

Forecasting Natural Demand

Powering the US Auto Market After COVID-19

April 23, 2020

What is Natural Demand?

Throughout and immediately following the Great Recession, there was much hand wringing about the future state of automobile sales in the United States. The wild swings in gas prices led some automakers to speculate that fuel efficiency would be the top factor in purchase decisions for consumers. Domestic automakers scrambled to make their passenger car lineups profitable and of comparable quality to Asian competitors to address this perceived weak spot in their showroom. Online social networking and new technologies like video chat led some cultural forecasters to foretell of the demise of the automotive industry as Millennials took their drivers license tests further and further out from their 16th birthday. The emergence of ride sharing apps like Uber and Lyft was supposed to further erode any passion for car culture among this generation that was set to overtake Baby Boomers in population numbers and spending power. While it's been over a decade since Tesla launched their proof of concept Roadster vehicle to the public, the question of how and when electric vehicles will take over as the powertrain of choice among consumers is still unanswered.

Ultimately, most who trekked these paths have either followed them to dead ends or continue to wander aimlessly. As we close the door on an epic run of growth and change in the US automotive industry and enter our next inevitable downturn, we see that the doomed brand Hummer is returning not only under the GMC banner, but as an electric powered pickup truck that will likely see Millennials, who have finally come around to embrace vehicle ownership like generations before them, as the ideal customer. Talk about a plot twist!

As the auto industry began to view the Great Recession in the rearview mirror and looked ahead to reinvigorated new vehicle sales, one question kept being asked: How long will the growth in sales last? ALG tackled this question by addressing the concept of pent-up demand from deferred sales during the recession and in the process explored a concept we call "Natural Demand".

Simply put, Natural Demand measures the need for vehicles by eligible drivers in the US and compares that number against annual scrappage rates. A shortage of vehicles relative to natural demand will result in higher transaction prices, lower incentives, fewer vehicles sent to the scrap yard and an increase to the average age of vehicles in the US car parc. An oversupply yields the inverse: lower prices and higher incentives as automaker force vehicles into the marketplace.

What is Natural Demand?

The concept of Natural Sales is quite simple. In the United States, the automobile is an essential part of daily life. We need a vehicle to commute to work, run errands for everyday tasks like grocery shopping or for the occasional home improvement project. During the Great Recession, struggling homeowners often opted to foreclose on their property rather than default on their auto loans. Your house cannot get you to your job interview! The idea that a vehicle is a necessity, rather than a luxury, is not new or revolutionary, nor is it debated by many individuals who reside outside dense urban settings like San Francisco or New York City.

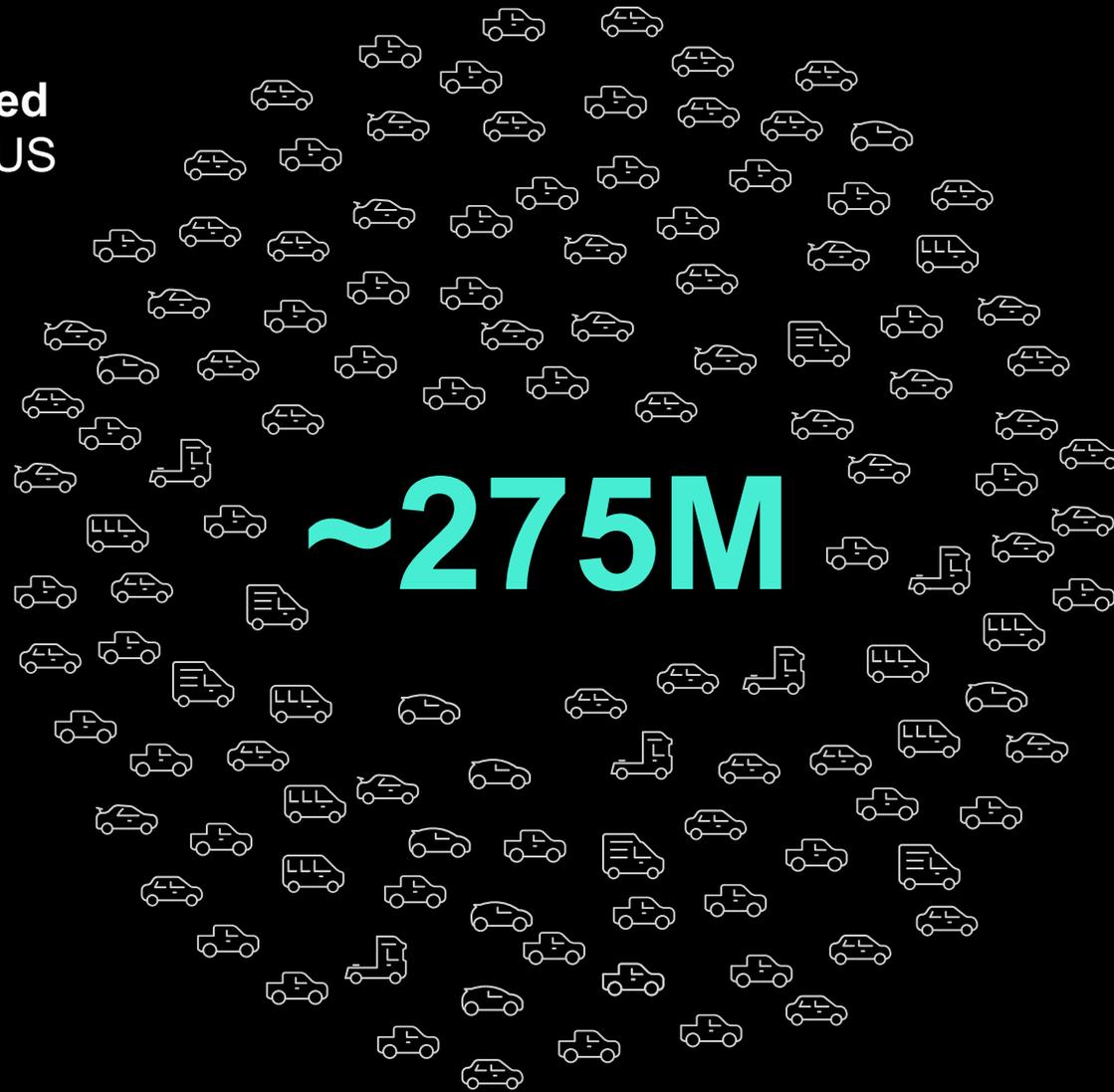
Coming from this point of view, it seems logical then that we can forecast demand for automobiles much in the same way we forecast demand for turkey at Thanksgiving dinner. How many people celebrate Thanksgiving? Remove the vegetarians, add back enough for leftover sandwiches on Black Friday and you can get a rough and consistent idea of how much turkey is required. (Apologies in advance as we continue with this analogy below, but it makes sense.)

With automobiles, the four critical questions (and their Thanksgiving counterparts) are: How many people are eligible for a driver's license (how many people celebrate Thanksgiving)? Subtract those people who don't have a driver's license (the vegetarians). How many vehicles does the typical licensed driver have registered (who wants leftovers)? Lastly, How many vehicles are sent to the junk yard every year (Thanksgiving comes and goes every year, so scrappage is 100%)? Luckily, each of these questions can be easily answered, and confidently forecasted, due to an expansive data set that is both consistent and generally determined in its directional trend.

