



Empty Shelves and Packed Ports

What the Surge in Consumer Purchases Meant for Refined Fuels Demand in 2021

by Troy Vincent, market analyst, DTN



Empty shelves and packed ports have been a common theme in U.S. financial reports since the start of the pandemic. We've seen a seemingly never-ending backlog of goods hanging out on ships offshore the United States, alongside a continuous rolling absence of various consumer goods from store shelves and e-commerce retailer inventories.

While it's easy to point fingers at government-imposed economic restrictions amid the COVID-19 pandemic, or the spread of the virus itself, which made life difficult for manufacturers, port workers, and maritime personnel, there's one key, often overlooked factor — surging demand. It is not only that the supply of labor for many parts of the global supply chain has been constrained, but that U.S. demand for goods surged to record highs amid these constraints. Combining the DTN Refined Fuels Demand data with port authority and broader economic data reveals surging demand for imported goods spurring on the U.S. oil demand recovery, propelling consumer prices higher alongside.

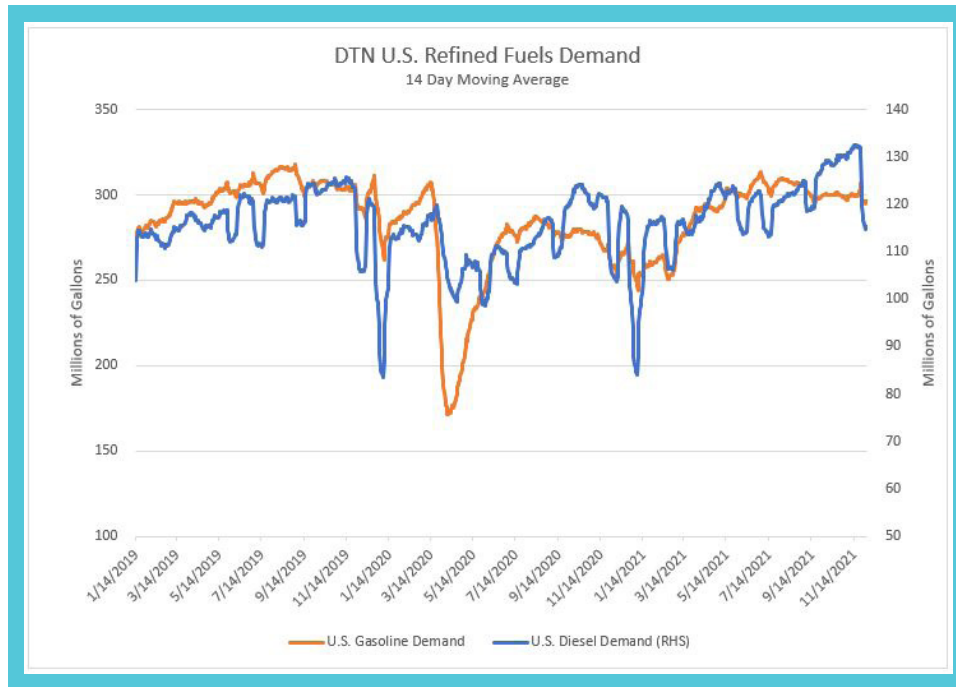
With constant shortages arising over the last nearly two years, much has been written about the need to restore or bring back industry to the United States lost to other nations amid the rise of international trade in recent decades. There has been serious scrutiny — not only of international trade but also just-in-time manufacturing, which limits on-hand inventories and has, in recent decades, helped reduce costs for suppliers and consumers. Blame has been placed on governors, port authorities, truckers, and many others. Meanwhile, little blame has been placed on federal stimulus measures for causing a historic surge in demand for goods at a time when demand would have otherwise been restrained alongside supply. Likewise, little appreciation has been given to just how resilient supply chains have been and how international trade and imports were soaring higher at the very time global supply chains were being most scrutinized. This very strength in trade and import volumes helped shore up U.S. diesel demand and push oil prices higher over the past two years.

Diesel Demand and Shifting Consumer Behavior

Diesel demand has been a key component of the global oil price and demand recovery since prices bottomed in April 2020. While gasoline demand fell 13% year-on-year in the

first half of 2020 (according to DTN Refined Fuels Demand data), diesel demand proved far more resilient, averaging only 5% below 2019 levels over the same period. Even amid record-high U.S. hospitalizations and deaths during the worst wave of the pandemic in the fourth quarter of 2020, diesel demand averaged only 2% below

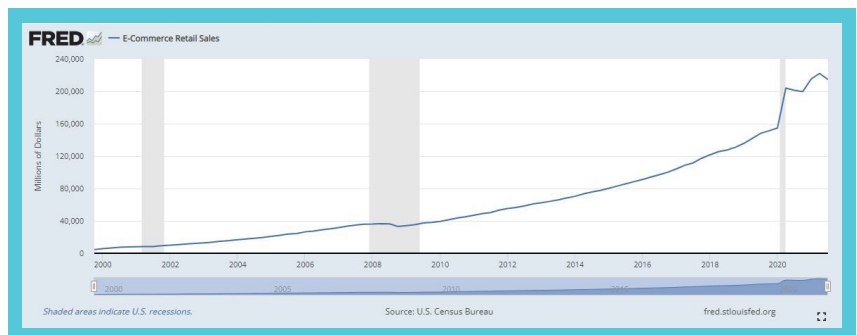
fourth quarter 2019 levels over the period. Meanwhile, U.S. gasoline demand was still averaging 10% below fourth quarter 2019 levels.



