

Fuels Institute

**Driving Vehicle
Sales – Utility,
Affordability
and Efficiency**

JULY 2018

ACKNOWLEDGEMENT

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The analysis presented within this report was conducted by the Fuels Institute. Some of the data used to prepare this report comes from WardsAuto. Readers can access this data by visiting wardsauto.com (a subscription may be required).

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Introduction

The U.S. recorded consecutive records for light duty vehicle sales in 2015 and 2016.

They exceeded the previous record set in 2005, and in 2017 the market continued with strong performance selling more than 17 million units for the third year in a row.

The composition of the vehicle market over the past 15 years has naturally evolved, with consumers gravitating towards different classes of vehicles over time. But why have certain vehicle classes thrived while others have struggled?

It is an oversimplification to claim that retail fuel prices and vehicle fuel efficiency are the only factors that lead to shifts in the market composition. These are important factors influencing consumer decisions, but to what extent do they actually affect the evolution of the market? Fuels Institute consumer research indicates that fuel efficiency and vehicle cost are the two most critical factors consumers take into account when purchasing a vehicle, and other evidence provides valuable insight into the effect of retail fuel prices on consumer behavior.¹ But the overall effect of these variables on the composition of the market is less clear than some headlines might suggest.

To provide additional, fact-based context to better understand the factors influencing consumer vehicle

choice, the Fuels Institute analyzed vehicle sales for the years 2003 – 2017 to identify market trends in the types of vehicles being purchased. We then analyzed this data within the context of retail fuel prices, vehicle fuel efficiency and vehicle sales price.

This white paper is designed to provide additional context when evaluating the trends of vehicle purchases in the United States. It is not a comprehensive assessment of all variables that influence that market, but does provide unique perspective on these three economic variables and how they might be influencing consumers when they shop for a vehicle.



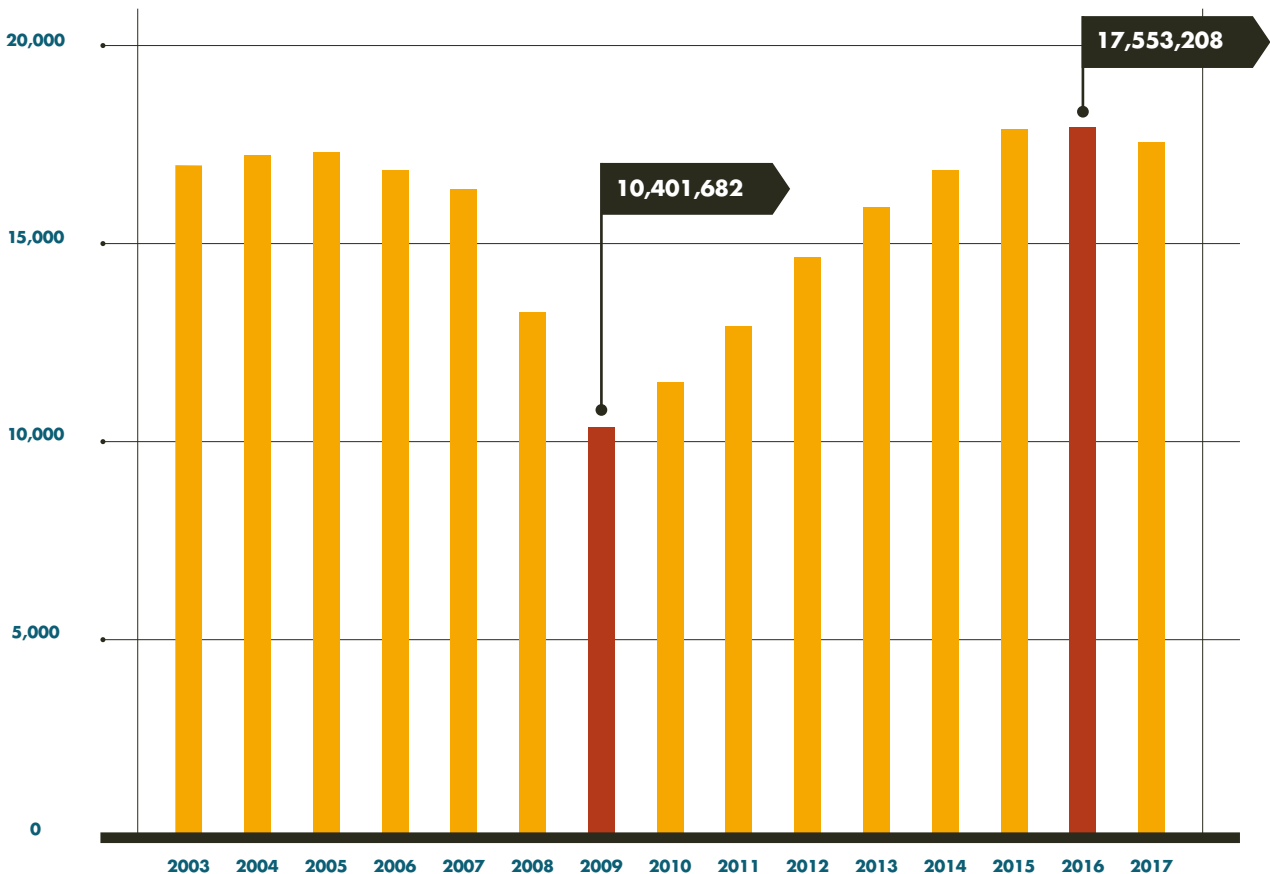
LIGHT DUTY VEHICLE MARKET OVERVIEW

The light duty market in the United States has experienced significant volatility since 2003. Total units sold have ranged from nearly 17 million in 2005 followed by a low of 10.4 million in 2010 and then a new high of 17.5 million in 2016. The dramatic dip in sales 2008-2011 was the direct result of the Great Recession.

Since 2003, the sales mix of vehicle classes (i.e., small cars, utility vehicles and pickup trucks ²) has evolved with one class gaining significant market share while most other have lost share. Figure 2 shows the shift in market share of new vehicles sold each year, broken down into eight vehicle classes. (Note: Except where stated, all references to market share refer to share of new vehicles sold.)