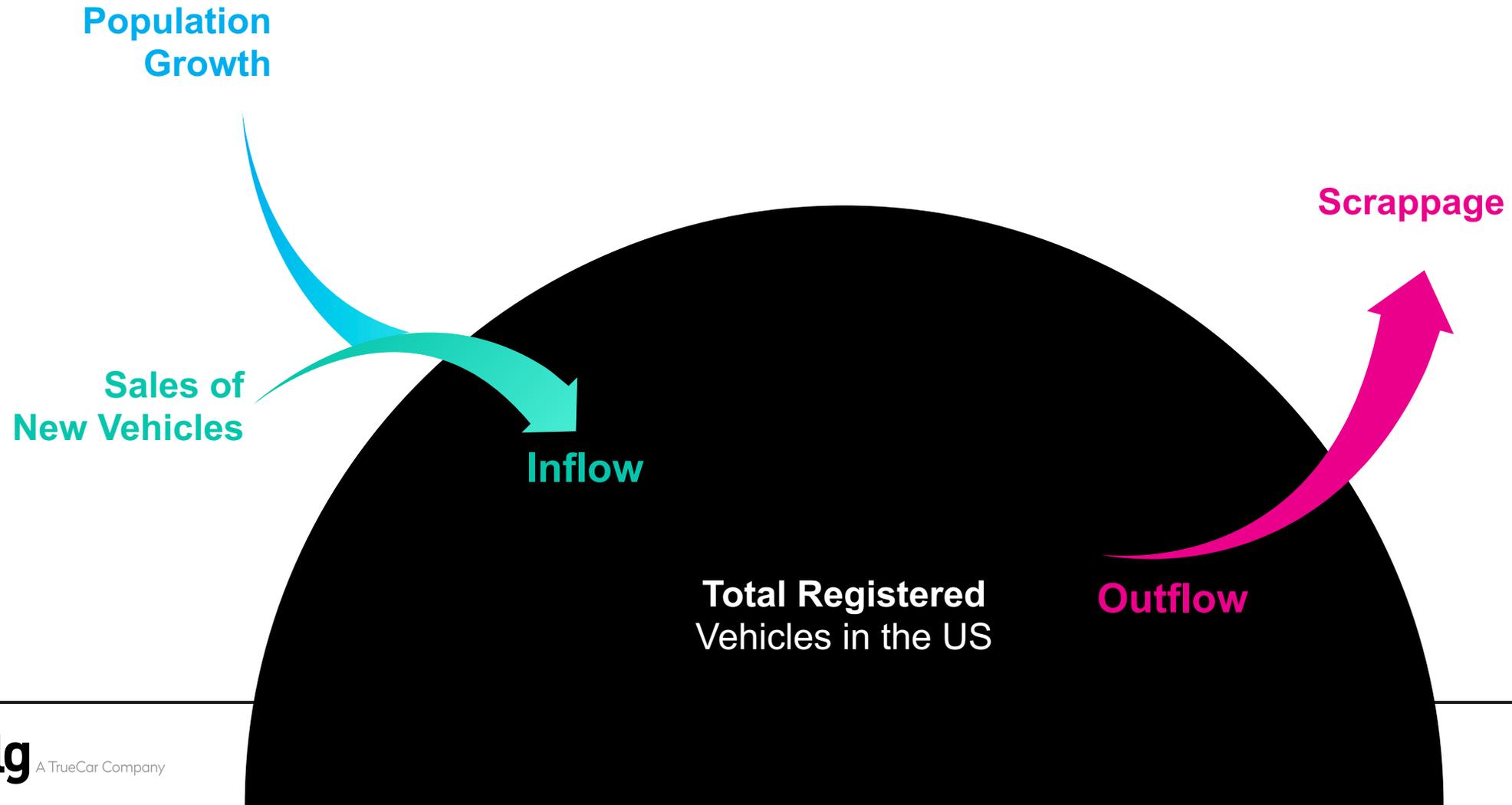
The following report will dive into the historical trends with each of these data sets and offer a variety of future possible outcomes. We believe that upon review of the key factors that influence both supply and demand, the mid to long term prospects for new vehicle sales in the US will be undeniably strong. The question will not be "if" new vehicle sales will return to the levels we saw in the mid 20-teens, but "when" will they return. That timing is solely dependent on the severity of the current global economic downturn and how the quickly the subsequent recovery will be. ALG is confident that regardless of when the recovery occurs, it will bring with it millions of potential sales from deferred purchases in 2020 and 2021 that will support a reinvigorated automotive industry through the rest of the decade.

Forecasting Methodology Summary

Total Registered Vehicles in the US



Natural Demand: Flow of Vehicles in the US Car Parc

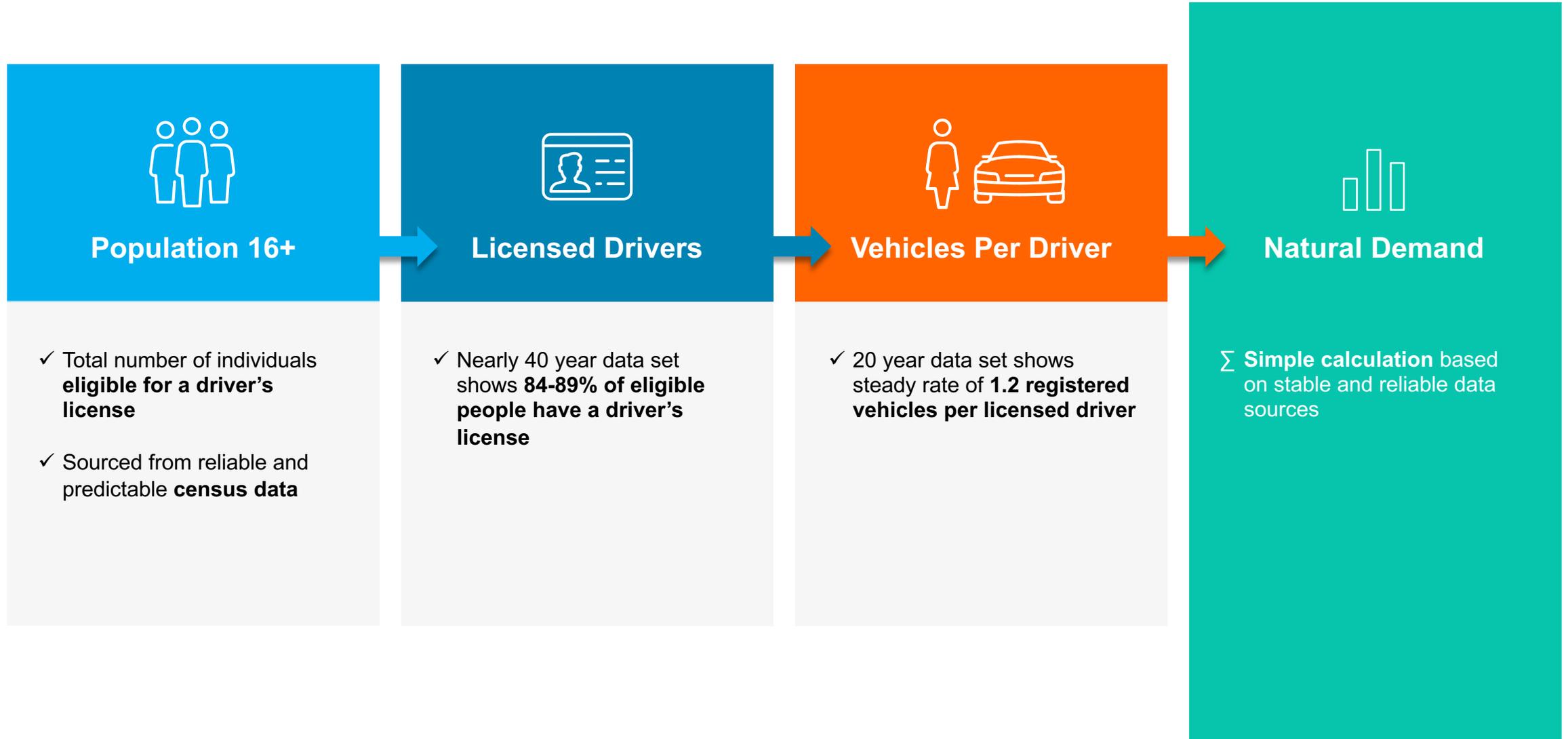


Natural Demand represents the new vehicles required to offset units *removed* from the car parc (replacement demand) *plus new drivers* from population growth (incremental demand).

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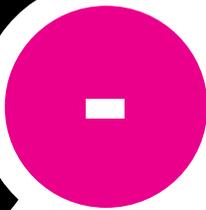
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How Do We Arrive at Natural Demand?