U.S. gasoline and diesel demand data from January 2019 to November 2021. Source: DTN Refined Fuels Demand.

In 2020, a sharp increase in consumer purchases was seen alongside a shift in consumer behavior toward increasingly purchasing goods online that need to be shipped to the home — a diesel-intensive logistical process. E-commerce sales surged to a record-high of 15.7% of total U.S. retail sales in the second quarter of 2020. As consumers increasingly turned to online retailers like Amazon rather than shopping in person, U.S. e-commerce sales jumped 31.7% year-on-year in 2020 to a record-setting \$576.6 billion. Although e-commerce sales as a percent of total retail sales have trended lower in 2021 (as consumers have

begun to resume more normal shopping behavior), they remain elevated at 13% of total retail sales as of the third quarter 2021 — 2.1% above third-quarter 2019 levels. Given the continued surge in total retail sales this year, e-commerce retail sales in the third quarter of 2021 were up a staggering 51% or \$66.6 billion from third-quarter 2019 levels.



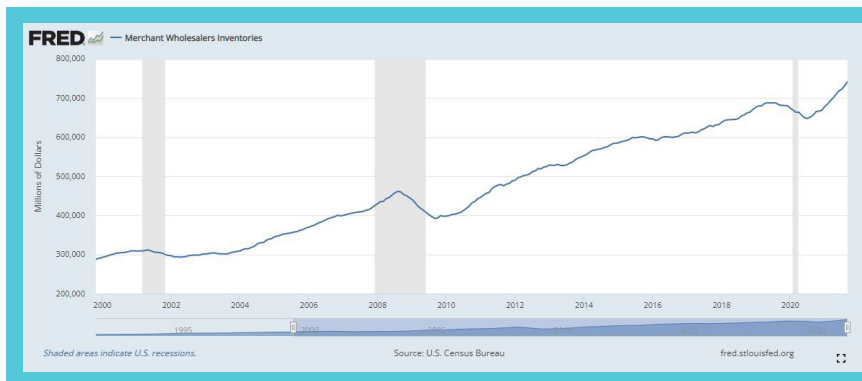
U.S e-commerce retail sales; note the spike related to the start of the pandemic. Source: FRED.

Through the January-November 2021 period, DTN Refined Fuels Demand data show on-road No.2 U.S. diesel demand averaging not only 7% above 2020 levels for the period but also averaging 2% above 2019 levels. The ability for diesel demand to surpass 2019 levels despite pockets of supply chain labor shortages is truly remarkable. Surging imports, retail sales, the strength in e-commerce deliveries, and the rise in working from home have all helped lead diesel demand above pre-COVID levels in 2021 while allowing gasoline demand to hold below 2019 levels. DTN Refined Fuels Demand data show U.S. gasoline demand up 10% year-on-year in

the January-November 2021 period — but averaging 3.4% below 2019 levels.

Pertinent Macroeconomic Data

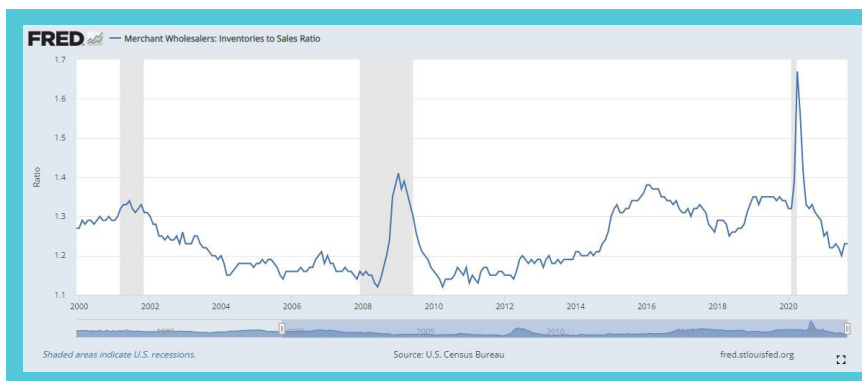
Merchant wholesale inventories were already sliding lower ahead of the arrival of COVID-19 and continued to move lower through mid-2020 amid COVID-19's initial wave, ultimately bottoming in July 2020. Since that time, wholesale inventories have been pushing higher — and, as of September 2021, were their highest in history. Valued at \$742.2 million, inventories are up 8.7% from September 2019 levels.



U.S. merchant wholesaler inventories; note the drop related to the start of the pandemic. Source: FRED.

