small, the global flows of funds, and other critical economic topics. These data, combined with expert insights, are unique assets the JPMorgan Chase Institute will use to provide a comprehensive perspective on the complex inner workings of the global economy and help policymakers, businesses and nonprofit leaders make smarter decisions to advance global prosperity.

References

Bennet, B., Conover, D., O'Brien, S., & Advincula, R. (2014). Cash continues to play a key role in consumer spending: Evidence from the Diary of Consumer Payment Choice. Retrieved from http://www.frbsf.org/cash/publications/fed-notes/2014/april/cash-consumer-spending-payment-diary.

Coglianese, J., Davis, L. W., Kilian, L., & Stock, J. H. (2015). Anticipation, tax avoidance, and the price elasticity of gasoline demand (No. w20980). National Bureau of Economic Research.

Council of Economic Advisors (2015). Explaining the U.S. petroleum surprise. Council of Economic Advisors.

Edelstein, P., & Kilian, L. (2007). Retail energy prices and consumer expenditures. CEPR Discussion Papers 6255, C.E.P.R. Discussion Papers.

Edelstein, P., & Kilian, L. (2009). How sensitive are consumer expenditures to retail energy prices? *Journal of Monetary Economics*, 56(6), 766–779.

Farrell, D., & Greig, F. (2015). Weathering Volatility: Big Data on the Financial Ups and Downs of U.S. Individuals. JPMorgan Chase Institute.

Federal Deposit Insurance Company (2014). 2013 FDIC National Survey of Unbanked and Underbanked Households. Federal Deposit Insurance Company.

Federal Reserve Board of Governors (2015). Transcript of Chair Yellen's Press Conference: June 17, 2015. Retrieved from http://www.federalreserve.gov/mediacenter/files/FOMCpresconf20150617.pdf.

Furman, J. (2015). Advance Estimate of GDP for the First Quarter of 2015. Retrieved from https://www.whitehouse.gov/blog/2015/04/29/advance-estimate-gdp-first-quarter-2015. Council of Economic Advisors.

Gagnon, J., Raskin, M., Remache, J., & Sack, B. P. (2010). Large-scale asset purchases by the Federal Reserve: did they work? Federal Reserve Board of New York Staff Report, (441).

Gicheva, D., Hastings, J., & Villas-Boas, S. (2010). Investigating Income Effects in Scanner Data: Do Gasoline Prices Affect Grocery Purchases? *The American Economic Review*, 480–484.

Hamilton, J. D. (2009). Causes and Consequences of the Oil Shock of 2007–08 (No. w15002). National Bureau of Economic Research.

Hill, C. (2015). Used car prices hit a record high—but that's good news for some buyers. Retrieved from http://www.marketwatch.com/story/used-car-prices-hit-a-record-high-but-thats-good-news-for-some-buyers-2015-08-21.

Kelley Blue Book (2015). New-Car Transaction Prices Soar In January 2015, Up More Than 5 Percent, According To Kelley Blue Book. Retrieved from http://mediaroom.kbb.com/new-car-transaction-prices-soar-january-2015.

Institute on Taxation and Economic Policy (2011). Building a Better Gas Tax: How to Fix One of State Government's Least Sustainable Revenue Sources. Retrieved from http://www.itepnet.org/bettergastax/bettergastax.pdf.

Paszkiewicz, L. (2003). The Cost and Demographics of Vehicle Acquisition. *Consumer Expenditure Survey Anthology* (61).

Patrabansh, S., Doerner, W. M., & Asin, S. (2014). The Effects of Monetary Policy on Mortgage Rates. Federal Housing Finance Agency Working Paper (14–2).

Perks, R. & Raborn, C. (2013) Driving Commuter Choice in America Expanding Transportation Choices Can Reduce Congestion, Save Money and Cut Pollution. *National Resource Defense Council Issue Paper* (13-06-A).

Santos, A., McGuckin, N., Nakamoto, H. Y., Gray, D., & Liss, S. (2011). Summary of travel trends: 2009 national household travel survey. U.S. Department of Transportation, Federal Highway Administration (No. FHWA-PL-ll-022).

