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Short-Term Energy Outlook: Retail Gasoline Expenditures

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Introduction

Petroleum prices have risen in recent months in response to increased demand and economic recovery from the COVID-19 pandemic, continued but slower recovery in global supply, and increased levels of geopolitical risk. In turn, U.S. spending on gasoline has also increased. More specifically, in our recently released *Summer Fuels Outlook*, we forecast that the average U.S. household will spend about \$450 more on an inflation-adjusted basis for gasoline expenditures in 2022 than last year.¹

Despite these increases, we find that gasoline expenditures as a percentage of disposable personal income (an after-tax measure of income available for consumer spending on goods and services) remain only slightly above the average since 2015 and below the average from periods when oil prices were last over \$100 per barrel (b). Gasoline expenditures averaged 2.6% of disposable personal income in the first quarter of 2022. This percentage is between the 2.4% average over the March 2015 to March 2020 period and the peak of 4.2% in 2008. We forecast that the percentage will rise to 3.2% in the second quarter of 2022 before falling back under 3% later this year.

Ratio of Gasoline Expenditures to Disposable Personal Income

Methodology

In this report, we analyze the share of nominal gasoline expenditures that we calculated to nominal levels of disposable personal income from the U.S. Bureau of Economic Analysis (BEA).² This ratio directly controls for general inflationary forces on both gasoline spending and income, allowing us to track the economic impact of gasoline expenditures on consumers over time.

We calculated gasoline expenditures in two different ways. First, we multiplied data on total gasoline consumed (product supplied) in a given month by that month's average U.S. retail gasoline price for all grades, both of which we had collected.³ We use this level of spending in our indicator, the *EIA-based ratio* of gasoline expenditures to disposable personal income. Second, we calculated gasoline expenditures using aggregate vehicle miles traveled, vehicle fuel efficiency in miles per gallon, and the retail gasoline price for all grades during the relevant time frame. This breakdown allows us to analyze the underlying drivers behind changes in gasoline expenditures. The U.S. Department of Energy's Argonne National Laboratory research has referred to the ratio using this measure as the *Transportation Energy Burden* (TEB).⁴

¹ U.S. Energy Information Administration, [Summer Fuels Outlook 2022](#).

² [Disposable Personal Income](#) data retrieved from St. Louis Fed Federal Reserve Economic Data.

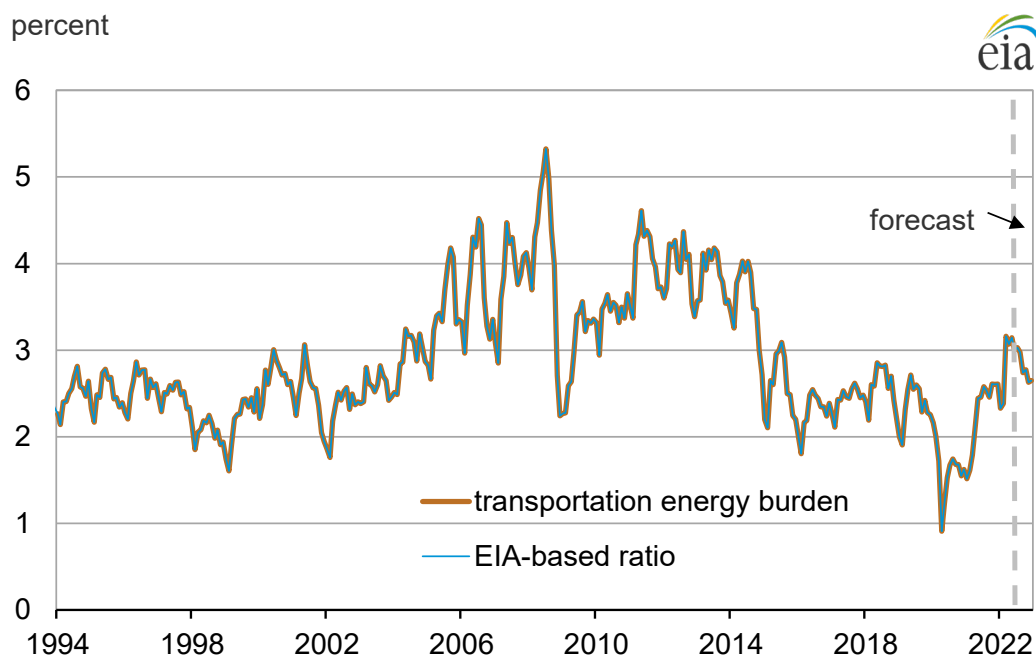
³ U.S. Energy Information Administration, [U.S. Product Supplied of Finished Motor Gasoline](#) and [U.S. All Grades All Formulations Retail Gasoline Prices](#).