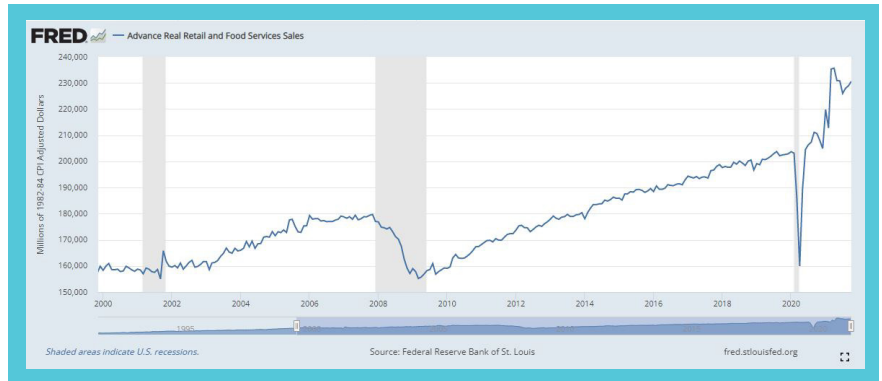
Despite the rise in inventories, the remarkable strength in sales over the past 20 months has meant that the wholesaler inventories-to-sales ratio continued to slide

lower throughout 2021. The ratio hit 1.2 in July 2021 — its lowest since July 2014 — and in September remained the lowest since October 2014, at 1.23.



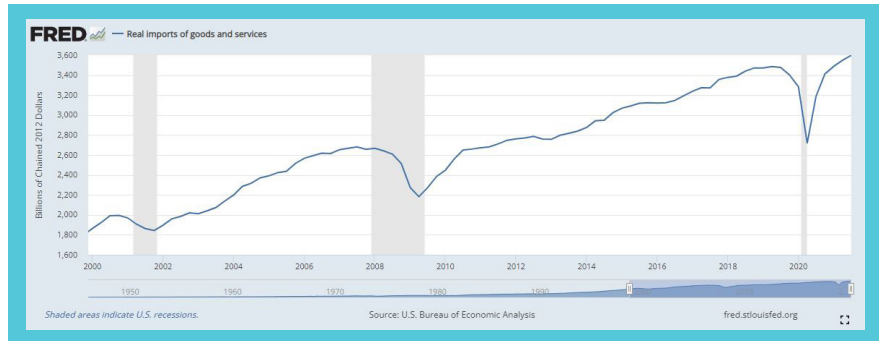
U.S. merchant wholesaler inventories to sales ratio; note the effect of the pandemic. Source: FRED.

This surge in sales is not merely a matter of base effects from a weak year in 2020 or inflation exaggerating the surge in demand (when viewing sales in nominal dollars terms). Adjusted for inflation, real retail and food services sales are up 14%, or \$26.7 million, in September 2021 from September 2019 levels. In the January-September 2021 period, real retail and foodservice sales have averaged 13% above 2019 levels for the period.



U.S. real retail and foodservice sales; note the effect of the start of the pandemic. Source: FRED.

Likewise, inflation-adjusted real imports of goods and services hit a record high of \$3.6 billion in the third quarter of 2021, up from \$3.4 billion in the third quarter of 2019. Keep in mind: in all these instances, the summer 2021 Delta wave of COVID-19 that hit the United States and other parts of the world provided renewed headwinds to economic activity at the time. While September is the latest data available in many of the data sets discussed, other high-frequency data — including our DTN Refined Fuels Demand data — suggests economic activity picked up, moving through the third quarter and into the fourth quarter as the Delta wave receded.



U.S. real imports of goods and services; note the effect of the start of the pandemic and the immediate spike after. Source: FRED.

Surging Demand amid Constrained Supply

Despite the production and logistical difficulties the pandemic presented, the data show limited goods availability is not an issue of supply chains being incapable of returning to pre-COVID-19 activity levels, but rather of ports and supply chains not being able to scale up activity well above pre-pandemic levels. Ultimately, this should force us to ask, amid such a sharp downturn in economic activity and labor force participation, which would normally cause demand for goods to fall as incomes decline, how could goods demand surge?



U.S. labor force participation rate; note the effect of the initial pandemic lockdowns. Source: FRED.

Quickly following the initial sharp contraction in U.S. economic activity in March 2020 came a combination of unprecedented fiscal and monetary stimulus from the federal government and Federal Reserve. As is the case with most economic policy measures, the lag time between enacting such stimulus measures and seeing the ultimate impact of these actions can be lengthy, often making it difficult to distinguish the impact of such policies given the myriad of other events shaping economic activity over the course of the passing months.