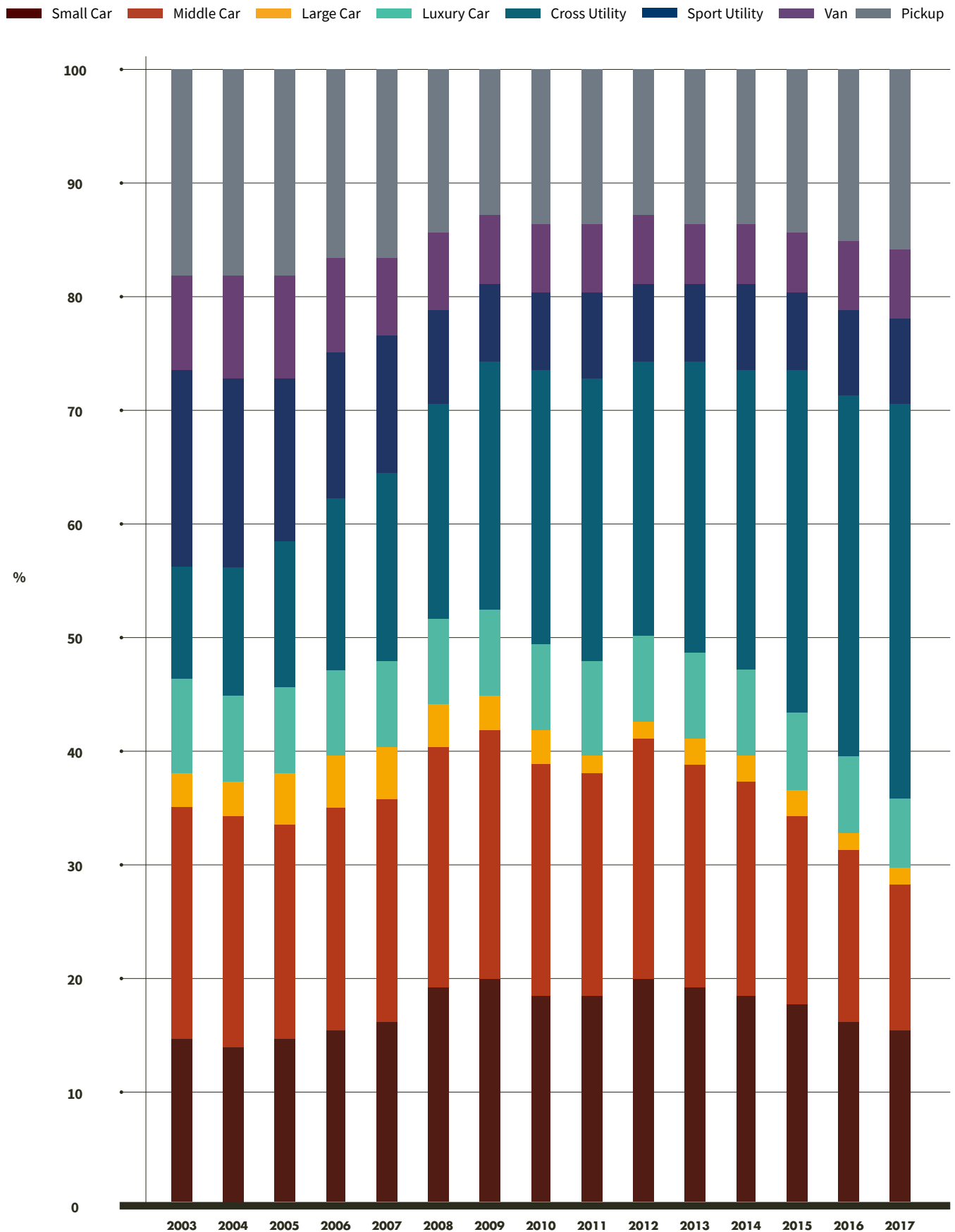


FIG 1: ANNUAL LIGHT DUTY VEHICLE SALES, 2003-2017



Source: WardsAuto

FIG 2: CHANGE IN MARKET SHARE BY VEHICLE CLASS (2003-2017)



From 2003 through 2017, there was one overwhelming shift in the composition of the light duty vehicle (LDV) market – the rise of the cross utility vehicle (CUV), which grew its share of all vehicles sold from 10% to 35%.

Concurrently, nearly all other classes lost market share, such as middle cars (21%-13%), large cars (3% - 1%), luxury cars (8% - 6%), sport utility vehicles (SUV) (17% - 8%), vans (8% - 5%) and pickup trucks (19% - 16%).

Cross Utility Vehicle (CUV) Market Share

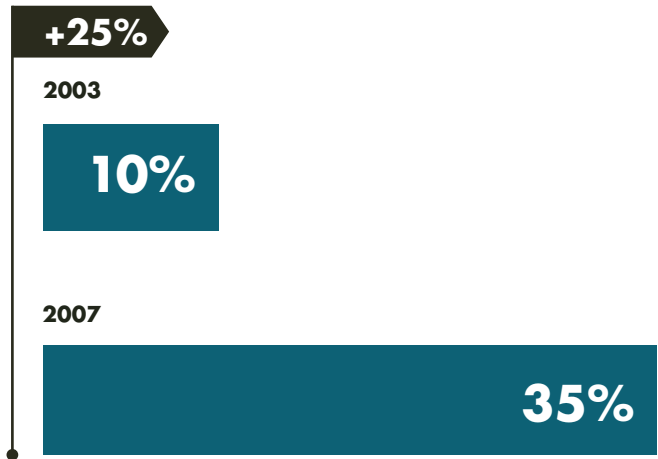
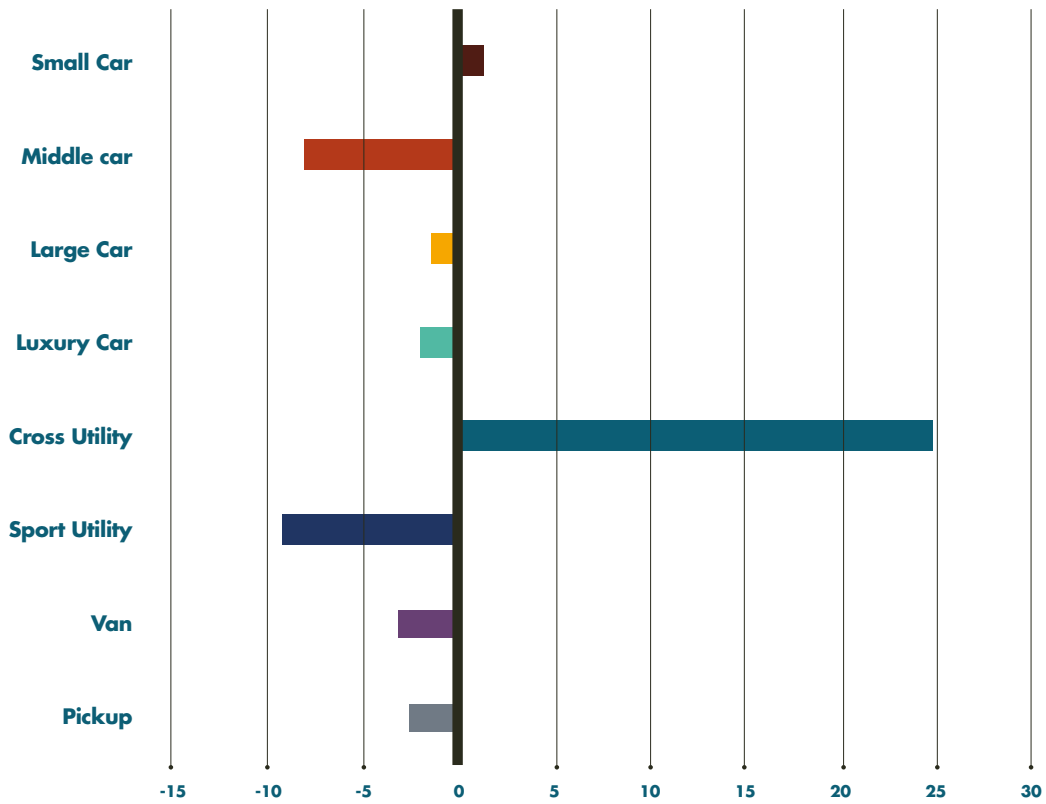
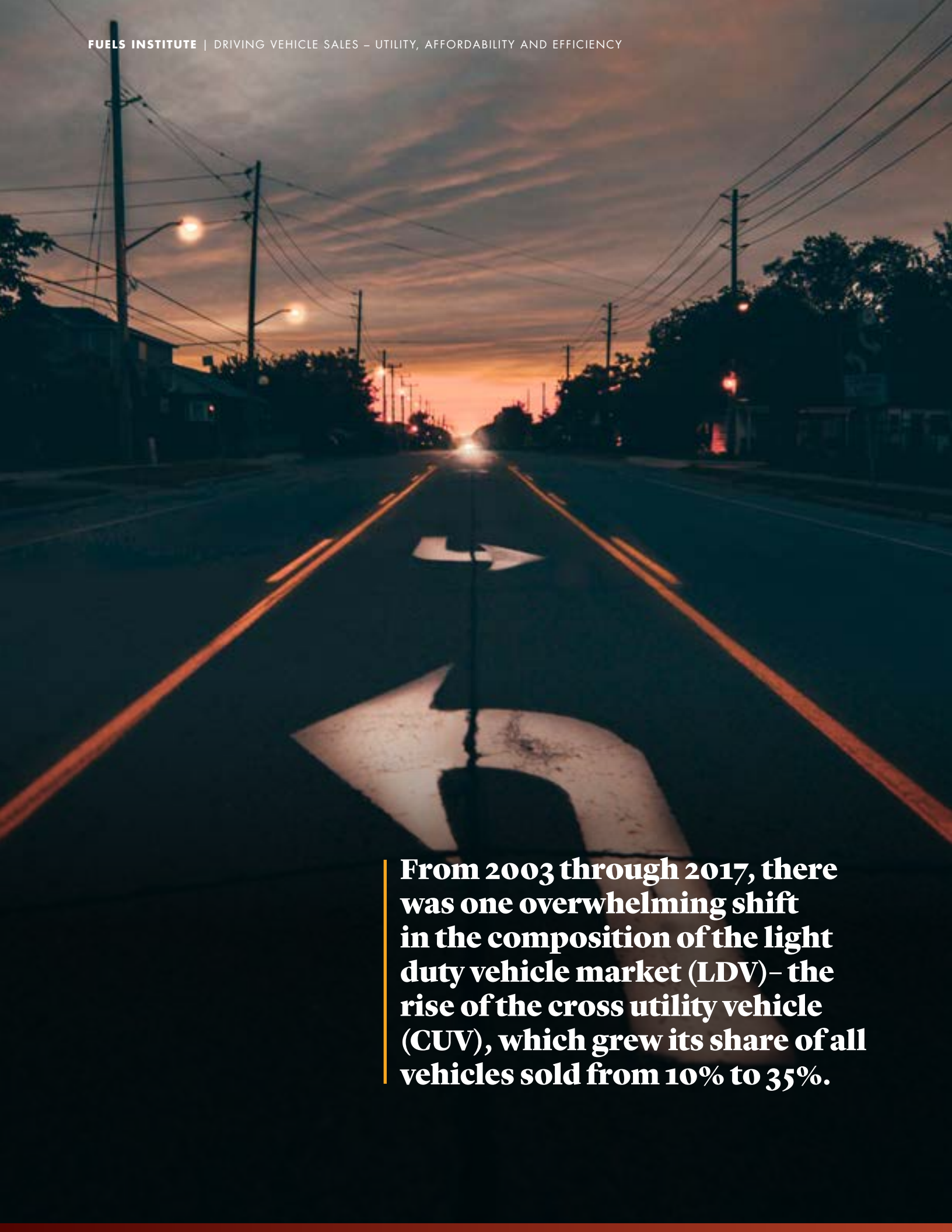


