

# AUTOBOLT

A dark blue Tesla Model S is shown driving on a two-lane asphalt road that curves through a vast, mountainous landscape. The car is in the foreground, moving towards the viewer. The background features rolling hills and large mountains, some with patches of snow, under a sky with scattered white clouds. The lighting suggests a bright, sunny day.

**Auto Glass ADAS and Technology Report**

**2023**

## Key Findings:

- We analyzed over 10,000 windshield lookups with AutoBolt where a VIN-verified result was provided, in order to determine how prevalent calibrations were in the auto glass replacement industry, and to identify new ADAS systems and the growth of non-ADAS technology.
- Based on our data, there should have been 3.8 million ADAS calibrations performed in 2022 in the auto glass industry. This translates to a total addressable market for ADAS calibrations in the auto glass industry alone of \$959 million. In other words, ADAS calibration for auto glass is already a billion-dollar business.
- 89% of model year 2023+ vehicles will require a calibration following a windshield replacement, up sharply from only 25% of model year 2016 vehicles.
- For the vast majority of automakers, a windshield replacement on a newer vehicle (MY2020+) all but guarantees a calibration will be required. For the 2022 model year, 11 of the top 15 automakers produced over 95% of their vehicles with forward-facing cameras requiring a calibration after windshield replacement. This is up sharply from just 5 years' previous, when just 35% of MY2017 vehicles on the road had forward-facing cameras requiring a calibration.
- Progress on ADAS adoption has been uneven. Among Asian manufacturers surveyed, all reached a >90% calibration rate starting at the 2020 model year. On the other end of the scale, only 10% of Stellantis vehicles produced in the 2020 model year had a camera requiring calibration.
- Static and dynamic calibrations continue to be about equally common, but we are seeing a trend where static *or* dynamic calibrations are becoming more common, which gives the most flexibility to the repairer.
- Calibrations of other ADAS systems, such as head-up display, night vision, or augmented reality cameras, following windshield replacement, remain low, but are slowly growing.
- Windshields continue to be a hotbed of technological innovation, as the number and prevalence of sensors and technology continues to grow year over year.

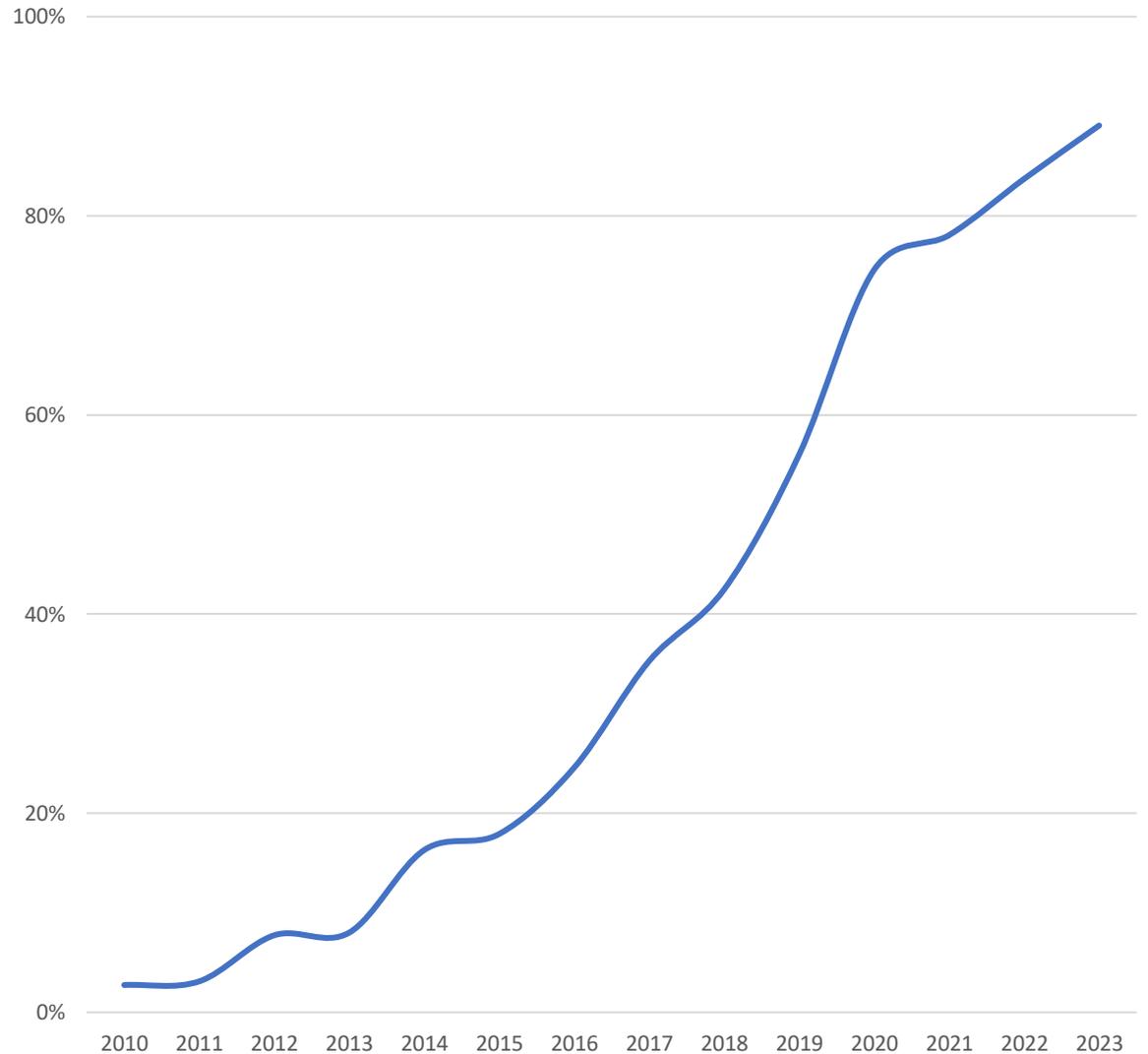
# Calibrations Have Been Consistently Trending Up