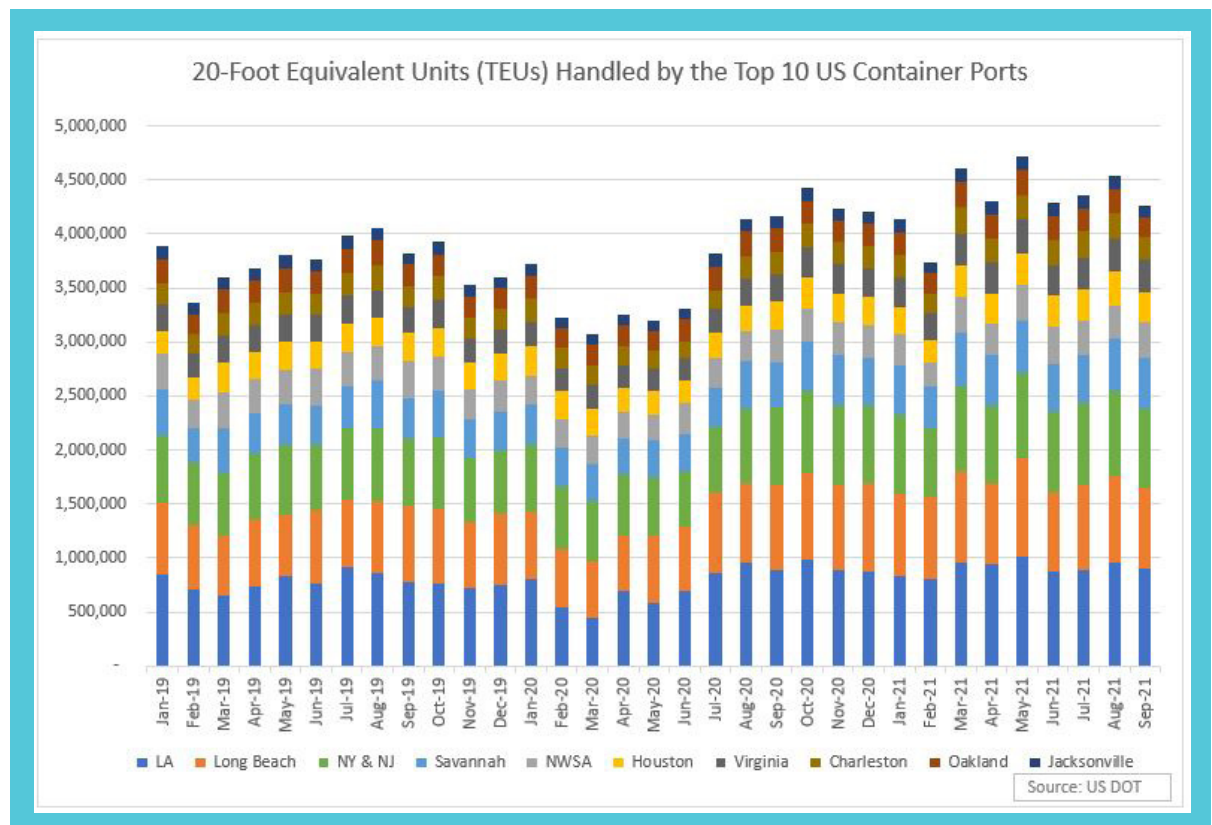
This time around, however, given the truly unprecedented size, scope, and duration of fiscal and monetary stimulus — in particular, the direct-to-consumer payments — the impact of these measures has come to light much more glaringly in the form of surging demand for consumer goods and surging consumer prices. For context, fiscal stimulus over the March 2020 to March 2021 period totaled nearly \$5.6 trillion. This amounts to

26% of total 2019 U.S. GDP and dwarfs the economic stimulus response that followed the 2008 financial crisis, which equated to 4.9% of GDP at the time.

Consumers, flush with government-provided funds and seeing rapidly-appreciating home values and investment accounts that benefited from the historic rise in stock and asset prices, have been both reluctant to return to work and capable of purchasing record volumes of goods while not producing or participating in the labor market. This has created a clear economic imbalance that we are seeing lead to shortages and rising consumer prices.

Port Activity and Diesel Demand

With such national attention on U.S. port congestion and supply chain issues over the past year, it is odd how little consideration has been given to the unprecedented



The number of 20-foot TEUs handled by the top 10 U.S. ports between January 2019 and September 2021. Source: U.S. Department of Transportation.

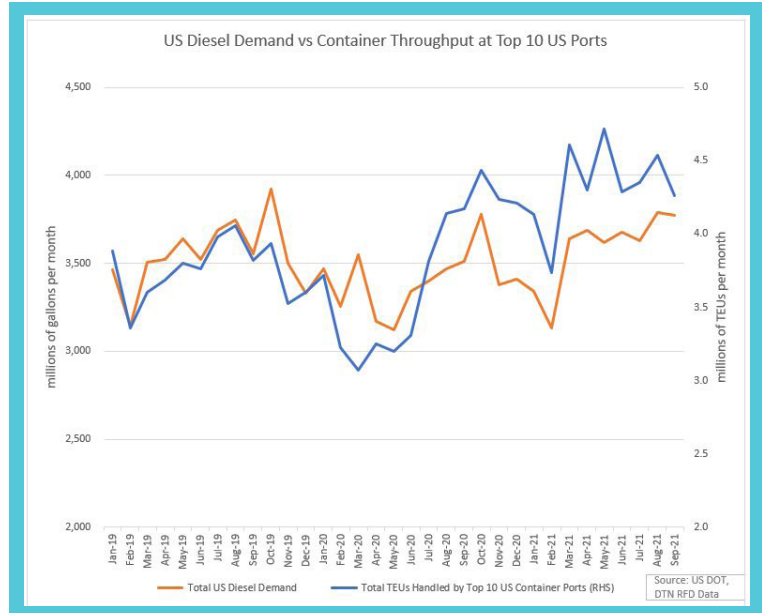
volume of goods flowing into the United States. Looking at the top 10 U.S. ports by container ship throughput, we can see that the number of 20-foot equivalent units (industry-specific language for shipping containers called TEUs) handled by U.S. ports initially contracted 15% year-on-year in March 2020. However, by August 2020, the number of TEUs handled at U.S. ports already exceeded 2019 levels.