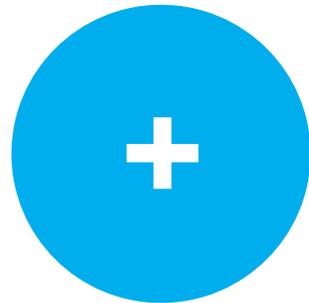
Forecasting Natural Demand

**Total Registered
Vehicles in the US**



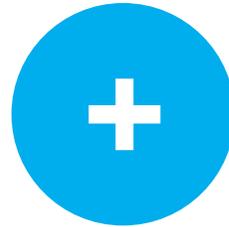
Scrappage Rate

Number of vehicles removed from operation/registration due to obsolescence or damage



Population Growth

Growth population aged 16+ and licensed drivers
Includes growth from immigration



New Sales Forecast

Short term sales will impact supply relative mid/long term outlook

Stress Test Variables

- ✓ Licensed drivers as percent of total eligible population
84.5% to 87.5%
- ✓ Number of registered vehicles per licensed driver
1.15 to 1.20
- ✓ Scrappage Rate
5.0% to 6.0%
Short term severe drop to 4.0% to 4.5%
- ✓ Sales
Omit or include pent up demand from 2020

Establishing Supply Metrics



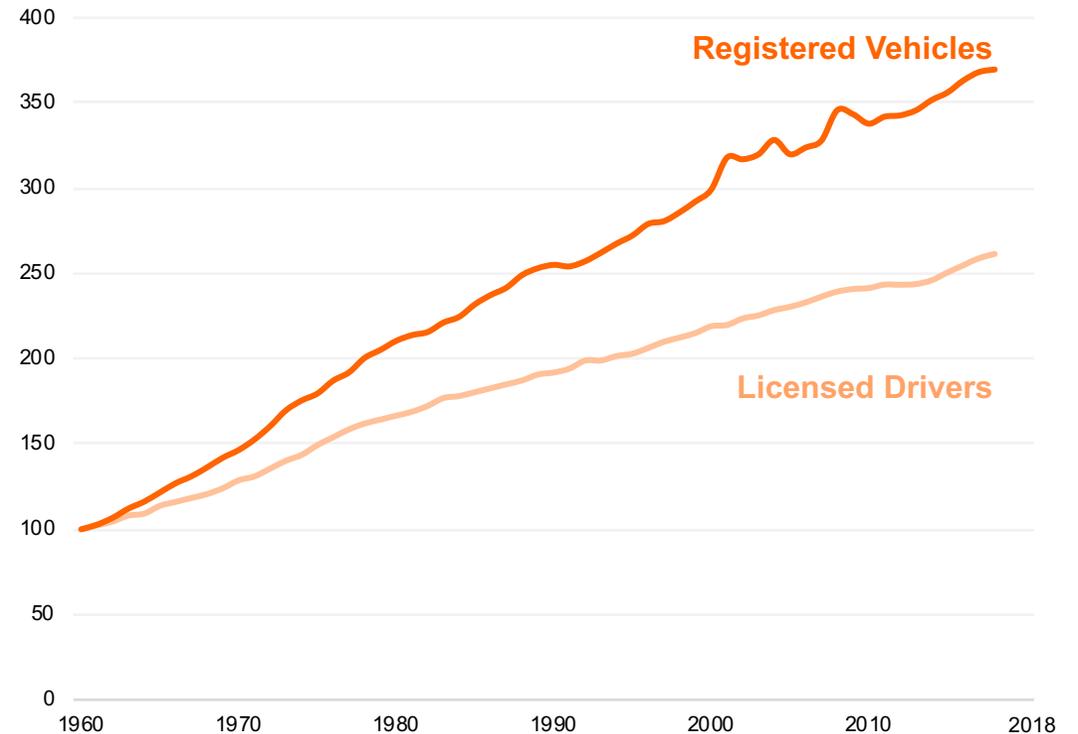
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Registered Vehicle and Licensed Driver History

The number of vehicles registered in the US has grown consistently since 1960. Key times where the rate of increase has slowed have been following the dot-com bubble and 9/11 attacks of the early 2000s and following the Great Recession.

Over time, the growth in number of registered vehicles has outpaced the growth in licensed drivers.

Registered Vehicles and Licensed Drivers
Indexed



Vehicle Scrappage History

The current supply of registered vehicles in the US exists at the intersection with the current demand of vehicles. The primary disruption to supply comes from two factors: scrappage and new vehicle production (the latter discussed in the following slide).

Scrappage is the removal of a unit from the US national fleet either due to damage or obsolescence (financial or otherwise). Simply put, if a vehicle is destroyed, it is scrapped, or if the cost to keep a vehicle operational is greater than the market value of the vehicle (or cost to acquire a different functioning vehicle), it is scrapped.

Vehicle durability certainly impacts the scrappage rate of vehicles. (Better built vehicles last longer!) The average age of the US vehicle fleet will be reviewed in later slides.

Scrappage rate also shows volatility over a 30 year time period, but within a fairly tight range and with consistent declines.

Conclusion for Study:

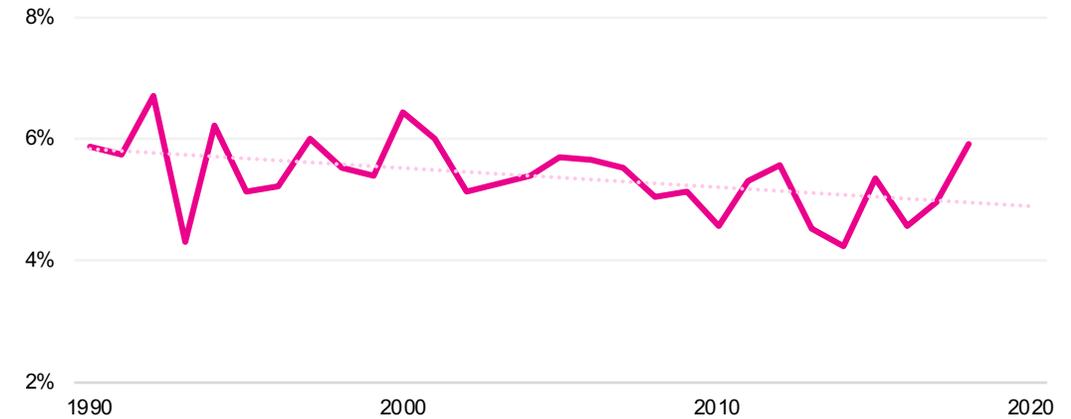
Large Supply Disruption: 6.0% scrappage

Baseline Supply Disruption: 5.5% scrappage

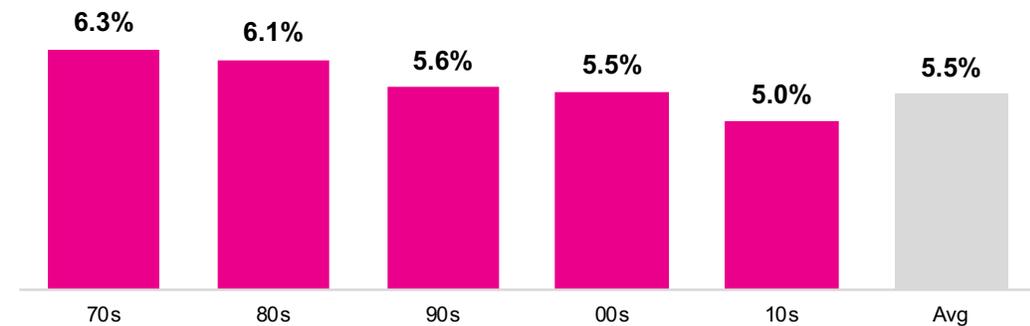
Small Supply Disruption: 5.0% scrappage

Short Term Severe Disruption: 4.0-4.5% scrappage in 2020/2021

Scrappage Rate



Scrappage Rate by Decade



New Vehicle Sales

Incoming supply into the US vehicle fleet is determined by the production and sale of new vehicles into market as well as used vehicle imports from international markets. The latter data set is quite volatile, difficult to obtain and a rounding error relative to new vehicle sales (in 2019, used vehicle imports represented 0.32% of new vehicle sales). As such, we will withhold it as an input in this exercise.

The ALG outlook is a revised forecast based on ALG's most likely scenario following COVID-19 disruption.

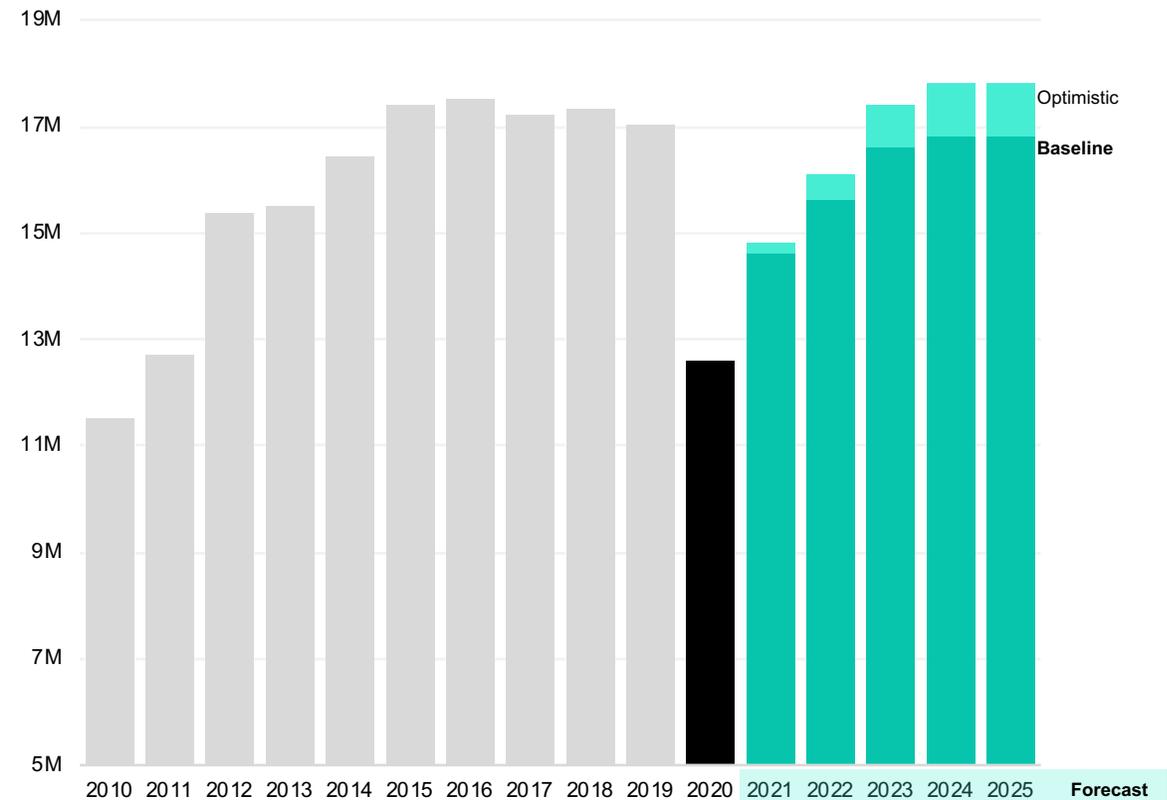
Conclusion for Study:

New Vehicle Sales

Scenarios	2020	2021	2022	2023	2024	2025
Optimistic	12.6	14.8	16.1	17.4	17.8	17.8
Baseline	12.6	14.6	15.6	16.6	16.8	16.8

New Light Vehicle Sales

2010-2025 Forecast



Establishing Demand Inputs

Driver's Age Population Trends

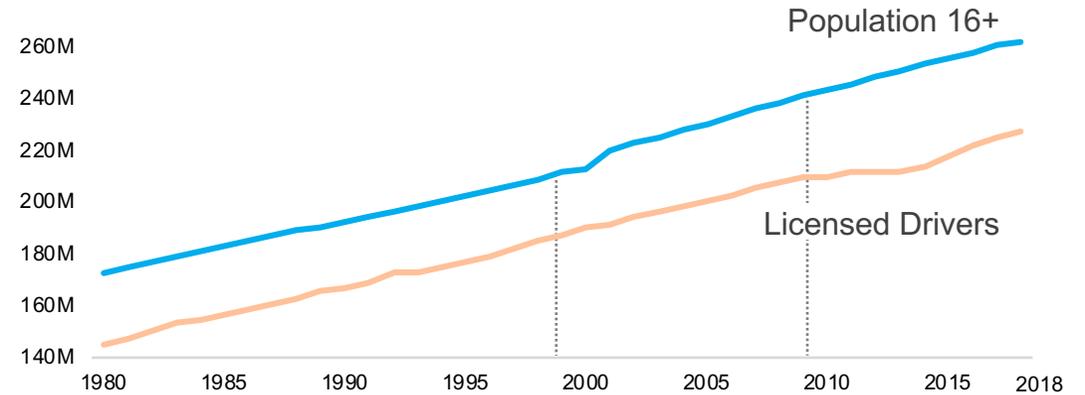
The increase in population that is eligible for a driver's license, 16 years of age and up, has moved in lockstep with the number of licensed drivers.

Two deviations from the long term trend occur around 2001 and 2009. Both periods represent significant macro-economic downturns with the dot-com bubble and 9/11 terrorist attacks in 2001 and the Great Recession in 2009.

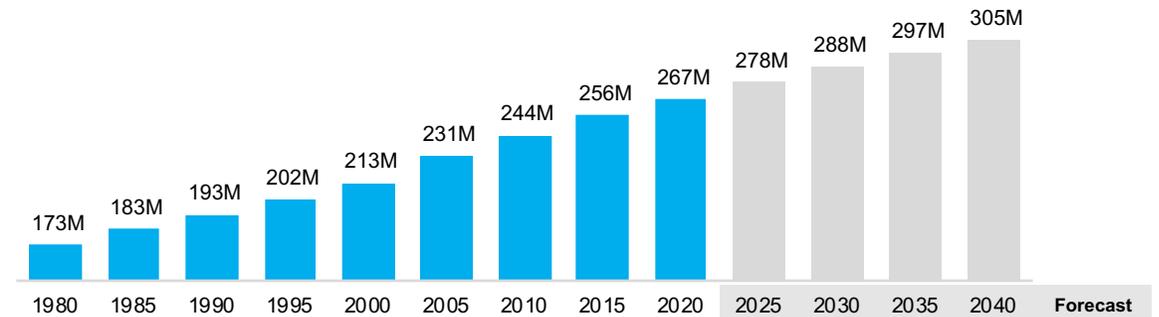
Following these short term market disruptions, the relationship between driver's age population and number of licensed drivers returns to the similar long term relationship.

Conclusion for study: follow US Census Population Projections (see table)

Population 16+ and Licensed Drivers
1980-2020



Population 16+
1980-2040 Forecast



Percent of Licensed Drivers

When we observe the number of licensed drivers relative to the population of the US age 16 and older, we see a pattern of volatility, again heavily influenced by macro economic events, but within an extremely tight range of 83.9% to 89.4%

While it is incredibly easy to establish a forecast of the US population aged 16 and up (based on births that have occurred over the last 16 years plus factoring in mortality and immigration) we can flex the number of licensed drivers in a forecast by adjusting for various demand scenarios.

Conclusion for Study:

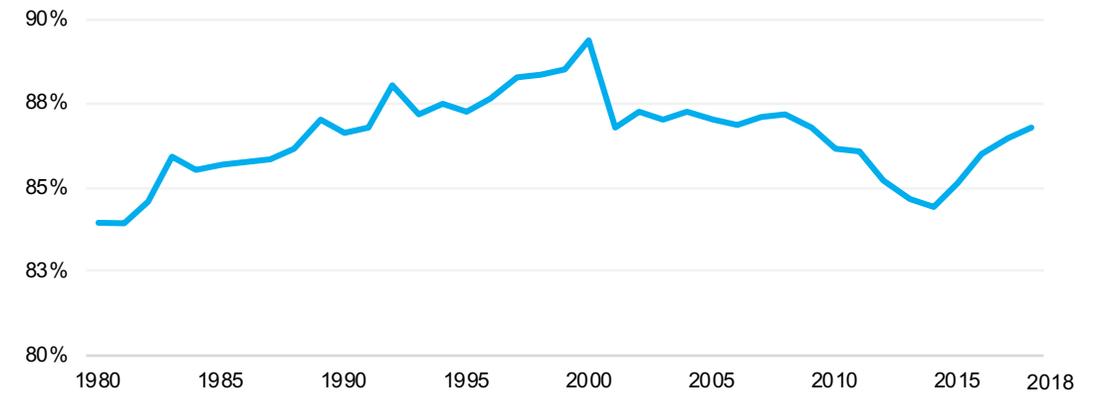
High Demand: 87.5% driven by favorable economic conditions combined with millennials approaching middle age

Baseline: 86.5% the four decade average, which was recently surpassed as millennials began to age into vehicle ownership and purchasing power

Low Demand: 84.5% (below 40 year low) speculation of a well connected and ride-sharing future, with heavy regulatory and insurance cost barriers to entry for younger drivers; potentially paired with a slow economic recovery

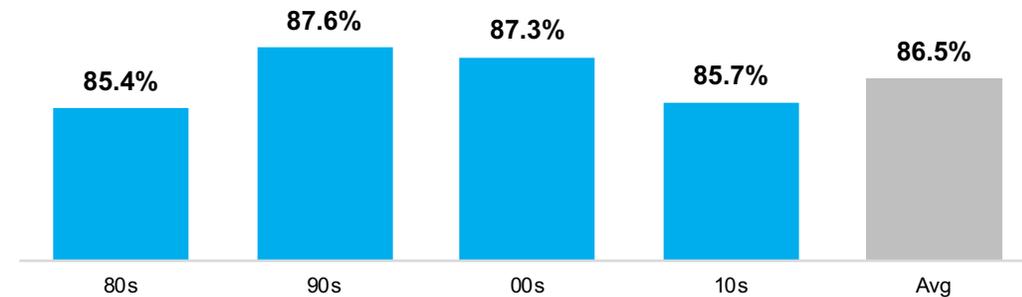
Population that are Licensed Drivers

1980-2020



Licensed Drivers %

by Decade



Registered Vehicles per Licensed Driver

The number of vehicles registered per licensed driver has also grown considerably since the beginning of our data set in 1960. While the number has shown some volatility over the last 20 years, again related to macro economic events of the early 2000s and the Great Recession, it has hovered around the 1.2 vehicles per driver since 2000.