FIG 3: CHANGE IN PERCENT MARKET SHARE BY VEHICLE CLASS (2003-2017)



Source: Fuels Institute based upon WardsAuto data

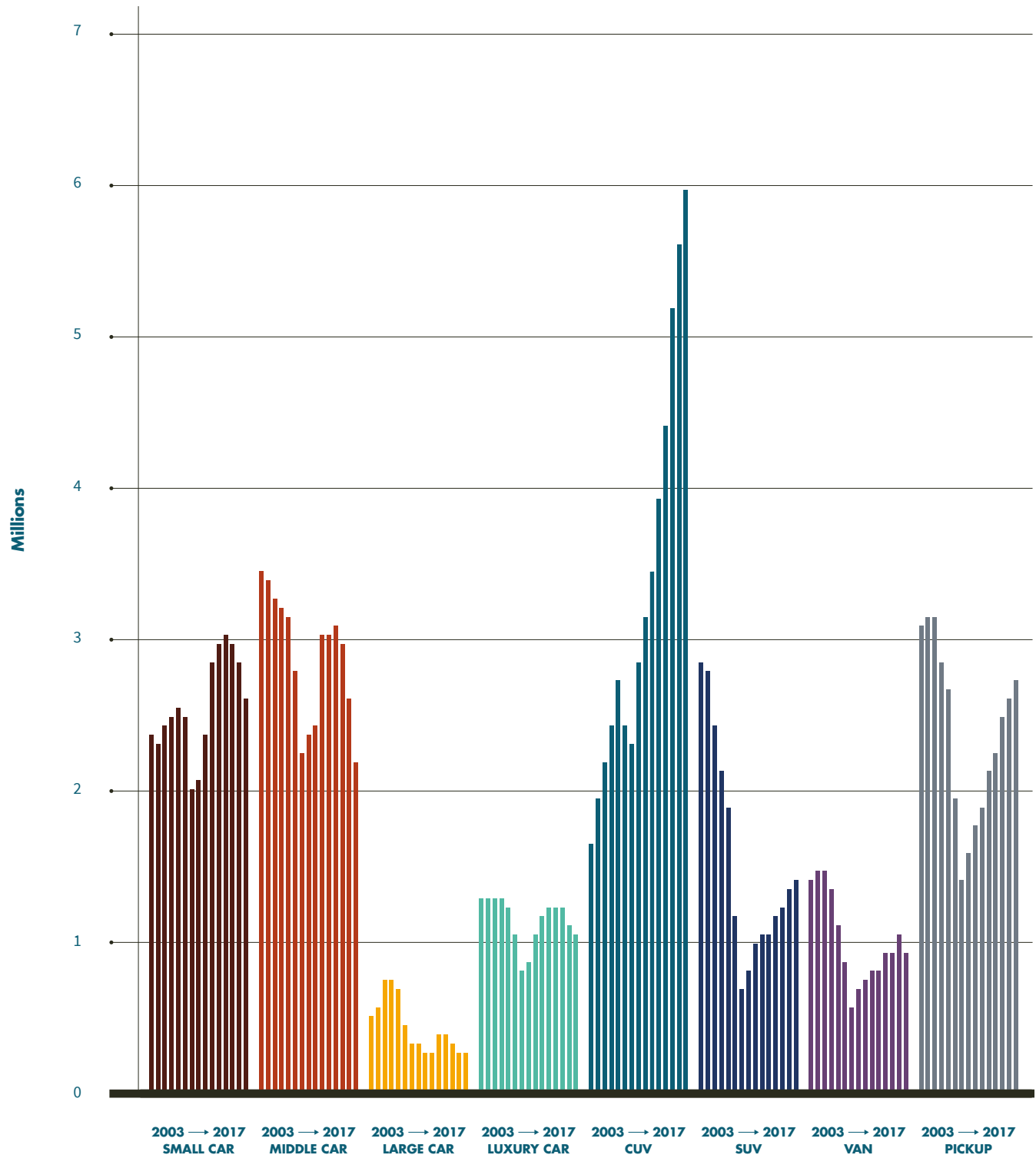
Figure 3 summarizes these shifts, showing the overall change in percent market share by vehicle class from 2003 – 2017. The big losses in terms of market share were incurred by sport utility vehicles (-9%) and middle cars (-8%). Meanwhile, the only two classes to gain market share were small cars (+1%) and CUVs (+25%).