Swift, A. (2015). *Most in U.S. Say Low Gas Prices Make Difference in Finances*. Gallup. Retrieved from http://www.gallup.com/poll/183596/say-low-gas-prices-difference-finances.aspx.

U.S. Energy Information Administration (2015a). Gasoline prices tend to have little effect on demand for car travel. Retrieved from http://www.eia.gov/todayinenergy/detail.cfm?id=19191.

U.S. Energy Information Administration (2015b). Short-Term Energy Outlook September 2015. Retrieved from http://www.eia.gov/forecasts/steo/report/prices.cfm.

U.S. Energy Information Administration (2015c). Unplanned refinery outage leads to higher Midwest gasoline prices. Retrieved from http://www.eia.gov/todayinenergy/detail.cfm?id=22552.

U.S. Energy Information Administration (2015d). U.S. household gasoline expenditures expected to fall in 2015. Retrieved from http://www.eia.gov/todayinenergy/detail.cfm?id=20752.

Vock, D.D. (2015). Raising Gas Taxes Gets Bipartisan Boost from Governors. Retrieved from http://www.governing.com/topics/transportation-infrastructure/gov-low-gas-prices-deteriorating-roads-fuel-push-for-gas-tax-hikes.html.

Endnotes

1 See U.S. Energy Information Administration (2015b and 2015d) for forecasts of gasoline prices and household gasoline expenditures. The EIA's estimate that households will save $700 on gas in 2015 is based in part on the EIA's projections of gas prices throughout the remainder of 2015. Although this report does not aim to re-estimate this number, we observe that on average individuals saved $22 per month on gas when comparing gas spending from Dec 2014–Feb 2015, when gas prices were at their trough, to one year prior, when gas prices were high. When projecting total spending on gas beyond just gas purchases made with Chase credit and debit cards, we find that the average person saved roughly $31 per month. Assuming gas prices remain constant for the remainder of 2015, this implies an average savings of $372 on an annual basis. Although this is somewhat lower than the $700 savings per household estimated by the EIA, our unit of analysis is the primary account holder, which reflects a mix of individuals and households.

2 This estimated saving of $600 represents the difference in interest expense in the first year of a 30-year fixed-rate mortgage of $120,000 associated with a 50-basis point decline in interest rates. Event studies estimate that the impact of the Federal Reserve Board's Large Scale Asset Purchases caused the 30-year fixed-rate mortgage interest rates to decline by roughly 20–100 basis points in the first round of asset purchases (QE1) starting in late 2008 (see, e.g., Gagnon et al. 2010 and Patrabansh et al. 2014).

3 For a discussion of this debate among governors, See Vock (2015).

4 The 2009 National Household Survey of Transportation shows similar demographic differences in terms of vehicle miles driven, and, in addition, that men drive more than women. See Santos et al. (2011) for a summary of transportation trends by demographic groups, and the Council of Economic Advisors (2015) for a discussion of how demographic trends are contributing to the decline in vehicle miles traveled.

5 There is substantial evidence from past oil price fluctuations that individuals spend more when gas prices decline and less as gas prices rise, and that the implied marginal propensity to consume is greater than one (Edelstein and Kilian, 2009; Hamilton, 2009; Edelstein and Kilian 2007). Edelstein and Kilian (2007) estimate that a 1% increase in energy prices translate into only a -0.04% change in discretionary income (given the share of income spent on energy) but a -0.15% change in real total consumption, implying a marginal propensity to consume well above one. As others have enumerated and shown, there are multiple pathways by which energy prices affect consumption: When gas prices fall, people have more discretionary income; they feel more optimistic about the economy and their personal finances, giving them the confidence to save less and purchase more durables; finally, they recognize that vehicles have lower operating costs and are thus more willing to purchase them. The most recent literature cited above provides evidence for the reverse effects when gas prices increase. There is contradicting evidence as to whether gas price increases and decreases impact the economy symmetrically. For example, Hamilton (2003) shows that oil price increases have a bigger impact on the economy than oil price decreases. Edelstein and Kilian (2007 and 2009) estimate impacts that are more comparable in size.

6 Gas price data for states are provided by GasBuddy.com.

7 The average incomes for individuals in each quintile of gas spending displayed in Figure 2 are $60,600 for quintile 1, $58,400 for quintile 2, $56,200 for quintile 3, $59,800 for quintile 4, and $70,000 for quintile 5.