Affordability of vehicles (both in relative transaction price and operational costs) combined with a wider range of products that offer specialized usage have contributed the multi-vehicle ownership trend.

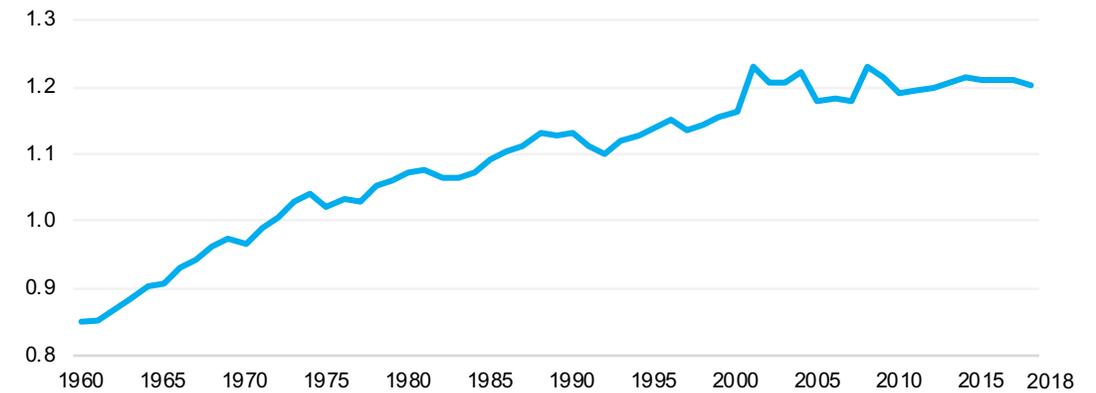
Also, as time passes, more and more registered vehicles are represented by classic/collector cars, aging vehicles that are used intermittently and registered but non-operational vehicles.

Conclusion for Study:

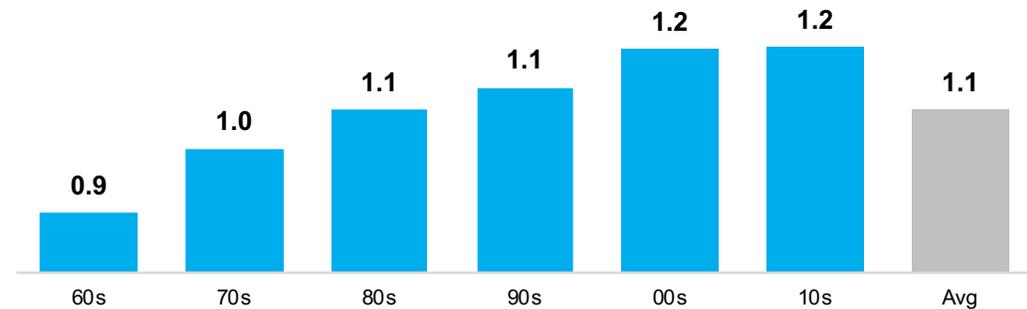
Baseline: 20 year average of 1.2 vehicles per licensed driver

Low Demand: Pullback to a 20 year low of 1.15 vehicles per licensed driver

Registered Vehicles per Licensed Driver
1960-2020



Vehicles per Licensed Driver
by Decade



Outlook Scenarios Based on Natural Demand



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Natural Demand Calculation Scenarios

The following slides will review historical trends and establish baseline and optimistic/cautious scenarios for each of the key drivers that influence overall vehicle demand in the US. The various scenarios are outlined here:

Percentage of Eligible Population (Age 16+) with a Driver's License

- Baseline – 86.5%
- Optimistic – 87.5%
- Cautious – 84.5%

Number of Registered Vehicles per Licensed Driver

- Baseline – 1.2 vehicles
- Cautious – 1.15 vehicles

Scrappage Rate

- Baseline – 5.5%
- Optimistic – 6.0%
- Cautious – 5.0%
- Short Term Severe Disruption: 4.0-4.5% scrappage in 2020/2021

New Vehicle Sales

Scenarios	2020	2021	2022	2023	2024	2025
Optimistic	12.6	14.8	16.1	17.4	17.8	17.8
Baseline	12.6	14.6	15.6	16.6	16.8	16.8

Outcome

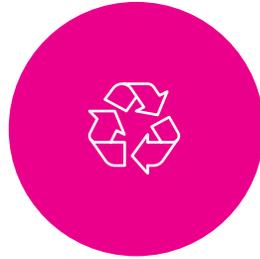
These inputs will yield a forecast that shows the **over/under** supply relative to these demand factors.

Each year reflects **the imbalance** between total US car parc volume and vehicle demand for that particular year.

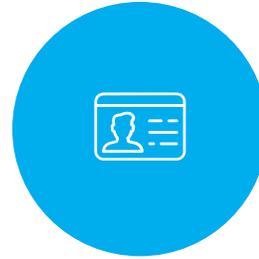
Primary Inputs Used to Calculate Natural Demand



Vehicles
Per Driver



Vehicle
Scrappage



Licensed
Drivers



Vehicles
Sales

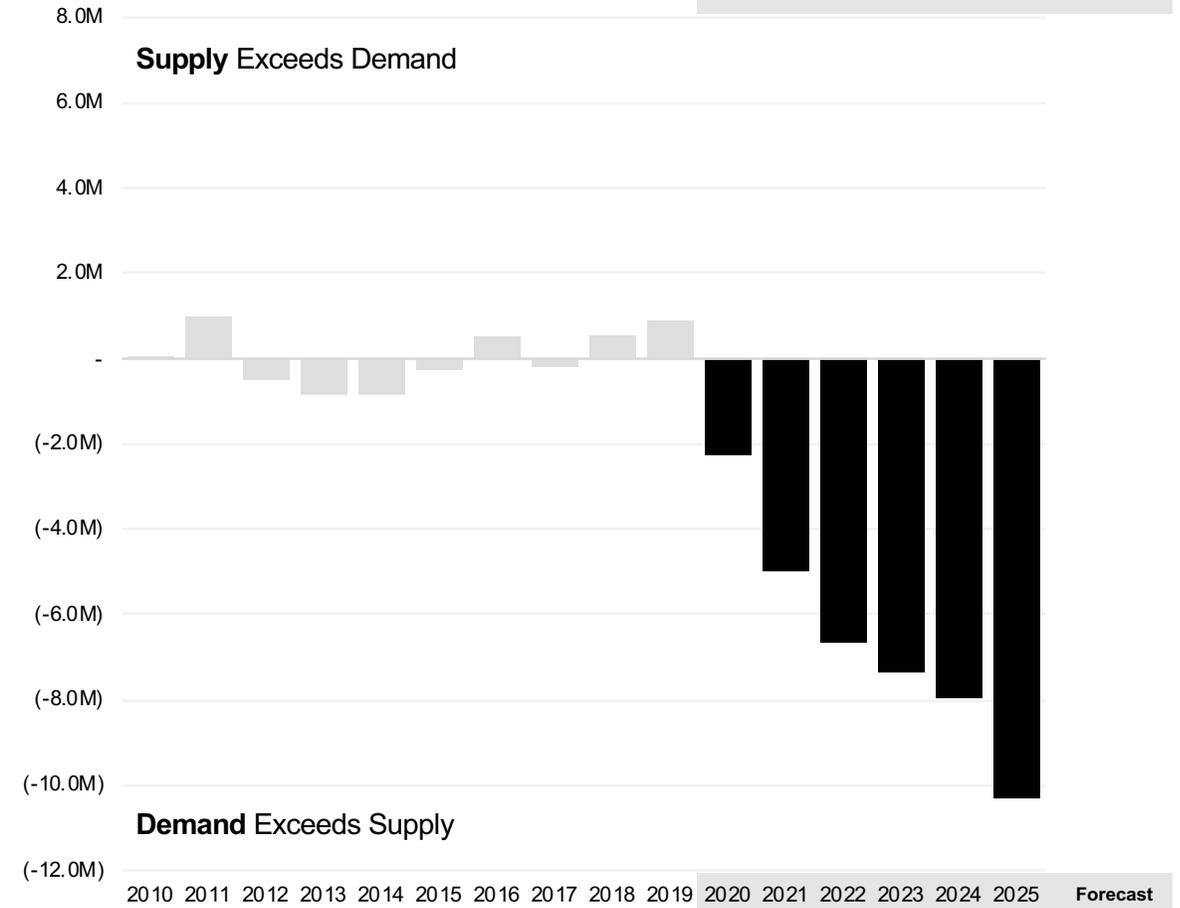
Base Scenario: Long Term Drivers Continue