Across all automakers, the number of windshields requiring a calibration following windshield replacement has steadily increased, from near-absent in vehicles produce in 2010, to 89% for MY2023 vehicles.

We noticed a sharp uptick in windshields with advanced driver-assistance systems (ADAS) requiring calibration starting in 2016. This coincides with the signing of a voluntary agreement by 20 automakers in 2015/2016 to make automatic emergency braking (AEB) standard on all light-duty cars and trucks with a gross vehicle weight of 8,000 pounds or less no later than September 1, 2022.

As automakers rushed to fulfill the voluntary agreement, they used mostly chose forward-facing cameras equipped behind the windshield as the sensor for AEB. This historic agreement between automakers to improve passenger safety gave rise to a historic opportunity – and challenges – for the auto glass repair and replacement industry.

### Windshields Requiring Calibrations, by Model Year



## Calibrations Are a Billion-Dollar Business

# 3.8 Million

The number of ADAS calibrations that should have been performed in 2022

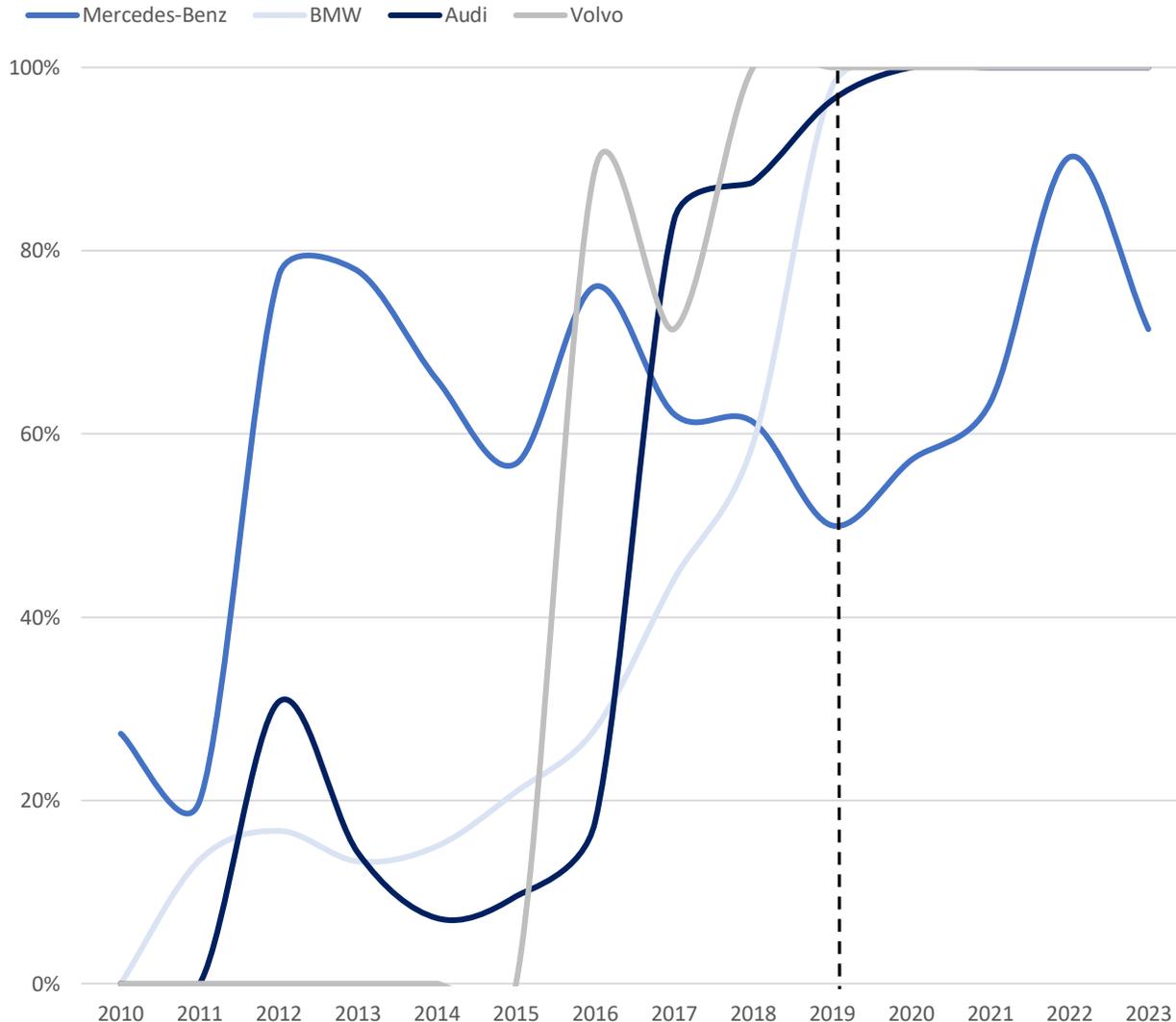
# \$959 Million

The total addressable market for ADAS calibrations in the auto glass industry in the USA (2022)

Data is for USA only. Using vehicle age distribution data from the 2017 National Household Travel Survey, we assumed 14 million windshields were replaced in 2022. We then multiplied the age distribution data by the calibration rate for each model year (shown in the graph above) to come to the 3.8 million calibration figure. We came to the \$959 million market size by multiplying the 3.8 million windshield replacements by an assumed average \$250 ADAS calibration fee for each calibration.