By March 2021, the total TEUs handled at the top 10 U.S. container ship ports was 50% higher year-on-year and 27% above 2019 levels for the month. In the January-September 2021 period, TEUs handled at these ports averaged not only 22% above the same period in 2020 but averaged 15% above 2019 levels. This is an unprecedented pace for port activity and emphasizes the difficult situation faced by maritime, port workers, and those trying to coordinate logistical activity.

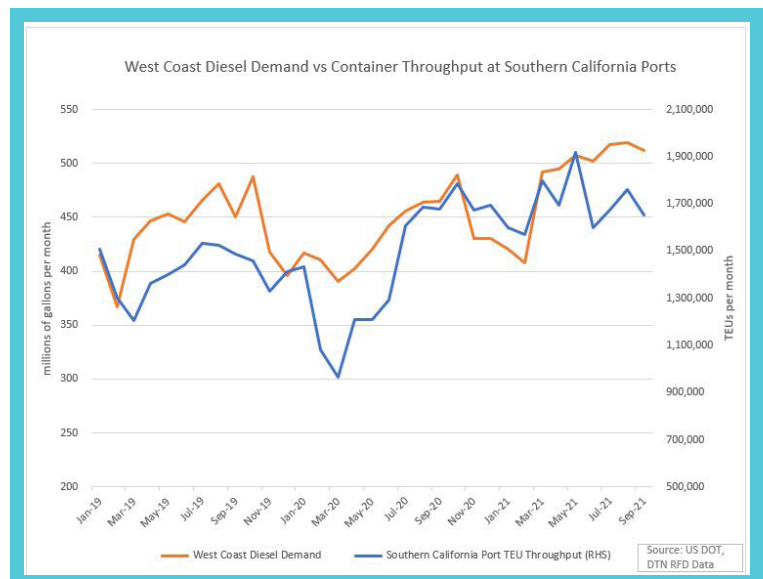
West Coast

Understandably, the Ports of Los Angeles and Long Beach, California, have received the most attention over the past year as they are the two largest ports nationally by container ship offtake volume. With their large port capacities and proximity to Asia, they are key arrival points for Asian goods to be distributed nationwide. Total TEUs handled at the two ports have averaged 25% above 2020 levels in the first nine months of 2021. More importantly, combined TEUs handled at the two ports have averaged 20% above 2019 levels for the January-September 2021 period.

Reflecting this sharp rise in port and logistical activity in the region, West Coast (PADD5) diesel demand has averaged 11% above 2019 levels over the January-September 2021 period according to DTN Refined Fuels Demand data — up far more than any other region nationally. Monthly data show a 64% correlation between TEU offtake at the two southern California ports and



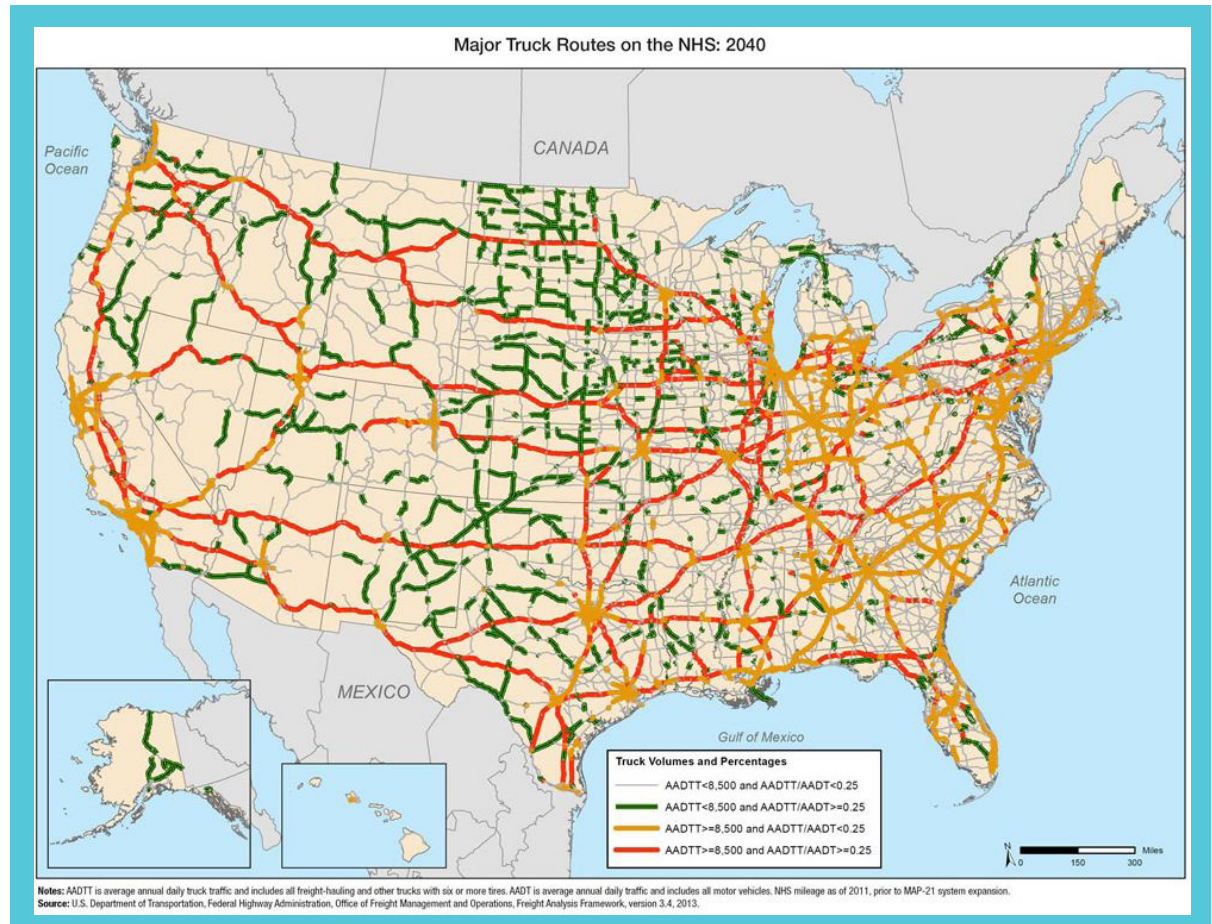
U.S. diesel demand vs. container throughput at the top 10 U.S. ports from January 2019 to September 2021. Source: DTN Refined Fuels Data.