8 In 2013, gas spending represented 4.1% of total income.

9 Each of the geographic analyses presented in this report (Figures 4 through 11) displays summary data aggregating credit and debit card transactions. The 23 states that have Chase branches have significantly higher proportions of debit card activity. For a more in-depth discussion of how this might influence our estimates, see the Data Asset and Methodology Section.

10 These regional differences contrast slightly with the 2014 Consumer Expenditure Survey that estimates gas spending to be the highest in the South and West ($213 per month per individual in both regions). We believe we may be underestimating gas spending in States in which we do not have a branch footprint. For example, in the West this includes Wyoming, Montana, and New Mexico. As a fraction of income, individuals spend the most on gas in the Midwest (4.3%) and South (4.7%), which is in line with our estimates. In addition, the 2014 CES finds gas spending to represent a larger fraction of income in rural areas (5.0%) compared to urban areas (3.4%). Similarly, the 2009 National Household Transportation Survey finds that households in less densely populated areas own more vehicles and drive more vehicle miles per year (Santos et al. 2015). Compared to employed individuals who live in large metropolitan areas, commuters who live in surrounding suburbs drive over 50% more miles, and commuters who live in rural areas and small towns drive almost twice as many miles (Perks and Raborn, 2013).

11 We assume here that everyone purchases gas in the state in which they live. State price data are provided by GasBuddy.com.

12 As recently reported by the EIA, supply disruptions can also cause temporary price shocks in certain markets leading to additional variation apart from gas taxes (EIA 2015c).

13 The implied price elasticity of demand of less than -0.30 is in line with recent research estimating the price elasticity of demand for gas at -0.37 (Coglianese et al. 2015).

14 The implied price elasticity of demand is more consistent with existing estimates of the price elasticity of demand used for modeling purposes by the EIA, which typically range between -0.02 and -0.04 (EIA 2015a).

15 This fraction (71%) represents our observed gas spending in 2014 as a fraction of the total per capita gas spending reported per consumer unit in the 2014 Consumer Expenditure Survey.

16 Our gas demographic findings are broadly consistent with national statistics. The 2014 Consumer Expenditure Survey (CES) finds gas spending to be highest among individuals aged 35–54 years in absolute terms, but individuals under 30 years old spend the highest fraction of their income on gas. In terms of income, the 2014 CES estimates monthly gas spending to be $97 or 11.3% of income for lowest quintile earners (less than $18,362 in income); $154 or 6.8% of income for second quintile earners ($18,362–$35,681); $203 or 5.2% of income for third quintile earners ($35,681–$59,549); $259 or 4.0% of income for fourth quintile earners ($59,549–$99,620); and $316 or 2.2% of income on gas top quintile earners (more than $99,620).

The income distribution of our population differs from the national population particularly at the low end of the spectrum, and gas spending estimates as reported by the CES are higher than JPMC Institute estimates particularly for high-income earners. In addition, data from the 2009 National Household Transportation Survey shows that women drive roughly one-third fewer vehicle miles than men on an annual basis, and that vehicle miles traveled peaks among individuals in their 30s and 40s and falls precipitously after age 60. We explore whether estimates reported may be biased by demographic characteristics of individuals who tend to be primary versus secondary account holders by calculating the same statistics for account holders who have a single authorized user on their account. We find similar results among this subsample of accounts with single authorized users.

17 For this analysis we assign people as low-gas spenders or high-gas spenders based on the average gas spending in each individual's zip code. See the Data Asset and Methodology section for a more in depth description of our approach.

18 Growth in non-gas card spend could be driven by not just economic growth, but also growth in Chase card usage relative to other payment mechanisms (e.g., cash, check and non-Chase credit cards).

19 As described in the Data Asset and Methodology section, we also explore whether the marginal propensity to consume differs by income group or by region. We find unreliable and therefore inconclusive results.

20 Non-gas spending increased by 5.9% for low-gas spenders, 5.2% for median-gas spenders, and 4.8% for high-gas spenders. These growth rates significantly higher than comparable estimates from the Census Bureau's Retail Trade Survey, from which we estimate 3.3% growth in per capita retail and food services spend not seasonally adjusted (and excluding auto and gas related spend).