# Among Luxury European Brands, Early Acceleration to 100% Adoption, Except Mercedes

## Luxury Euro Brands - Windshield Replacements with Calibration, by Model Year



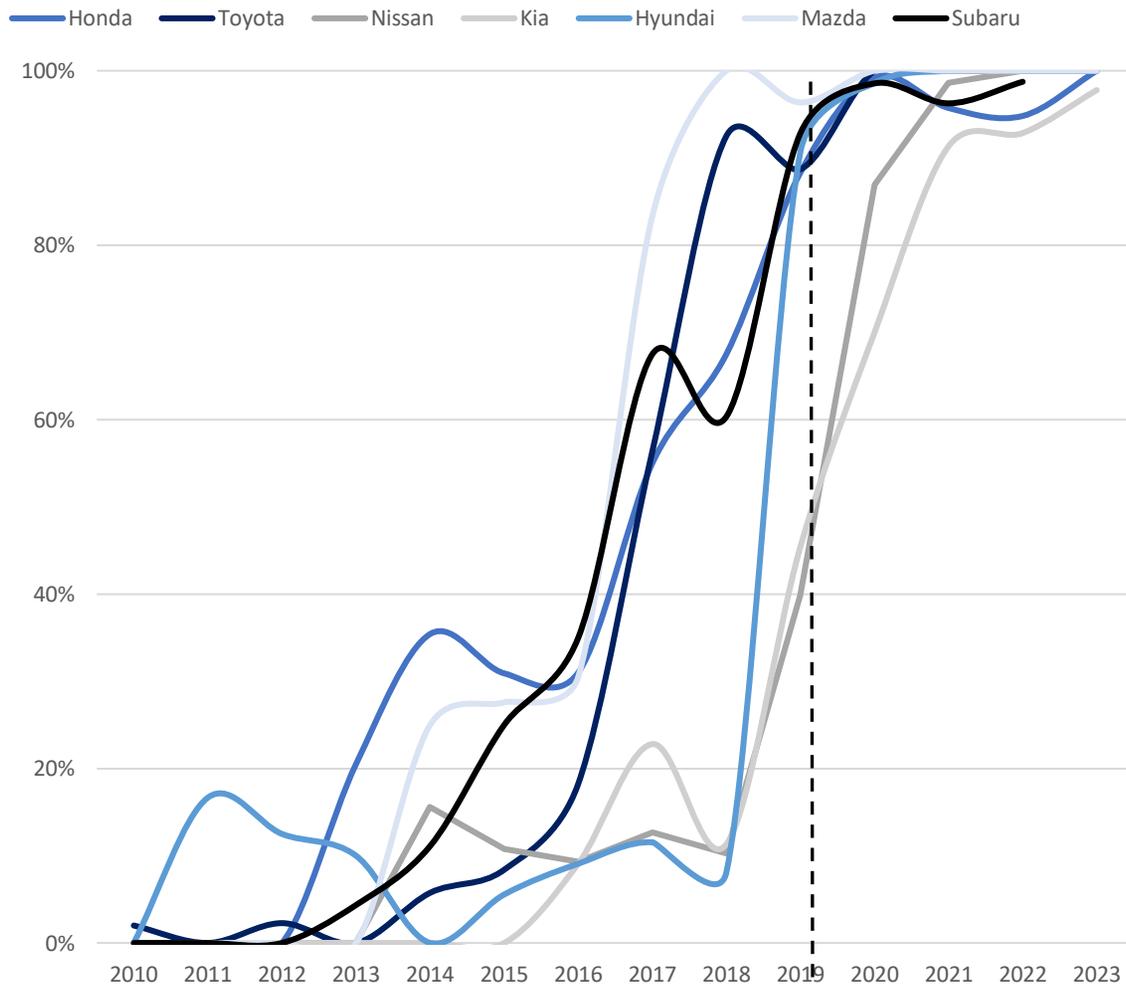
In the luxury European segment that we surveyed, which included Mercedes-Benz, Audi, BMW, and Volvo, all save Mercedes reached >95% rate of vehicles produced with forward-facing cameras in Model Year 2019, ahead of the rest of industry, as expected.

One big standout? Mercedes-Benz, which still has a substantial number of its models that are produced without a forward-facing camera system.

While most automakers use the forward-facing camera to control AEB, Mercedes' emergency braking system, which is typically marketed as Active Brake Assist, uses a front radar instead. In keeping with Mercedes' fashion of making nearly everything an additional add-on, lane keeping brings in the forward-facing camera and typically is an expensive package, except for the highest-end models.

# Asian Brands Performed Nearly as Well as the Luxury Europeans, Are All at Near-100% Calibration Rate

## Asian Brands - Windshield Replacements with Calibration, by Model Year



Interestingly, the Asian automakers – not including their luxury brands – did nearly as well as the luxury European automakers at adopting AEB and making it standard across their model range.

Every Asian automaker included in the chart produced >95% of their vehicles with a front-facing camera in MY2022, with the exception of Kia which was at a mere 93%.

Nearly every Asian automaker was around the 90% mark by 2019, less Kia and Nissan, who were about 2 years behind on ramping up making AEB standard and hitting the 90% mark.