U.S. diesel demand vs. container throughput at the Ports of Los Angeles and Long Beach, California, from January 2019 to September 2021. Source: DTN Refined Fuels Data.

PADD5 diesel demand since January 2019. This correlation between port activity and diesel demand is even more clear when one follows key trucking routes out of California. Given that diesel fuel prices have averaged about \$1 per gallon (nearly 30%) higher in California than neighboring states like Arizona and Nevada, truckers

try to make it across state lines before filling up. TEU offtake at the two southern California ports is 68% correlated with Arizona and Nevada diesel demand. While California diesel demand is 4% above 2019 levels in the January-November 2021 period, Arizona diesel demand is up 12% over the same period in 2019.



Major U.S. truck routes, color-coded by volumes and percentages. Source: U.S. Department of Transportation.

Across PADD5 there is a clear divide in diesel and gasoline demand developments that emphasizes the impact of the logistical effort to distribute imported goods, rather than a widespread normalization of economic activity, vehicle travel, etc., in 2021. According to DTN data, PADD5 gasoline demand has averaged 8% below 2019 levels in the first 11 months of 2021 despite the strength in regional diesel demand. California gasoline demand has averaged 8% below 2019 levels in the January-November 2021 period, and Arizona gasoline demand has averaged 13% below 2019 levels.

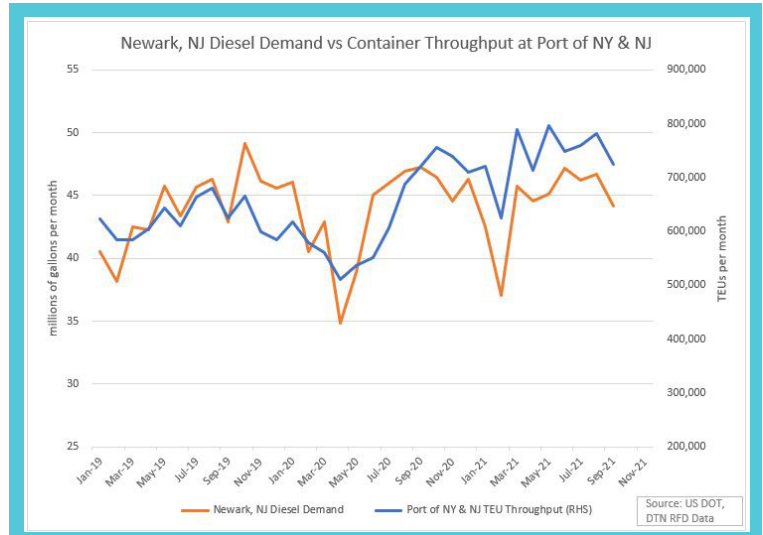
East Coast

The East Coast (PADD1) is home to the third and fourth-largest U.S. ports by TEU throughput volume, and uncoincidentally, is the only region nationally other than PADD5 to see diesel demand average more than 1% above 2019 levels so far in 2021. The port of New York and New Jersey is the third-largest port based on TEU throughput, and the Port of Savannah, Georgia, is the fourth largest. Like on the West Coast, East Coast ports have also seen container ship arrivals push well above pre-COVID-19 levels this year.