⁴ Argonne National Laboratory, Energy Systems Division, "Affordability of Household Transportation Fuel Costs by Region and Socioeconomic Factors," (ANL/ESD-20/11), by Yan Zhou, Spencer Aeschliman, and David Gohlke.

Long-Run Trends in the Ratio of Gasoline Expenditures to Disposable Personal Income

The *EIA-based ratio* and *TEB* exhibit similar patterns over time (Figure 1). The share of disposable personal income allocated to gasoline expenditures reached its peak in 2008, just before the onset of the global financial crisis when oil prices were at record highs. Since then, the share of disposable personal income allocated to gasoline expenditures has generally declined, albeit with a significant amount of volatility in the series.

Figure 1. Ratio of gasoline expenditures to disposable personal income



Source: U.S. Energy Information Administration and U.S. Bureau of Economic Analysis

In 2020, gasoline expenditures briefly fell to about 1% of disposable personal income as a result of both low gasoline consumption associated with COVID-19 pandemic mitigation efforts and low gasoline prices. The ratio has since increased; both measures ranged between 1.5% and 3.2% in 2021 and into early 2022. As of early 2022, the gasoline expenditure to disposable personal income ratio is still below the high of 5.3% in July 2008 and is closer to the average ratio of 2.5% from 2015 to 2019.

To forecast the *TEB*, we use our *Short-Term Energy Outlook (STEO)* forecasts for petroleum prices, gasoline prices, vehicle miles traveled, and miles per gallon (MPG), and we use S&P Global's forecasts for disposable personal income. For 2022, we forecast that 2.9% of disposable personal income will be allocated toward gasoline expenditures. Although we expect the ratio to increase to its highest level since 2014 as a result of high gasoline prices in the second quarter of 2022, the ratio is also very close to the sample average from 1993 to 2020 and less than its peak in 2008.

Main Drivers

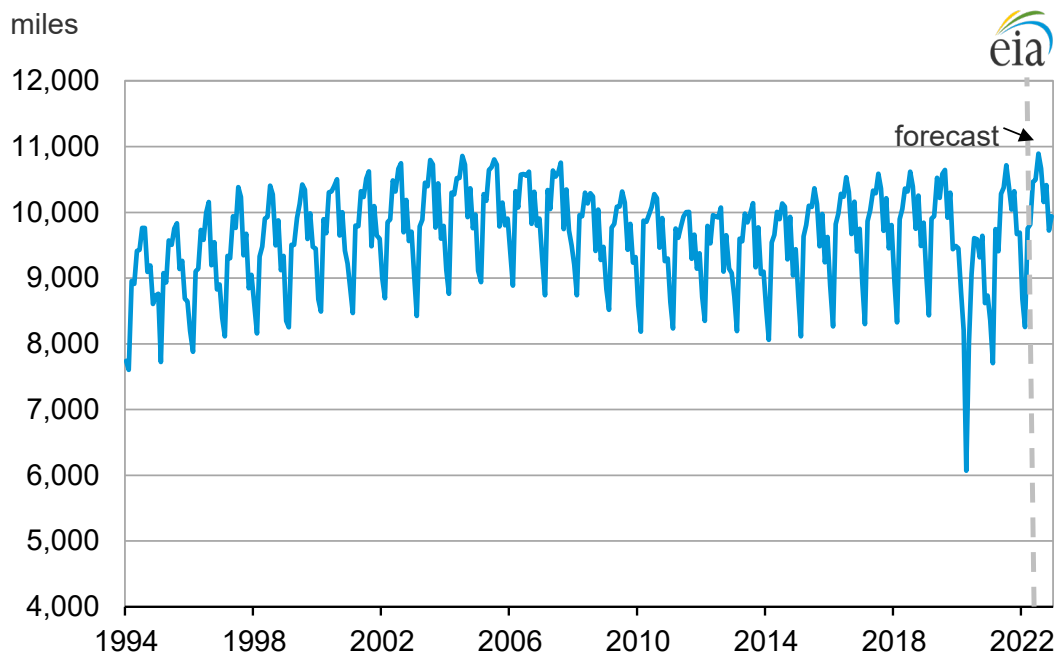
Looking at the individual data series in the definition of TEB allows us to examine the drivers of change. In particular, we analyzed whether changes in the ratio result from changes in:

- U.S. traveling behavior measured by the number of vehicle miles traveled
- The efficiency of vehicles on the road
- Gasoline prices
- The average U.S. disposable personal income

We measure U.S. traveling behavior by annual vehicle miles traveled per person since 1994 (Figure 2). Relative to 2019, vehicle miles traveled fell by 11% in 2020 during the COVID-19 pandemic, which significantly impacted commuting and leisure travel. Many employees have since returned to the workplace, as seen in the corresponding increase in vehicle miles traveled in 2021 and early 2022. Nevertheless, the 2021 number is 1.5% lower than its 2019 level because some workers continue to work from home.⁵

Over a longer time horizon, however, the number of miles traveled has remained relatively steady over our sample period. On a national basis, the average number of miles traveled in the first quarter of 2022 (1Q22) is only slightly below peaks in 2007 and 2021. These patterns suggest that vehicle miles traveled is not a major contributor to the declining trend in the ratio of gasoline expenditures to income in the United States.

Figure 2. Vehicle miles traveled per capita

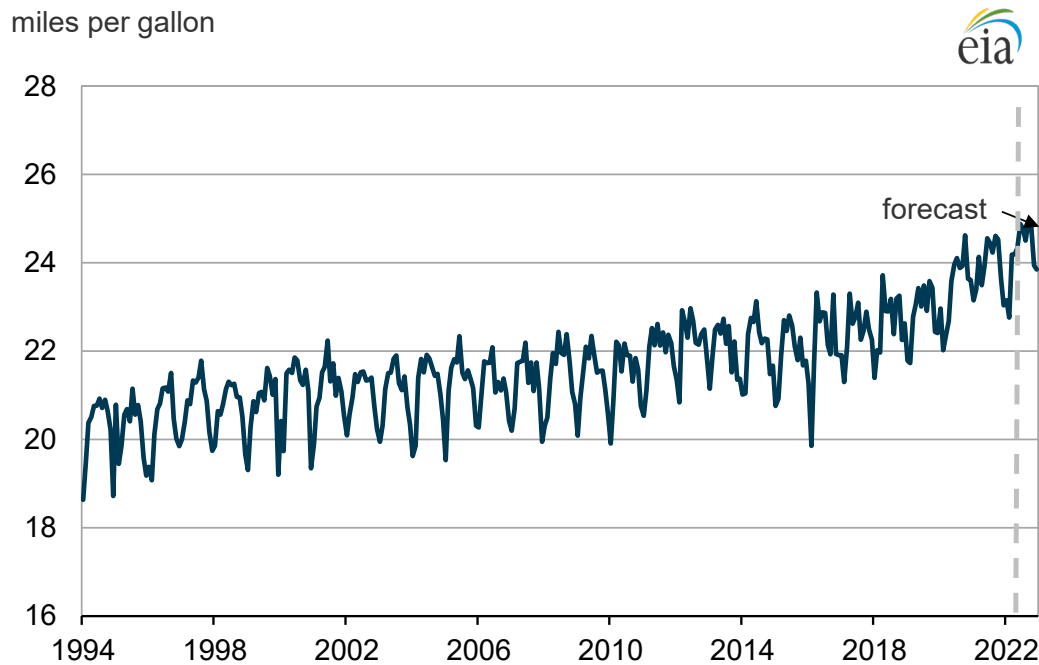


Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, April 2022

⁵ U.S. Census Bureau Household Pulse Survey.

Vehicle efficiency measured in MPG has steadily improved in the last few decades (Figure 3), increasing over the long run from an average of 20.2 MPG in 1994 to 23.9 MPG in 2021. The upward trend highlights that consumers have been able to travel farther per gallon of gasoline over time, which lowers the amount of gasoline needed to meet a given level of travel demand. This increasing vehicle efficiency does tend to lower the ratio of gasoline expenditures to disposable personal income on average.