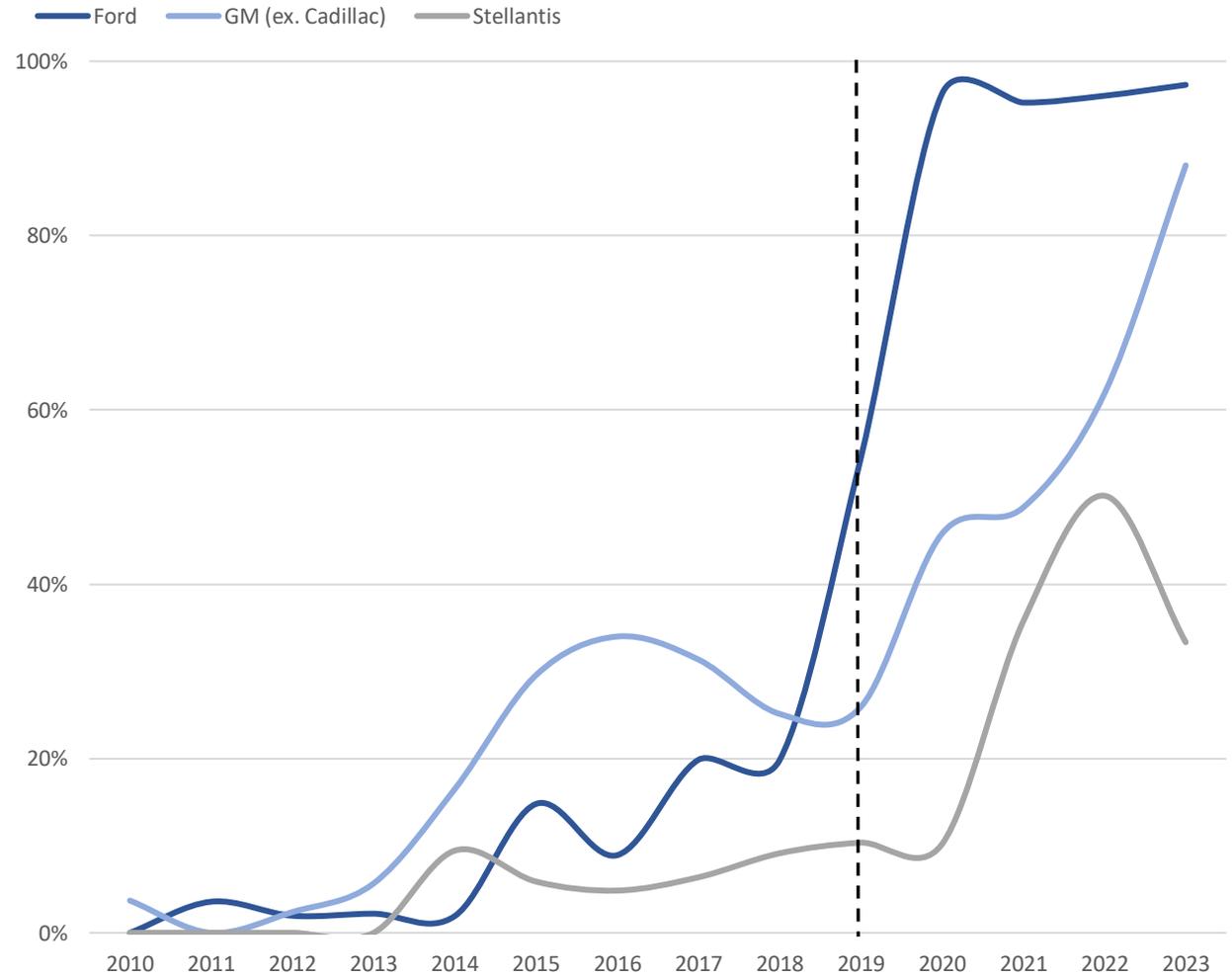
# Domestic Automakers Were Slow to the Game, Stellantis Still Lags

Without a doubt, domestic automakers have been laggards in ADAS adoption across the board. This clearly includes forward-facing cameras, as the chart to the left shows.

Some of this can be explained by a much higher sales volume of pickup trucks and Jeeps which may have a Gross Vehicle Weight Rating that exceed the terms if the voluntary agreement. But, even after filtering those out, domestic automakers were much slower to adopt ADAS than Asian and European automakers.

Stellantis will need to undertake significant efforts to improve ADAS adoption to meet the terms of the voluntary agreement.