While the impact on diesel demand in the region is still evident when analyzing the impact of East Coast port activity on diesel demand, one must appreciate the relative scale of East Coast vs. West Coast port activity and the relative scale of the regional diesel markets.

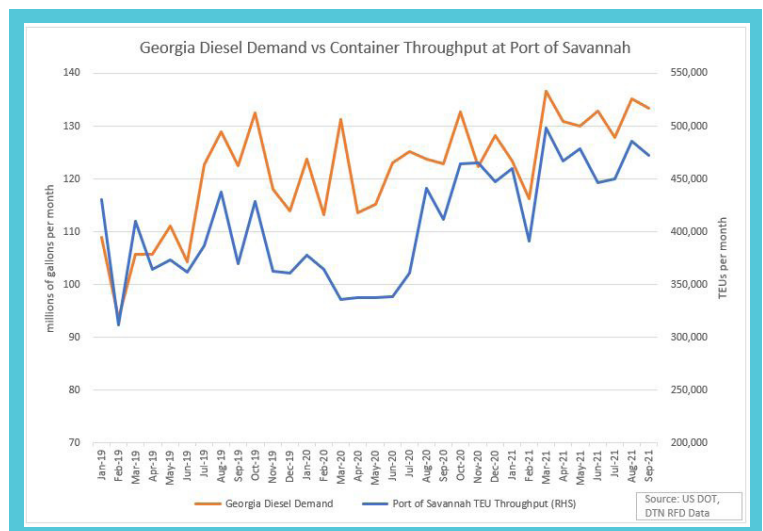
Although both East Coast ports have seen TEU volumes surge above 2019 levels this year, the port of New York and New Jersey has TEU volumes 56% below the combined southern California port volumes discussed. The Port of Savannah handles 73% fewer TEUs than the combined southern California port volumes. At the same time, it's important to note that East Coast diesel demand averages roughly double that of West Coast diesel demand. Therefore, the increased port activity at the largest East Coast ports will carry less weight in terms of the volumetric impact on regional diesel demand.

The Port of New York and New Jersey has seen a 24% year-on-year increase in TEU throughput volume in the January-September 2021 period. Volumes at the port are up 18% over the nine-month period from the same period in 2019. At the same time, New York diesel demand has averaged 5% above 2019 levels in the January-September period. And like what was seen in California and PADD5, this strength in diesel demand has come despite gasoline demand in New York averaging 7% below 2019 levels over the same period according to DTN data. As was the case in California, this flow of goods can be tracked through key trucking routes. Two of the key trucking routes that take cargoes west from the Port of New York and New Jersey, I-78 and I-81, run through Pennsylvania. Pennsylvania has seen diesel demand average 7% above 2019 levels in the January-September 2021 period.



Newark, New Jersey diesel demand vs. container throughput at the Port of New York and New Jersey, from January 2019 to November 2021. Source: DTN Refined Fuels Data.

The Port of Savannah has seen TEU throughput average 20% above 2019 levels over the January-September 2021 period. As Savannah is a much smaller city relative to New York and Newark, the relationship between port activity and Savannah diesel demand is much clearer. Since January 2019, diesel demand in Savannah is 70% correlated with Port of Savannah TEU throughput volumes. Diesel demand in Georgia has averaged 8% above 2019 levels in the January-September 2021 period. This strength in state-wide diesel demand is led by demand strength in Savannah, which has seen diesel demand in the city double relative to 2019 levels so far this year.



Georgia diesel demand vs. container throughput at the Port of Savannah, from January 2019 to September 2021. Source: DTN Refined Fuels Data.

Gulf Coast

The Gulf Coast (PADD3) is home to the Port of Houston, which is the sixth-largest U.S. port by TEU throughput volume and has also seen container ship activity surge this year. The Port of Houston has benefited from the backlog of ships off the California coast, which prompted some ships to take the longer route through the Panama Canal to Houston. TEU throughput at the Port of Houston has averaged 16% above 2020 levels in the January-September 2021 period and is 12% above 2019 levels. This has helped push Houston diesel demand to average 22% above 2019 levels so far in 2021.

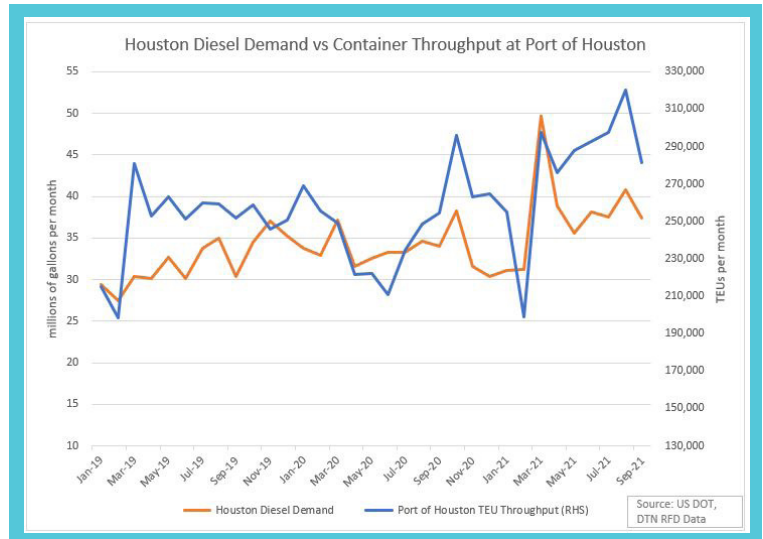
However, unlike the West Coast and East Coast, Texas and the Gulf Coast region have also experienced a major drag on diesel demand by way of weakening oil exploration activity. Oil drilling and exploration is a notoriously diesel-intensive process. As a proxy for this regional drag on diesel demand from the oil sector, we need look no further than Baker Hughes rotary rig count data, which shows the weekly Texas rig count averaging 221 through the first 11 months of 2021, compared to a 467 weekly rig count average in 2019. Despite this drag on diesel demand from the oil sector in 2021, PADD3 diesel demand has managed to average 0.3% above 2019 levels so far this year.