- This scenario uses ALG's 2020-2025 sales outlook
- Consistent license rate, scrappage and registered vehicles per driver yield a significant shortage of vehicles relative to long term demand variables
- This scenario creates tremendous pent-up demand that is unmet in the time frame provided due to inability or unwillingness of automakers to match demand
- The shortage of supply would likely reverse incentive spending trends, significantly shedding the price discounts offered since the early 2000s

Year	Vehicles per Driver	Scrappage Rate	License Rate	Sales
<i>Scenario Impact</i>	<i>No Change</i>	<i>No Change</i>	<i>No Change</i>	<i>No Change</i>
2020	1.20	5.5%	86.0%	12,900,000
2021	1.20	5.5%	86.0%	14,584,000
2022	1.20	5.5%	86.0%	15,597,000
2023	1.20	5.5%	86.0%	16,603,000
2024	1.20	5.5%	86.0%	16,800,000
2025	1.20	5.5%	86.5%	16,800,000

US Car Parc Supply vs Demand Imbalance

Significant Demand Disruption

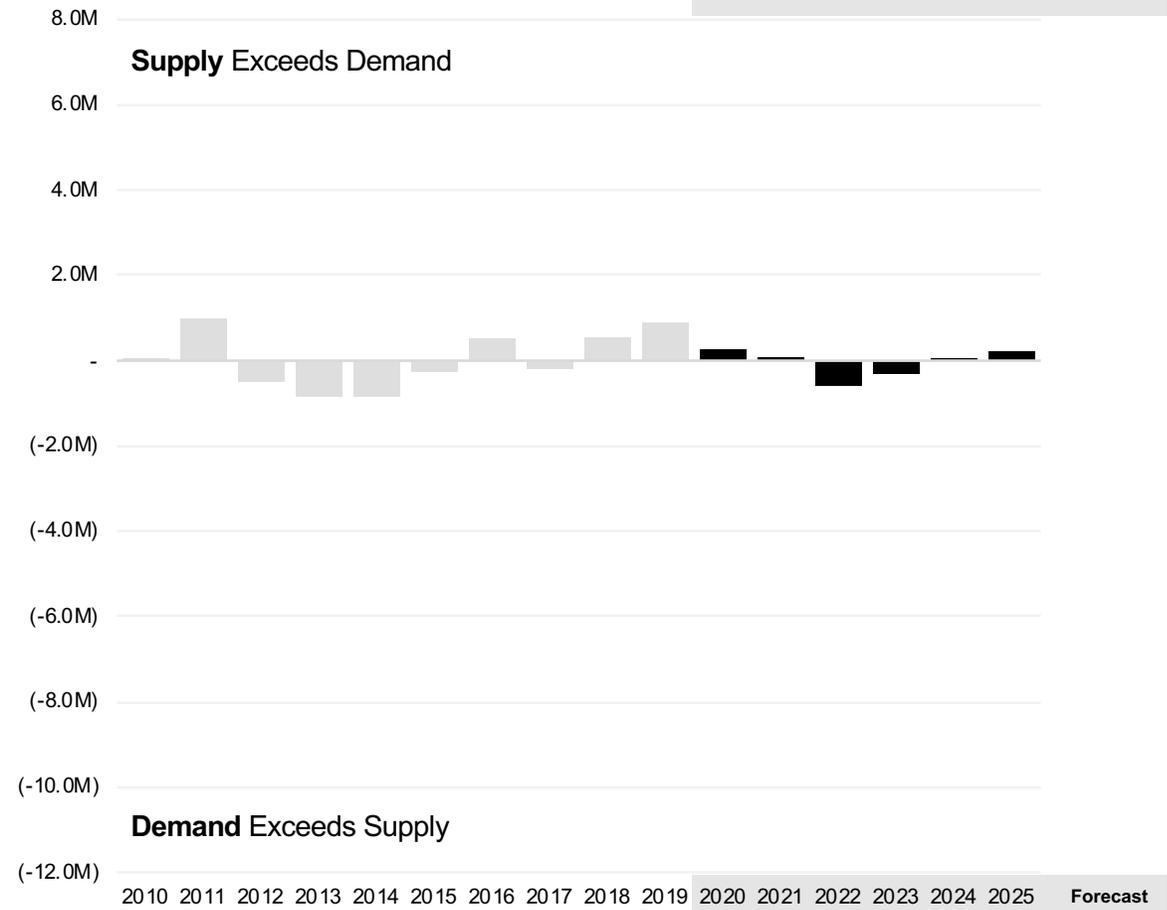


Alt Scenario: Downturn Sees Scrappage Drop

- This scenario assumes macro economic pressure will push scrappage rates to 30 year lows before recovering to levels aligned with the scrappage rates experienced in the previous recovery period of the 2010s
- It also assumes no change to long term behavioral impacts of drivers license rate or vehicles per driver
- The supply variance makes sense in a quick recovery scenario: oversupply during correction, undersupply in recovery, parity and then a return to slight oversupply as production ramps up

US Car Parc Supply vs Demand Imbalance

Scrappage Rate Declines

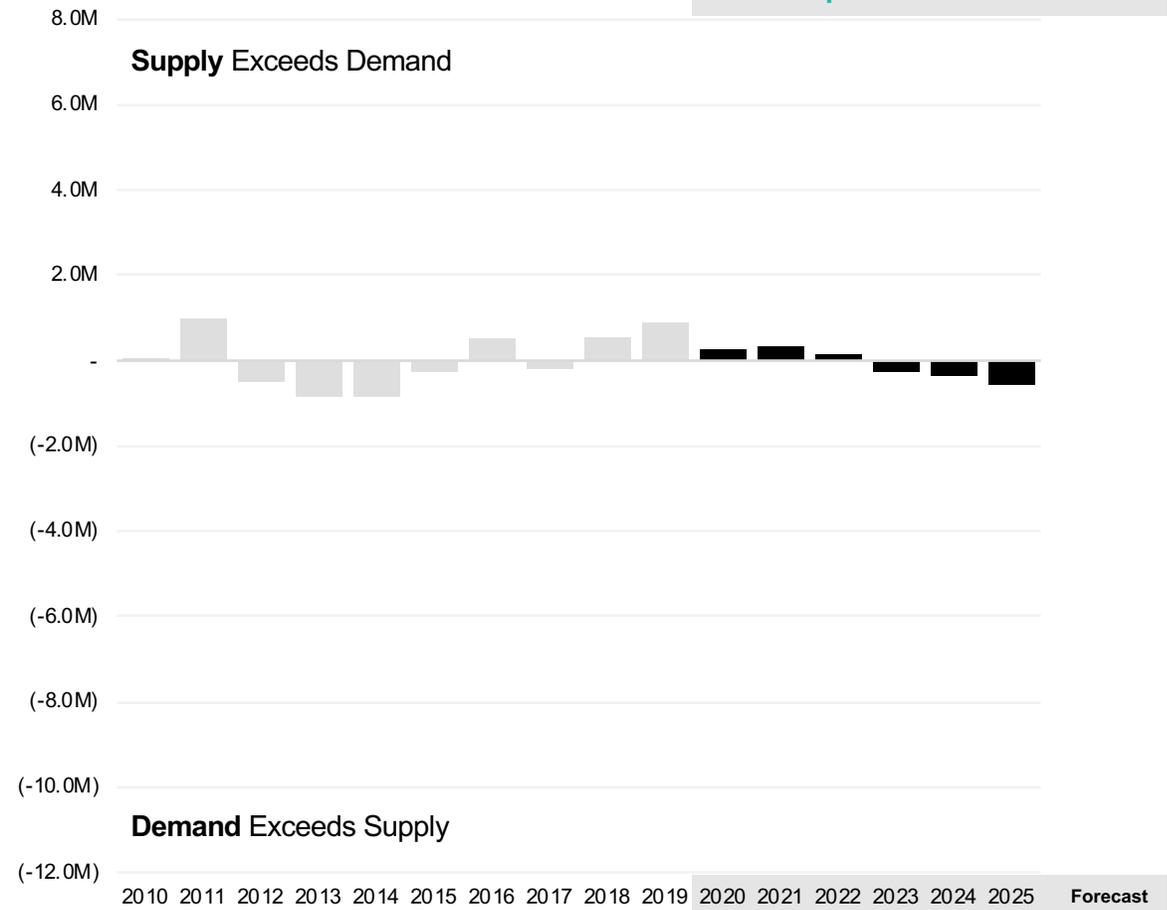


Year	Vehicles per Driver	Scrappage Rate	License Rate	Sales
<i>Scenario Impact</i>	<i>No Change</i>	Continued Declines	<i>No Change</i>	<i>No Change</i>
2020	1.20	4.0%	86.5%	12,900,000
2021	1.20	4.5%	86.5%	14,584,000
2022	1.20	5.0%	86.5%	15,597,000
2023	1.20	5.0%	86.5%	16,603,000
2024	1.20	5.0%	86.5%	16,800,000
2025	1.20	5.0%	86.5%	16,800,000