## Domestic Brands - Windshield Replacements with Calibration, by Model Year

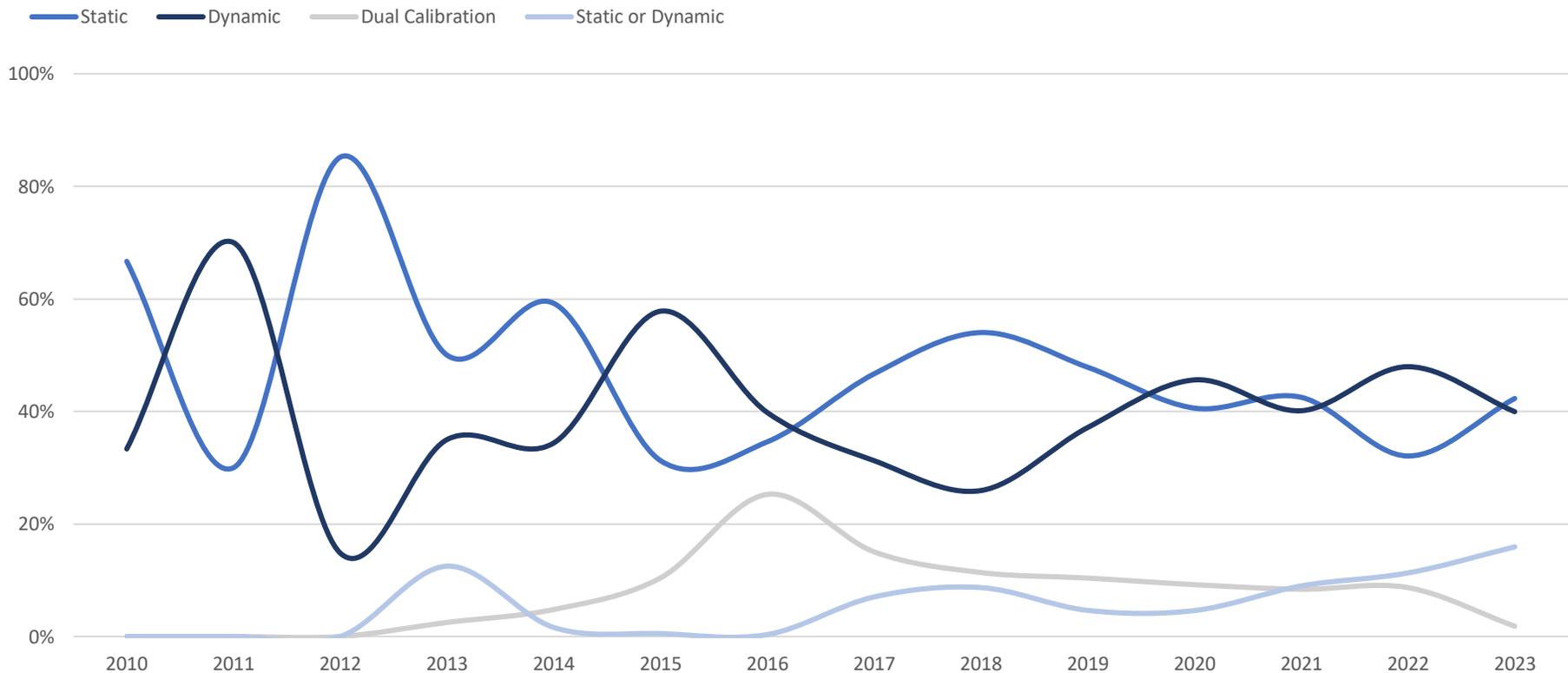


## No Clear Winner on Static vs. Dynamic, But Simplification and Choice Grow

For years, the auto glass and collision repair industries have debated whether static or dynamic calibrations will prevail over the other. Both have positives and negatives: static calibrations have a steeper learning curve and may have space and environmental constraints (level floor, lighting, full tank of gas, car unloaded) that can make it difficult to perform properly. On the other hand, dynamic calibrations can be impossible to perform in some climates, such as when the roads are covered in snow, during heavy rain, heavy traffic, or when the sun is low. For northern areas, this can be a significant challenge during the winter in particular.

The data shows that static and dynamic calibrations continue to be at parity at roughly 40% prevalence, each. But in a win for the industry, we have seen the growth of static *or* dynamic calibrations – which puts the choice for the calibration operator – rise in prevalence, giving the flexibility of both approaches. At the same time, we have seen dual calibration recede in prevalence.