From 2003 through 2017, there was one overwhelming shift in the composition of the light duty vehicle market (LDV) – the rise of the cross utility vehicle (CUV), which grew its share of all vehicles sold from 10% to 35%.

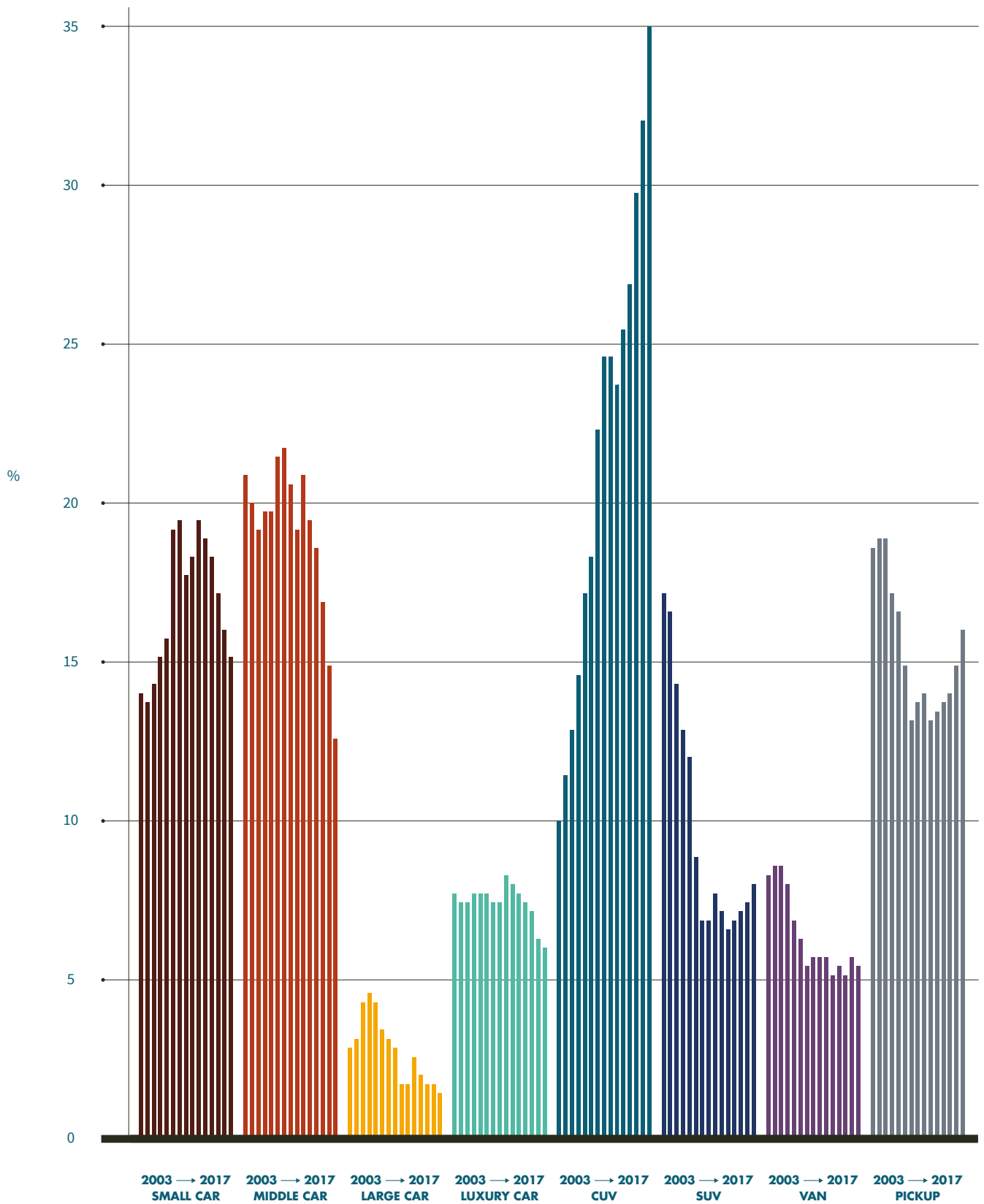
Figure 4 further shows the change in consumer purchasing behavior by plotting total units sold by class overtime, and Figure 5 shows the market share of each class. The Great Recession affected every vehicle segment, yet some were able to recover more quickly, and more sustainably, than others.

FIG 4: ANNUAL SALES BY VEHICLE CLASS, 2003-2017)



Source: WardsAuto

FIG 5: MARKET SHARE BY VEHICLE CLASS, 2003-2017



Source: WardsAuto



DIFFERENTIATING PRE- AND POST-RECESSION SALES

Analyzing data over a long time period is very instructive to show trend evolution, but the broad impact of changes can be lost. Figures 6-8 compare vehicle sales in two different time segments: pre-recession and post-recession³.

In the years leading up to the recession, only three vehicle classes were gaining market share: small cars, large cars and CUVs. After the recession, a slightly different three vehicle classes were gaining market share: CUVs, SUVs and pickup trucks.

FIG 6: PRE-RECESSION MARKET SHARE BY CLASS

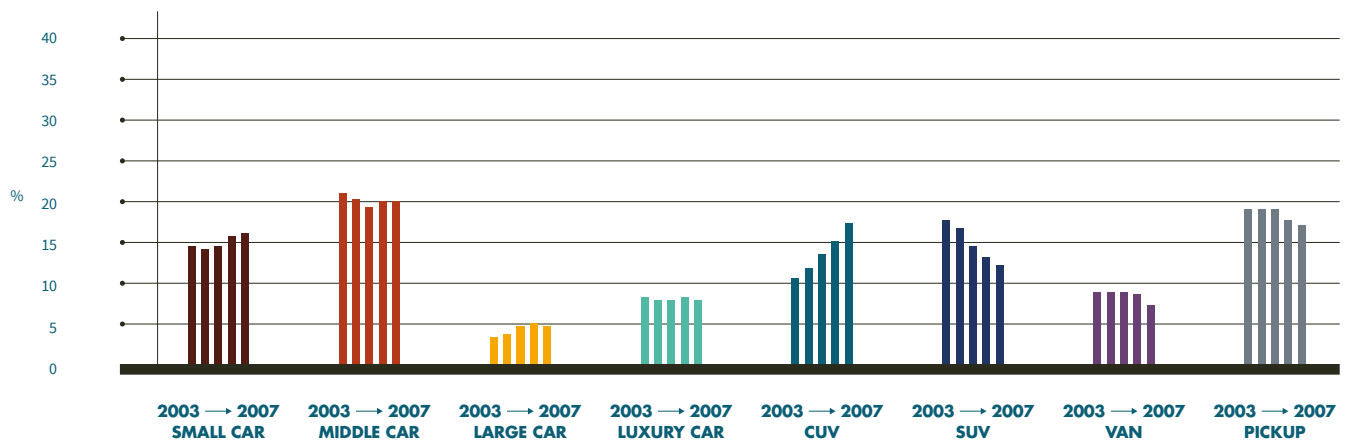
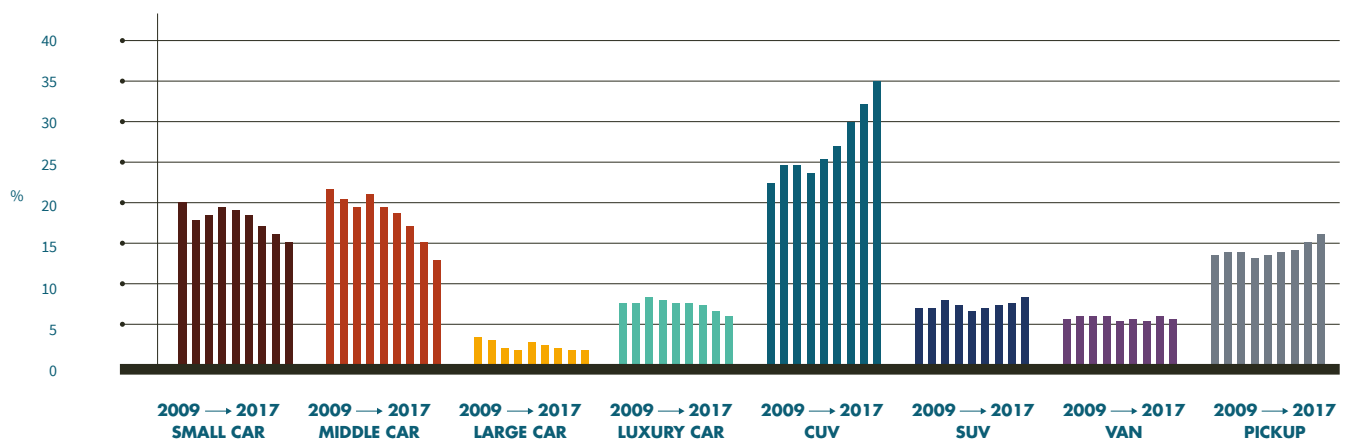