Alt Scenario: Downturn Sees Scrappage Drop + *Pent-Up Demand Returns*

- Similar to the previous scenario but includes more optimism in the form of higher scrappage rates in 2023 and the return of 3.5M sales vs. the baseline scenario through 2025
- Scenario still yields undersupply due to return of scrappage rates to long term trend of 5.5%

US Car Parc Supply vs Demand Imbalance

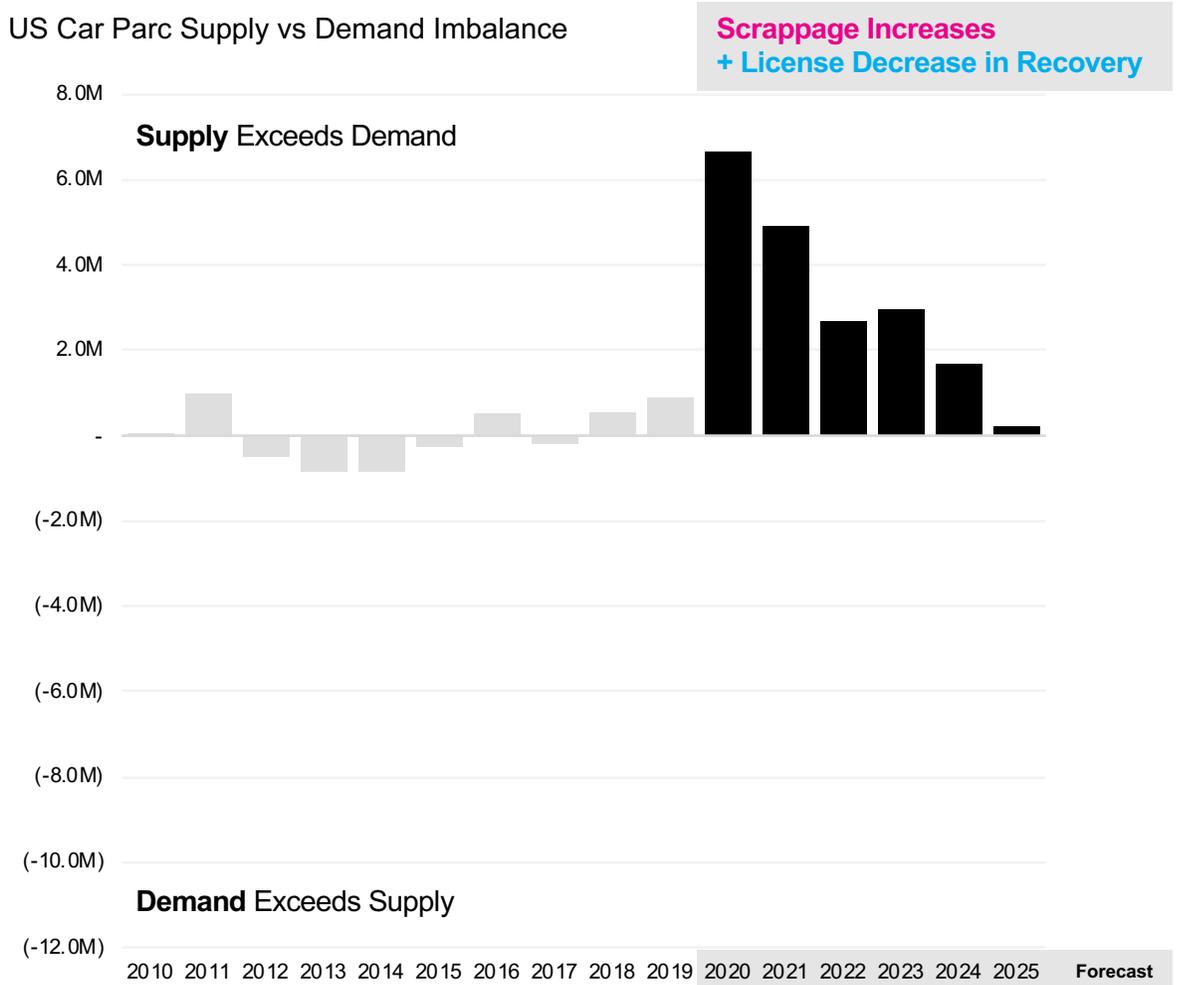


Year	Vehicles per Driver	Scrappage Rate	License Rate	Sales
<i>Scenario Impact</i>	<i>No Change</i>	Scrappage Resumes	<i>No Change</i>	Demand Returns
2020	1.20	4.0%	86.5%	12,900,000
2021	1.20	4.5%	86.5%	14,834,000
2022	1.20	5.0%	86.5%	16,097,000
2023	1.20	5.5%	86.5%	17,353,000
2024	1.20	5.5%	86.5%	17,800,000
2025	1.20	5.5%	86.5%	17,800,000

Alt Scenario: Downturn Sees Scrappage Drop + *Pullback in License Rate*

- Assumes significant behavior changes to drivers license rate and scrappage as US population reacts to severe macro economic disruption
- Imbalance isn't resolved until 2025, which would require significant incentives to accommodate ALG's sales forecast

US Car Parc Supply vs Demand Imbalance



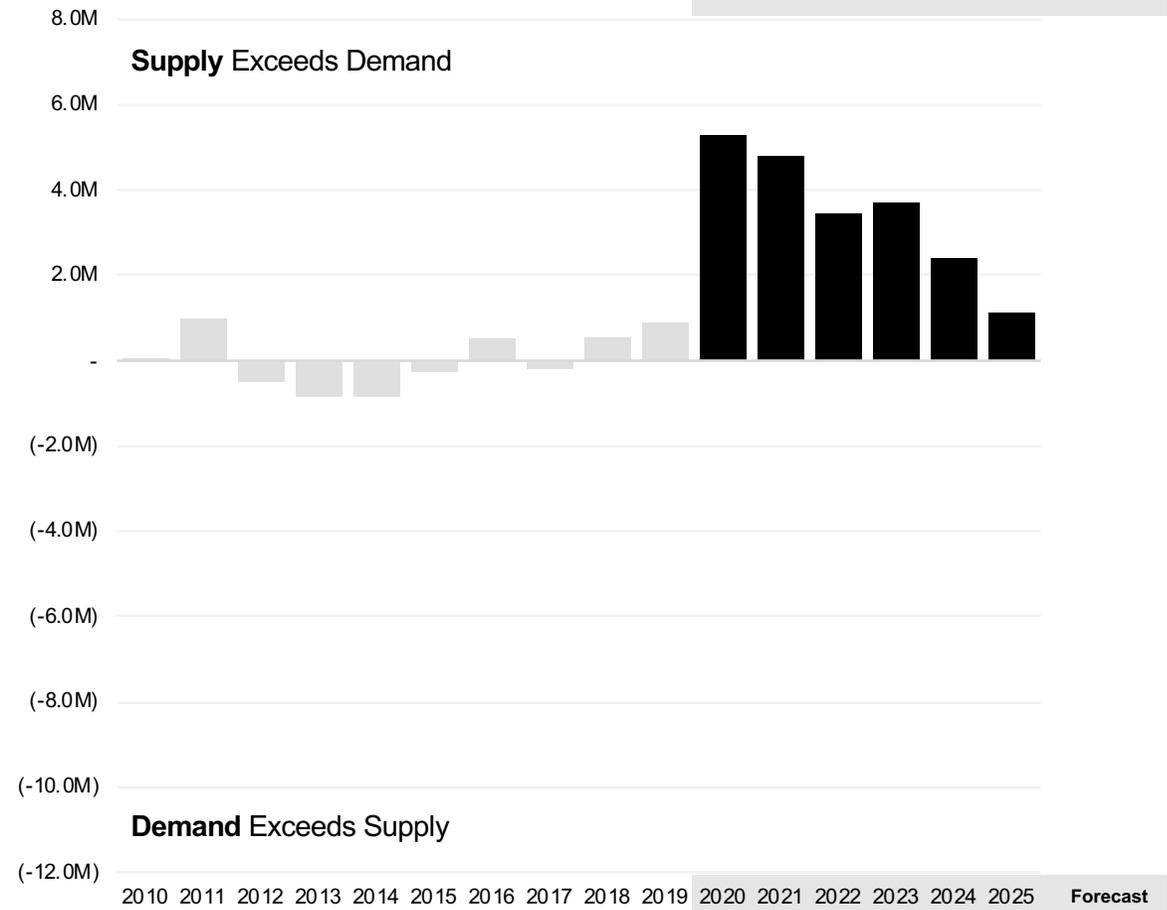
Year	Vehicles per Driver	Scrappage Rate	License Rate	Sales
<i>Scenario Impact</i>	<i>No Change</i>	<i>Continued Declines</i>	<i>License Drop</i>	<i>No Change</i>
2020	1.20	4.0%	84.5%	12,900,000
2021	1.20	4.5%	85.0%	14,584,000
2022	1.20	5.0%	85.5%	15,597,000
2023	1.20	5.0%	85.5%	16,603,000
2024	1.20	5.0%	86.0%	16,800,000
2025	1.20	5.0%	86.5%	16,800,000