Figure 3. Vehicle efficiency



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, April 2022

Finally, we compare trends in disposable personal income and gasoline prices over time in nominal terms (Figure 4). We focus on nominal prices, rather than real prices, because we are interested in whether increases in gasoline expenditures offset increases in disposable personal income, and so we compare nominal changes to both. Specifically, we do not hold the purchasing power of a dollar (by extension, the nominal disposable personal income level) fixed at a specific point in time by adjusting for inflation.

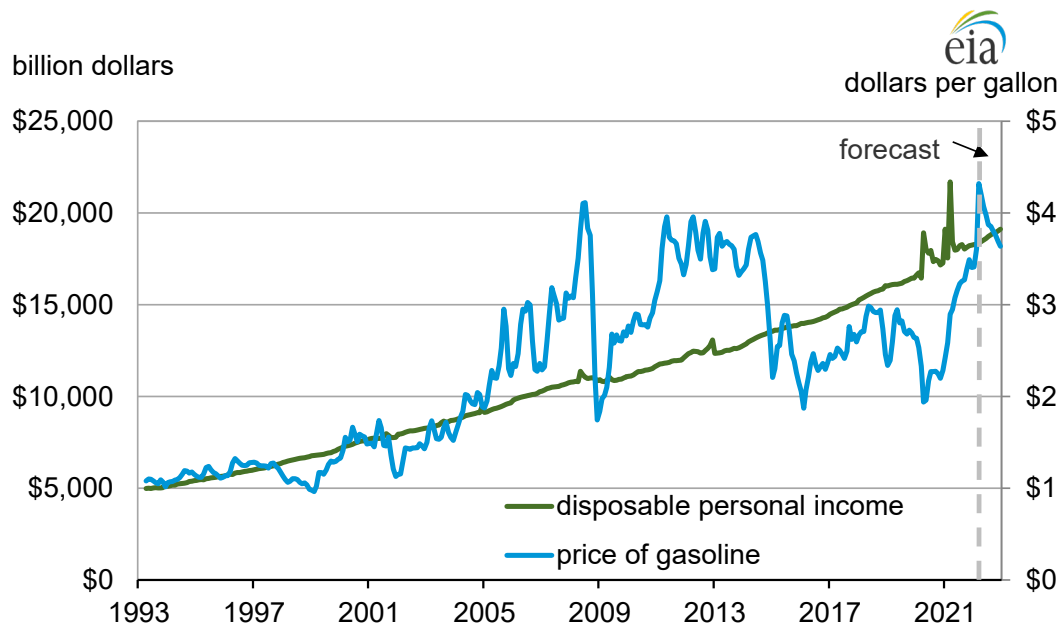
Several long-run patterns emerge in Figure 4. In the early part of our sample from 1993 to 2005, disposable personal income and gasoline prices both steadily increased. Since 2005, gasoline prices showed more volatility and its trend has flattened. For example, prices were close to \$4.00 per gallon several times between 2008 and 2012, and they reached as low as \$1.74/gal at the end of 2008. The average retail price of gasoline of \$3.09/gal in 2021 was 6% lower than \$3.31/gal in 2008.

In contrast, disposable personal income in 2021 was 76% higher relative to its level in 2005 on a per capita basis, and 97% higher on an aggregate basis. Over our entire sample, income increased steadily with the exception of spikes in 2020 and 2021 resulting from direct government assistance during the pandemic.

Taken together, the rise in disposable personal incomes for the average American since 2008 has more than offset changes in gasoline prices. Looking ahead in the short run, our projections show gasoline prices in 2022 pushing the ratio of gasoline spending to disposable personal income to its highest level since 2014. Because we forecast that gasoline prices will likely fall by the end of the year, the share of disposable personal income spent on gasoline purchases will fall similarly. However, in the long run, the ratio will remain close to its sample average.

Note that this trend is an average for the United States and will vary widely across the distribution of incomes, geographies, or driving patterns.⁶

Figure 4. Disposable personal income and gasoline prices



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, April 2022

⁶ One solution would be to look at unadjusted median income. However, this series is only available until 2020. Using this series shows that median income was up by 34.2% from 2008 to 2020 compared with 46.2% based on the disposable personal income per capita measure that we used in this forecast. More information is available in the working paper by Kuhn, Kehrig, and Ziebarth (2021) entitled “Welfare Effects of Gas Price Fluctuations.”