21 These percentages are estimated based on observed levels of spending in 2014 in our data compared to those reported in the 2014 Consumer Expenditure Survey. See the Data Asset and Methodology section for a more detailed description of these estimates.

22 See for example Edelstein and Kilian (2007).

23 We also examine whether the marginal propensity to consume differed according to income group and region, but we do not find reliable results or discernible patterns. The results are described in the Data Asset and Methodology section.

24 Our findings are consistent with Gicheva et al. (2010) and Edelstein and Kilian (2007) who find that when gas prices increase, individuals reduce their restaurant expenditures. Both studies also find, however, that people increase their grocery expenditures overall since they are eating at home more, but that they switch to less expensive grocery purchases. Edelstien and Kilian (2007) provide evidence that gas price changes have a large impact on vehicle purchases and smaller but significant impacts on other durable goods, non-durable goods and certain services.

25 For example, we likely underestimate the impacts on certain services and durables, notably vehicle purchases, where debit or credit cards are not the most typical payment mechanism. Hamilton (2009) and Edelstein and Kilian (2007 and 2009) provide evidence that gas price fluctuations have a substantial impact on vehicle purchases.

26 It is worth noting that we do not observe itemized purchase receipts and therefore cannot distinguish between gas and convenience store purchases within gas stations. On the other hand, gas purchases at large discount stores are typically separate purchases and categorized as gas stations.

27 Research by the Federal Reserve Bank of San Francisco estimates that roughly 60% of total spend on food, personal care and general merchandise are made on credit or debit cards, compared to less than 50% for all other categories (Bennet et al. 2014).

28 When we assign individuals to gas spend quintiles based on their own gas spending in the High Price period (Dec 2013–Feb 2014), we observe that gas spending among top quintile gas spenders appears be lower in the years prior and after simply due to mean reversion. Shifting to the leave out mean decreases the spread in gas spending between low-gas and high-gas spenders. Average spending levels of median-gas spenders increase from $101 to $143 in gas spend and $1319 to $1432 in non-gas spend when we go from means to leave out means. The spread between low-gas and high-gas spenders also narrows when we shift to leave out means: low-gas spenders increase from $2 to $64 in gas spending and $1010 to $1432 in non-gas spend, and high-gas spenders drop from $359 to $196 in gas spending and $2290 to $1703.

29 As an alternative specification to adjust our estimates for pre-trends in percentage terms, we also calculated the difference in equations (3) and (4) relative to a counterfactual level, which assumes that gas spending and non-gas spending, respectively, had continued to increase during the treatment period at the same rate as they had during the pre-period. Mathematically, this is done by replacing $GasSpend_i^{HighPrice2}$ and $NonGasSpend_i^{HighPrice2}$ in equations (3) and (4) respectively with $GasSpend_i^{HighPrice2} * \frac{GasSpend_i^{HighPrice2}}{GasSpend_i^{PriorHighPrice}}$ and $nGasSpend_i^{HighPrice2} * \frac{NonGasSpend_i^{HighPrice2}}{NonGasSpend_i^{PriorHighPrice2}}$. This estimate removes the pre-trends in percent terms but still allows for a direct estimate of the MPC in dollar terms. This specification yielded very similar results: an MPC point estimate of 73% and a confidence interval of 44% to 103%.

30 We estimate the fraction of gas spend observed on card (71%) by dividing average monthly gas spend observed for Chase customers in 2014 ($146) by the average monthly consumer expenditure on gasoline and motor oil ($206) reported by the 2014 Consumer Expenditure Survey. Similarly we estimate the fraction of non-gas spend observed on card (58%) by dividing monthly non-gas card spend for Chase customers ($1,524) by the average monthly consumer expenditure on total non-gas consumption ($2,636) for 2014. In defining non-gas consumption within the Consumer Expenditure Survey, we exclude auto purchases, auto finance, shelter and pension related expenditures, which we believe are extremely unlikely to be expenditures made using credit cards. Although we believe benchmarking our estimates to the CES provides us with the best calibration, our results would have been qualitatively similar had we used other industry benchmarks.