Alt Scenario: Significant Demand Shifts Impact Long Term Demand & Sales

- A prolonged and severe downturn could impact fundamental demand inputs of scrappage rate and drivers license rate which results in fewer vehicles per driver and long term decline in sales as production schedules adapt to new behavior
- Assumes more flexible metrics of scrappage and drivers license rate return to long term historical averages in 2025
- Industry annual sales in this scenario would need to stay at 14M to approach equilibrium in 2025

US Car Parc Supply vs Demand Imbalance

Significant Demand Disruption



Year	Vehicles per Driver	Scrappage Rate	License Rate	Sales
Scenario Impact	Ownership Drops	Continued Declines	License Drop	Demand Drops
2020	1.20	4.5%	84.5%	12,900,000
2021	1.19	4.5%	85.0%	13,500,000
2022	1.18	5.0%	85.5%	14,000,000
2023	1.17	5.0%	85.5%	14,000,000
2024	1.16	5.0%	86.0%	14,000,000
2025	1.15	5.0%	86.5%	14,000,000

Related Data

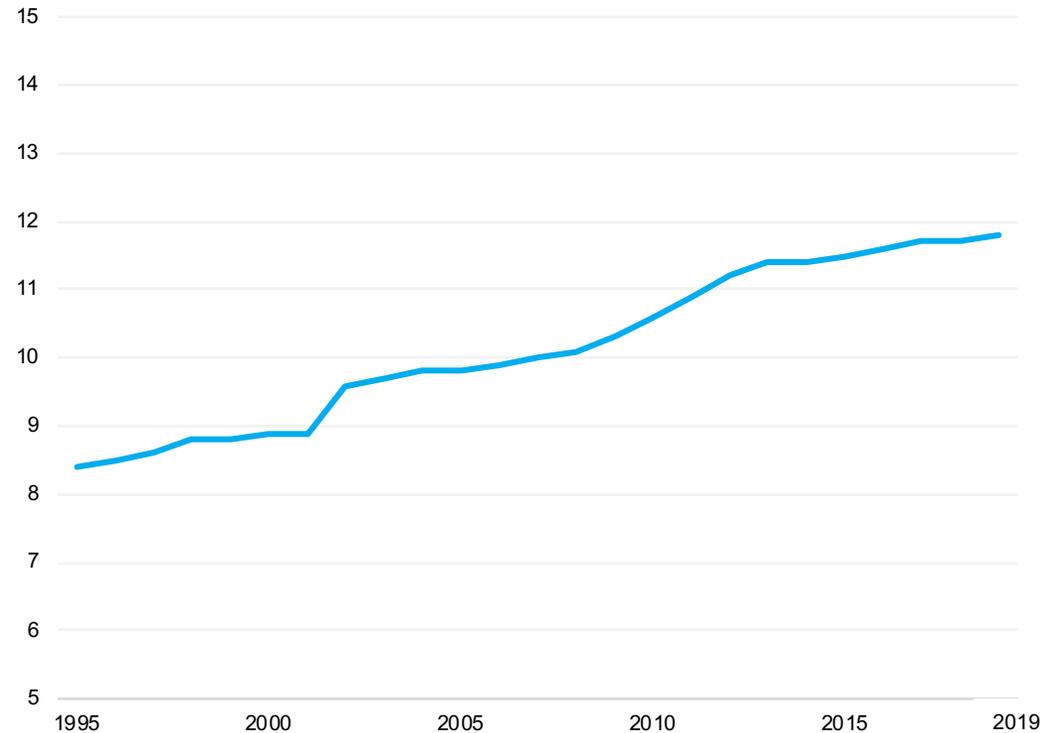
Average Vehicle Age in the US

If there is a shortage of vehicles relative to natural demand, the likely outcome is lower scrappage rates which drives up the average vehicle age of the US fleet.

The average vehicle age has been climbing steadily since 1995 thanks to more durable and higher quality vehicles that last longer which then supports the increased demand caused by population growth.

It's unlikely that average vehicle age will rise much further over the next decade as late model vehicles have introduced significant advances in vehicle technology and safety. These new features are not just creature comforts, they fundamentally reduce ownership costs by increasing fuel efficiency, lowering operational costs with longer duty cycles and limiting costs associated with damage, accidents and ultimately insurance.

Average Vehicle Age
In Years



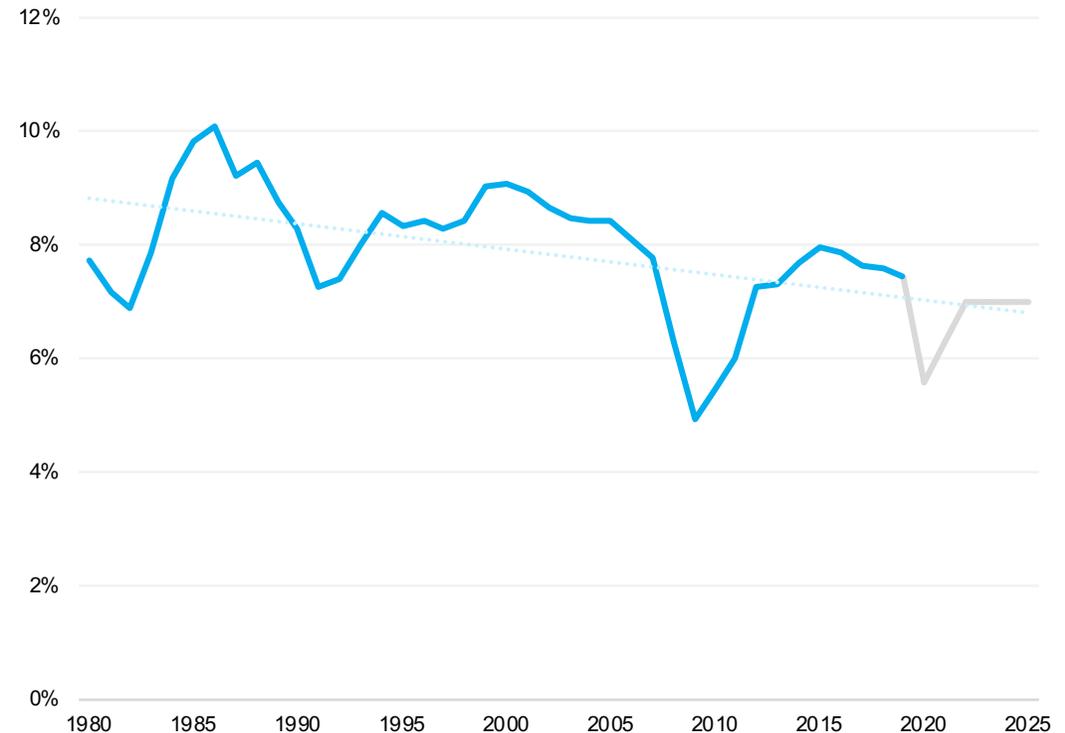
New Vehicle Sales per Licensed Driver

Another sense check is to look at the vehicle sales per licensed driver. The trend is certainly showing a downward trajectory, which is driven by population growth and results in the rise in average vehicle age in the US fleet.

If we assume a 5.6% rate of sales for 2020 (to align with ALG's 2020 forecast, a rate of 6.3% during a transition year in 2021 and then a 7% rate going forward, we yield sales forecast results that are actually slightly above the baseline ALG forecast.

These rates are derived from real world performance, reflecting the drop in sales during the Great Recession, the recovery and finally landing at a rate consistent with the 40 year directional trend.

Average Vehicle Age
In Years



For ALG's Interactive Natural Demand Simulator, please visit <https://www.alg.com/newsroom/ALG-Natural-Demand.html>

Please contact industrysolutions@alg.com or reach out to your ALG Solutions Representative for more information.