Other Regions

Port activity and population density along the U.S. coasts have meant the coastal regions saw the strongest impact on diesel demand by rising import volumes, e-commerce sales, and home deliveries.

In the Midwest (PADD2), diesel demand has averaged just 0.9% above 2019 levels so far this year. Meanwhile, gasoline demand in the region has averaged 1% below 2019 levels.

In the Rockies (PADD4), diesel demand has averaged 5% below 2019 levels so far this year. Gasoline demand in the region has averaged 3% below 2019 levels.



Houston diesel demand vs. container throughput at the Port of Houston, from January 2019 to September 2021. Source: DTN Refined Fuels Data.

Refined Fuel Market Impact



**9.4%
lower**

U.S. refiners refined 9.4% less crude in 2021 than 2019.

The divergence between diesel, gasoline, and jet fuel demand throughout the pandemic has caused considerable pain for refiners. Weakness in jet fuel demand has weighed on refining margins, despite the strength in diesel demand over the past year and the recovery in gasoline demand. The weakness of the total refining margin has led U.S. refiners to refine 1.6 million bpd or 9.4% less crude in 2021 than in 2019. This follows U.S. refinery runs averaging 2.3 million bpd, or 14%, below 2019 levels in 2020.



**Down
7.4%**

U.S. distillate fuel oil stocks are down 7.4% below the five-year average.

With strength in diesel demand and lower refinery runs, U.S. distillate fuel oil stocks, as measured by the Energy Information Administration (EIA), have declined 24.5 million barrels over the past year. Total distillate fuel oil stocks are currently 5% below the 2016-2019 average and 7.4% below the five-year average in the latest EIA data for the week ending December 3, 2021.



**Up
28%**

Retail diesel prices average 28% above 2020 levels.

Diesel demand strength and narrowing inventories have pushed the U.S. average retail price for No.2 on-road diesel to the highest level since October 2014, according to AAA data as of the final week of November 2021, at \$3.72 per gallon. Retail diesel prices in the United States have averaged 28% above 2020 levels so far this year and have averaged 7% above 2019 levels.

Looking Forward

As was seen in DTN Refined Fuels Demand data and U.S. port data, World Trade Organization (WTO) data show the rebound in global economic activity in the first half of 2021 pushed global merchandise trade above its pre-pandemic peak. The WTO is now forecasting global merchandise trade volume growth of 10.8% in 2021. But that growth should moderate in 2022 as the fiscal stimulus impulse diminishes, the Federal Reserve and other central banks begin to tighten monetary policy, and surging prices for consumer goods weigh on demand. The WTO forecasts global trade growth to slow to 4.7% in 2022.

Likewise, we expect U.S. diesel demand growth to moderate to 3-4% in 2022, as port activity and goods imports should begin to slowly normalize and return to their pre-COVID-19 trend rather than the breakneck quarterly growth pace seen since the second quarter of 2020. We expect e-commerce sales will continue to hold above pre-COVID-19 levels and provide a tailwind for diesel demand. At the same

time, if domestic crude oil production is set to hold at current rates or grow through 2022 as EIA projects, this should soon entail rising U.S. rig counts and drilling activity. This, too, should provide a boost for U.S. diesel demand in 2022.

We will continue to track the developments in these respective industries and markets by using our city-by-city DTN Refined Fuels Demand data to gauge economic and fuel demand activity in real-time over the coming year. With our data currently showing U.S. diesel demand above 2019 levels and gasoline demand in line with 2019 levels for the seasonal period, the emphasis for the oil demand recovery remains on jet fuel. If COVID-19 developments and global governments allow for a normalization of global passenger air travel in the coming year, and jet fuel joins the diesel and gasoline demand party, the recovery in U.S. fuel demand would be complete, which would signal a normalization of refinery runs and crude oil demand in 2022.

About the author

Troy Vincent is a market analyst for DTN. He's been in the economic research and energy risk management industry for nearly a decade, from large multinationals like Schneider Electric and Ingersoll Rand to innovative technology startups like ClipperData. Vincent specializes in crude oil and refined products and has a thorough understanding of economics and monetary policy, which gives his readers a deeper understanding of market moves and indicators than basic supply and demand levels.

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