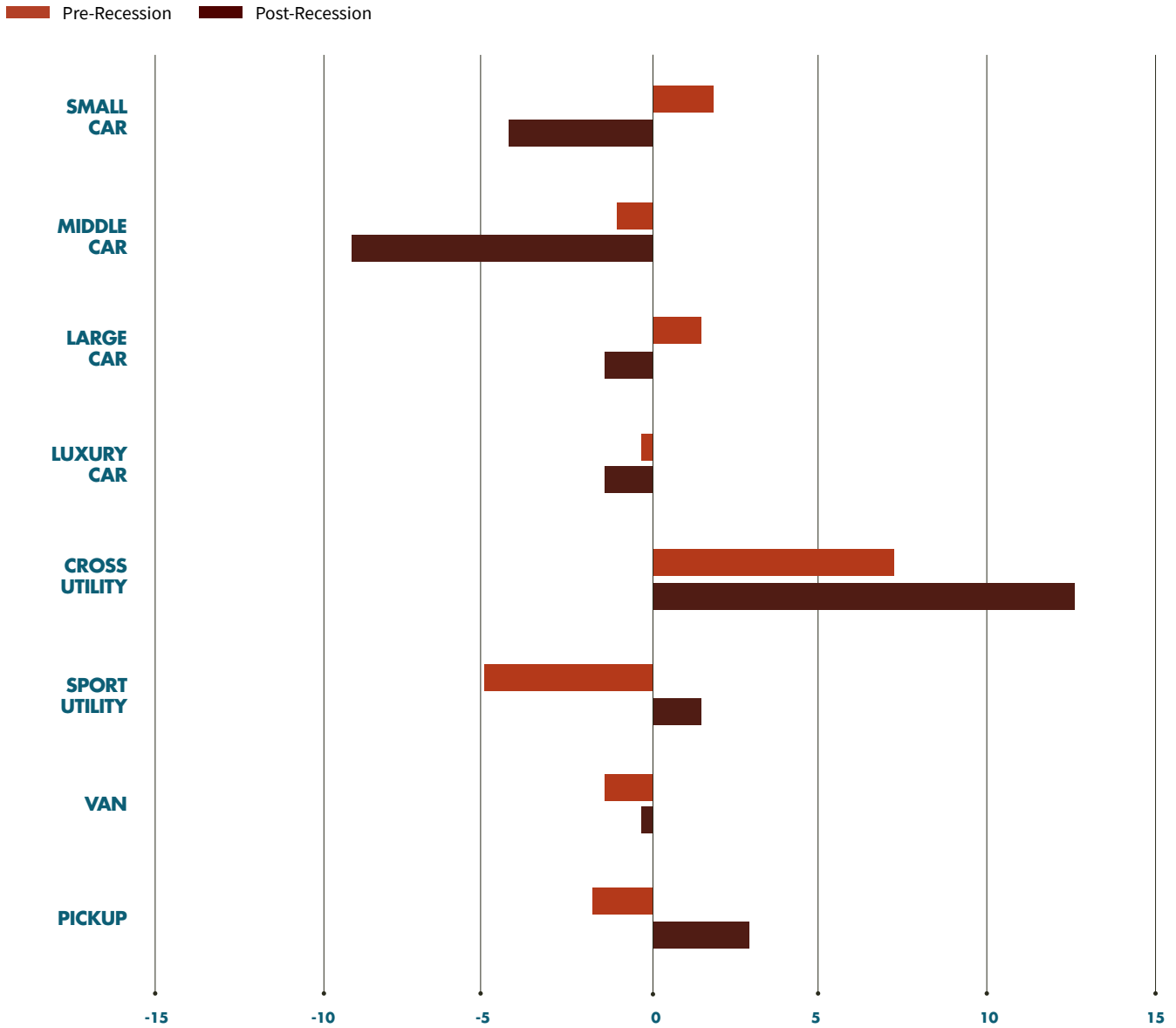
FIG 7: POST-RECESSION MARKET SHARE BY CLASS



Source: WardsAuto

In the years leading up to the recession, only three vehicle classes were gaining market share: small cars, large cars and CUVs. After the recession, a slightly different three vehicle classes were gaining market share: CUVs, sport utility vehicles (SUVs) and pickup trucks.