### Share of Calibrations, by Model Year



# Calibrations Aren't Limited to Forward-Facing Cameras

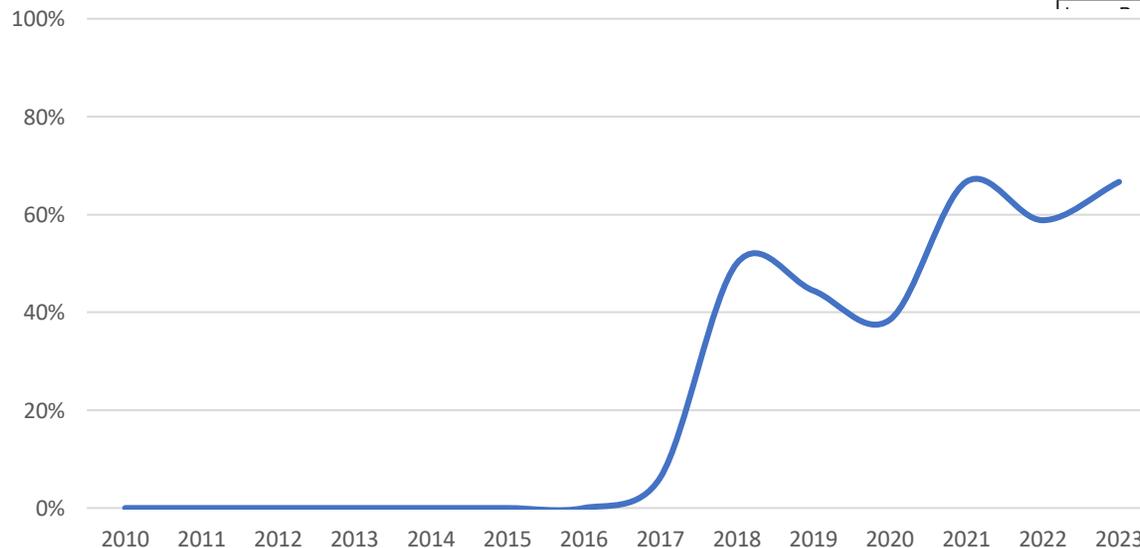
While forward-facing cameras are the dominant system that require calibration, as automakers continue to push the technological envelope and add more technology to vehicles, new systems are being added that also require a calibration when the windshield is replaced.

Ford and Lincoln required the head-up display system to be calibrated after a new windshield is installed, as the snippet from *Ford and Lincoln ADAS Job Aid – Glass Version* at right shows. Special service tools are required to perform this calibration – it is not just a fine-tuning procedure using a special menu in the infotainment system.

For Mercedes-Benz vehicles with Augmented Reality Head-Up Display, a camera mounted on the windshield below the stereo camera system also requires its own separate calibration when a new windshield is installed. However it uses the same target as Mercedes' existing camera systems at the same position, lessening complexity.



## Lincoln Windshield Replacements Requiring HUD Calibration (%)



| Component              | When is Calibration Required  | Notes   |
|------------------------|---|---|
| Head Up Display Module | - A new HUD is installed  | - Programmable Module Installation  |
|                        | - The HUD is removed and reinstalled or replaced<br>- The instrument panel is removed and installed or replaced<br>- <b>A new windshield is installed</b> | - HUD Calibration <ul style="list-style-type: none"> <li>• If the system is not calibrated, the images may be distorted or display improperly.</li> </ul> |

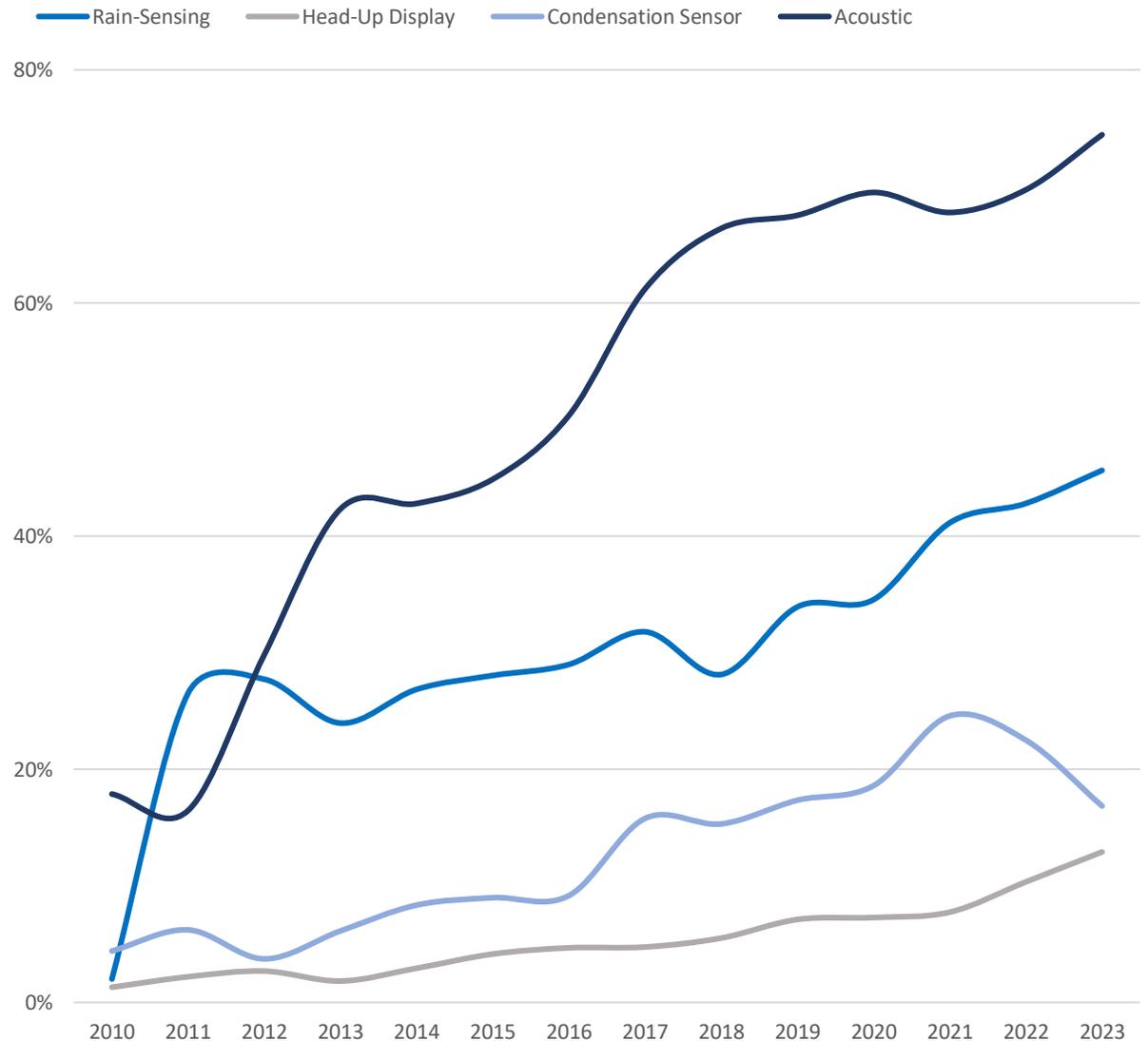
# Non-ADAS Technology Continues to Proliferate on Windshields

Unsurprisingly, other technologies have also taken on a great prevalence on windshield, as vehicles become more advanced and once-optional features become standard.

Acoustic features to reduce driving noise are becoming nearly as standard as solar coatings, while rain sensors are now on half of every vehicle produced in MY2023. There has also been strong growth in Head-Up Display technology, which no longer belongs to luxury vehicles and can now be found on a Toyota Camry.

We think we will see these features continue to become more common on windshields. At the same time, new technology will take their place as rare, high-end features, and they will slowly trickle down to the mass market. Some examples include Augmented Reality Cameras, which started on Mercedes-Benz but which can now be found on Kia and Stellantis vehicles, as well as video display rear-view mirrors. A new full-width head-up display system by BMW is also in the works. Expect more technology and more continued variation across windshields.

## Technology Prevalance on Windshields by Model Year



## About the Authors

# AUTOBOLT

AutoBolt is a windshield lookup service that launched in 2022. It is the industry leader in breadth and accuracy of auto glass identification. AutoBolt enables auto glass installers, distributors, and others to order the correct windshield the first time, quote over the phone and capture the job without calling a dealer, and improves sales and operating efficiency through proper part identification.

### **Nick Dominato**

CEO, AutoBolt

Nick Dominato is the CEO of AutoBolt, where he is responsible for product design, sales, marketing, and whatever else might cross his desk at any given point in time. Prior to AutoBolt, Nick founded adasThink, a software business that automatically identifies required ADAS calibrations and other electronic repair operations based on estimate data, which was focused on the collision industry. adasThink won Best New Product at SEMA in 2020 and was acquired by Repairify in 2021 where Nick was Senior Vice President - Product. Nick published a number of industry analysis and thought leadership content while at adasThink, including a study that found body shops were missing 88% of required ADAS calibrations. He was named as one of SEMA's 35 Under 35 in 2021.



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## Auto Glass ADAS and Technology Report



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