FIG 8: CHANGE IN PERCENT MARKET SHARE BY VEHICLE CLASS BY PERIOD



Source: WardsAuto

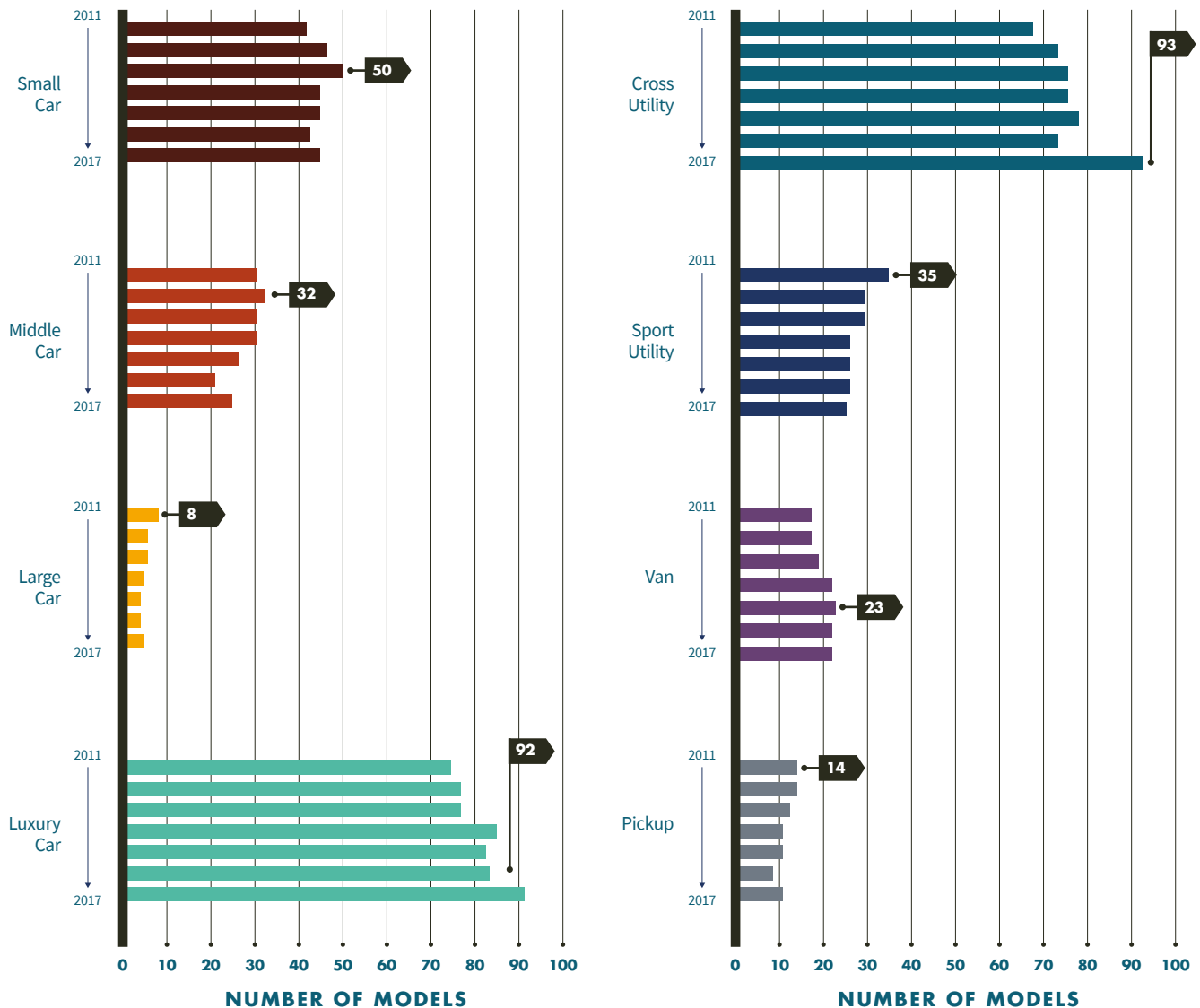
When we look at the overall market share change of each class for each period, the comparison is interesting. Since the recession, share of all car classes (small, middle, large and luxury) have declined. It is clear that American consumers favor more utility-focused vehicles, with CUVs continuing their aggressive growth in market share and SUVs and pickups reversing their pre-recession trends. However, with the notable exception of CUVs, no vehicle class has returned to a market share that equals pre-recession level.

DESPITE POST-RECESSION GROWTH, SUV MARKET SHARE LAGS 4 POINTS BELOW PRE-RECESSION LEVELS AND PICKUP TRUCKS REMAIN 1 POINT BELOW.

Another measure by which to evaluate the popularity of a certain class of vehicle is by looking at the number of models available within that class. It stands to reason that consumers cannot buy vehicles that are not available, and automakers do not want to offer vehicles consumers do not want to buy. Hence, evaluating the number of vehicle models made available by class can provide context to the sales market strength of each class. This theory, however, is contradicted by the large number of models available within the luxury class of vehicles. Luxury vehicles have never accounted for

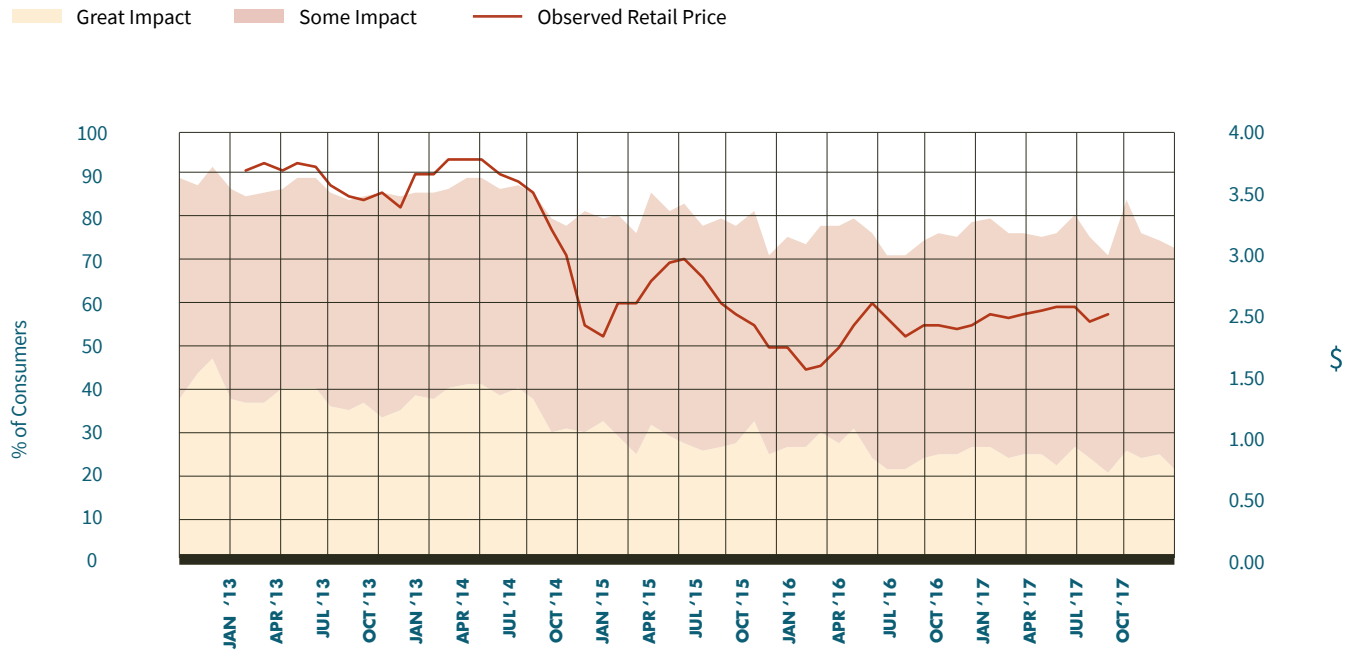
more than 10% of vehicle sales, yet they consistently rank as one of the most available vehicle classes. One possible explanation could be the higher profitability of these vehicles. Another might be found in the selectiveness of the target consumer segment, which demands and is willing to pay for more choices. Figure 9 shows the number of models offered for sale each year since 2011.

FIG 9: NUMBER OF VEHICLE MODELS AVAILABLE BY VEHICLE CLASS, 2011-2017⁴



Source: WardsAuto

FIGURE 10: GAS PRICES AFFECT FEELINGS ABOUT THE ECONOMY



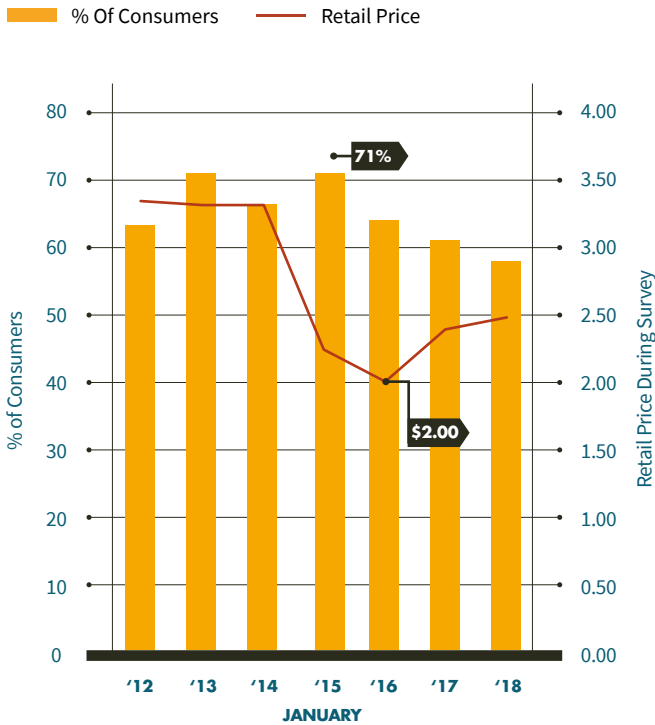
Source: NACS, Penn Schoen Berland

EFFECT OF RETAIL FUEL PRICES

Retail fuel prices have a direct effect on consumer behavior. As the only consumer product for which the price is posted on 20-foot signs on nearly every corner, consumers have been conditioned to be more aware of these prices and to react to them accordingly. Monthly since January 2013, NACS has asked consumers how they feel about the economy and to what extent gasoline prices affect their feelings. In that time frame, not once did the percentage of consumers who said gas prices had some impact or a great impact on their feelings about the economy fall below 72%. Clearly, fuel prices have an influence on economic sentiment.



FIGURE 11: PRICE IS MOST IMPORTANT CONSUMER FACTOR



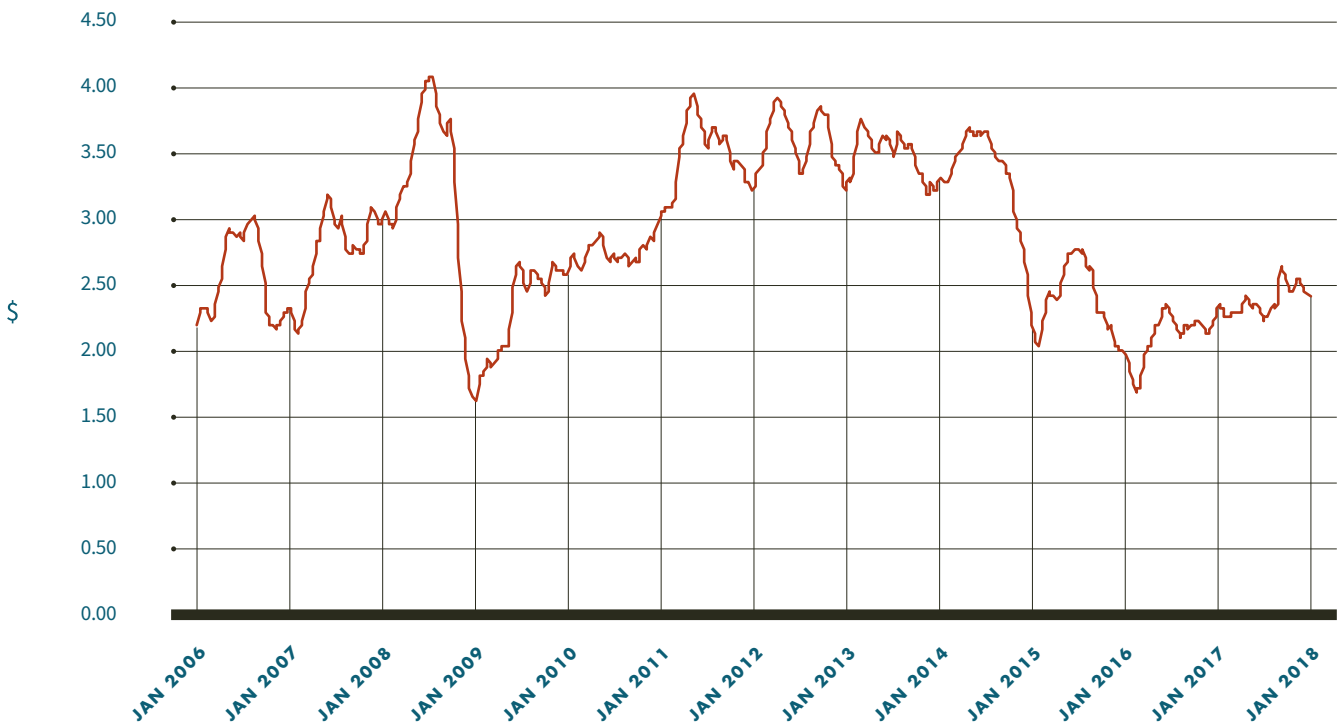
In addition, over the years, the majority of consumers have told NACS that the most important factor influencing their decision of where to purchase gasoline is the posted retail price. And this has remained consistent regardless of the movement of retail fuel prices.

Understanding the relationship of fuel prices to consumer behavior is important when considering what factors might influence a consumer’s decision to purchase a particular vehicle.

Prior to the Great Recession, retail gasoline prices followed global oil prices to reach their highest price on record, reaching a national average retail price for regular grade gasoline of \$4.11. However, in the fall of 2008, crude oil and retail gasoline prices experienced a free fall and by the end of that year the average retail price of gasoline bottomed out at about \$1.62 per gallon.

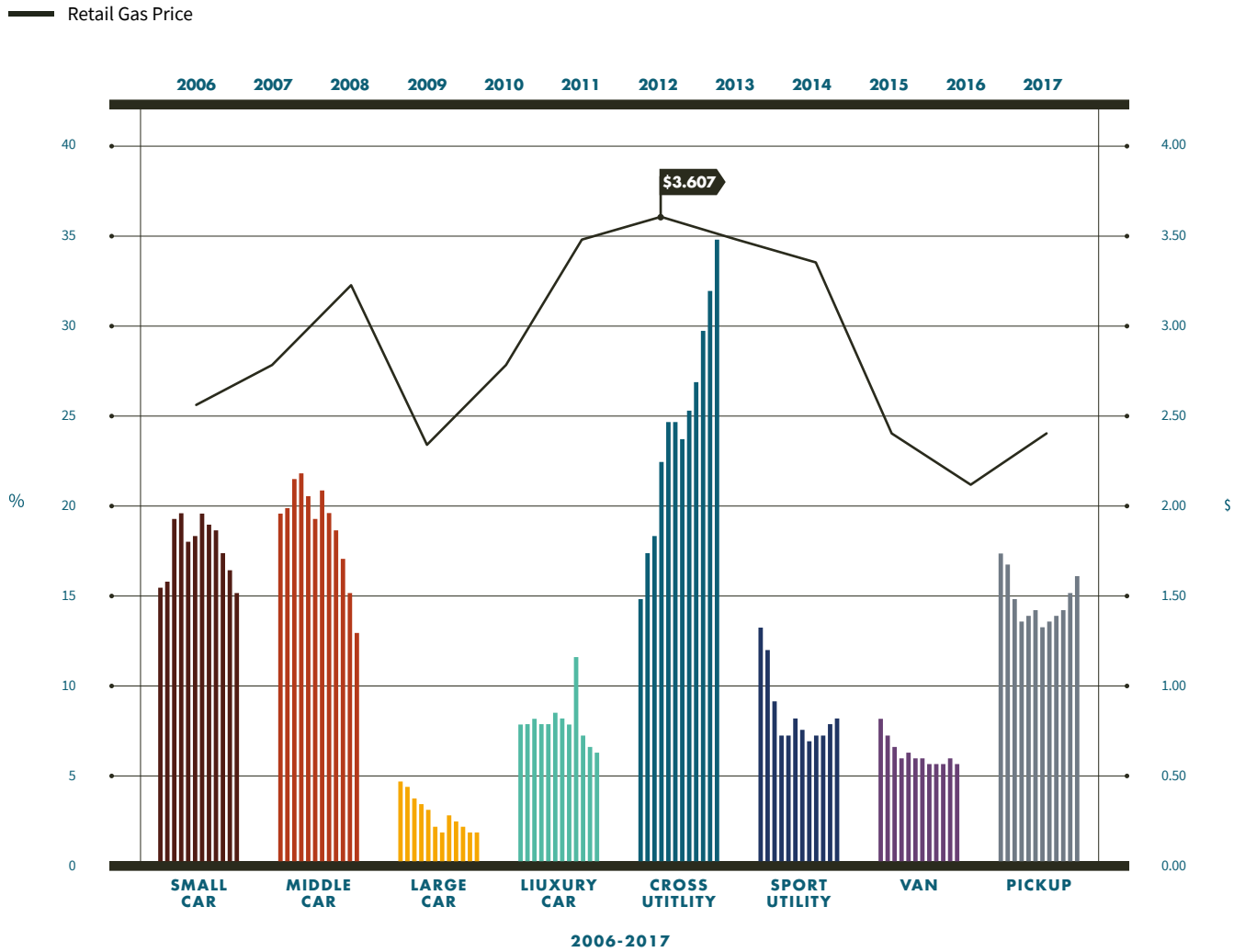
Source: NACS, Penn Schoen Berland

FIGURE 12: RETAIL GASOLINE PRICE, 2006-2017



Source: OPIS

FIGURE 13: VEHICLE CLASS MARKET SHARE VS RETAIL GAS PRICE



Source: WardsAuto, OPIS

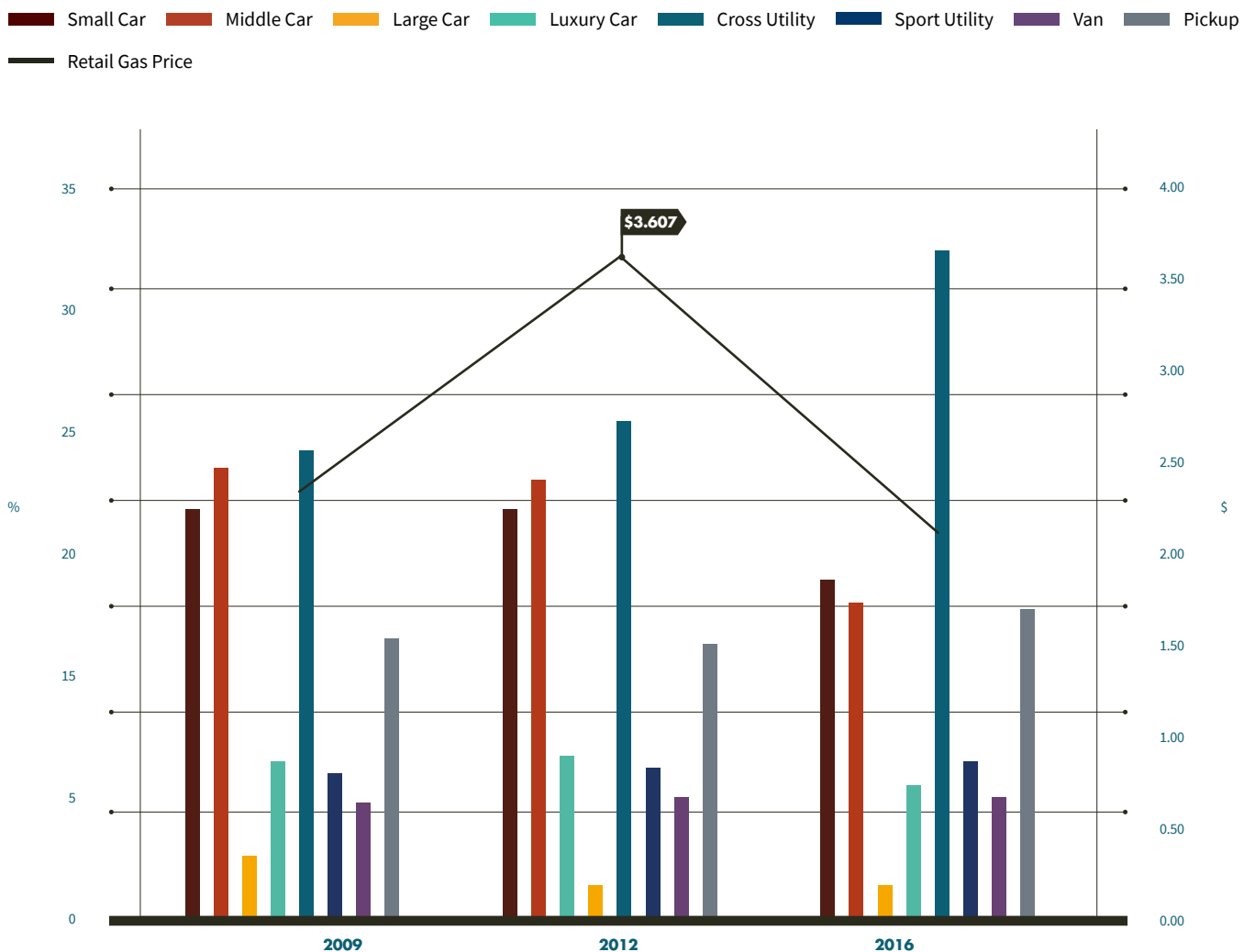


What is the relationship between retail fuel prices and sales of specific vehicle classes? Most media will assert that higher fuel prices lead consumers to purchase smaller, more fuel-efficient vehicles while lower prices “encourage” the purchase of larger, less fuel-efficient vehicles. Figure 13 shows the market share of vehicle classes each year compared with the average retail price of gasoline for that year.



While it is impossible to reach a definitive conclusion regarding the overall impact of retail fuel prices on vehicle class sales because there are several other factors that influence a consumer decision, looking at shifts in market share by class during prolonged drops or increases in fuel prices (as presented in Figure 14) might give some insight.

FIGURE 14: CHANGE IN VEHICLE CLASS MARKET SHARE VS RETAIL GAS PRICES



Source: WardsAuto, OPIS

Looking at shifts in market share by class during prolonged drops or increases in fuel prices might give some insight.



Here are some observations about the data presented in Figure 14:

During this period of rising fuel prices (2009-2012):

1. Retail gasoline prices increased each year from 2009 – 2012, starting with an annual average price of \$2.33 in 2009 and ending with an average price of \$3.61 in 2012.
2. Sales of small cars did not increase during this time period, with market share remaining relatively the same at about 19.5%.
3. Despite what might be expected, SUVs gained market share from 6.9% to 7.2% and vans grew slightly from 5.6% to 5.8%.
4. Pickup trucks lost a little ground from 13.3% to 13.1%.
5. CUVs increased market share modestly, from 22.3% - 23.7%.

During this period of declining fuel prices (2012-2016):

1. Retail fuel prices declined each year from 2012-2016, from a high of \$3.61 in 2012 to a low of \$2.13 in 2016.
2. Small cars lost market share in this period, dropping from 19.5% to 16.1%.
3. SUVs continued to gain share, increasing from 7.2% to 7.6% while vans remained steady at about 5.7%.
4. Pickup trucks increased market share from 13.1% to 14.9%.
5. CUVs continued to grow market share, increasing from 23.7% to 32.0%.

It is tempting to draw conclusions from such data, but it is impossible to determine from the performance of the market that fuel prices drove sales of certain classes of vehicles. It is important to also understand the evolution of fuel economy within each class, as well as purchase cost, which help determine the consumers' perspective of cost and value of ownership.

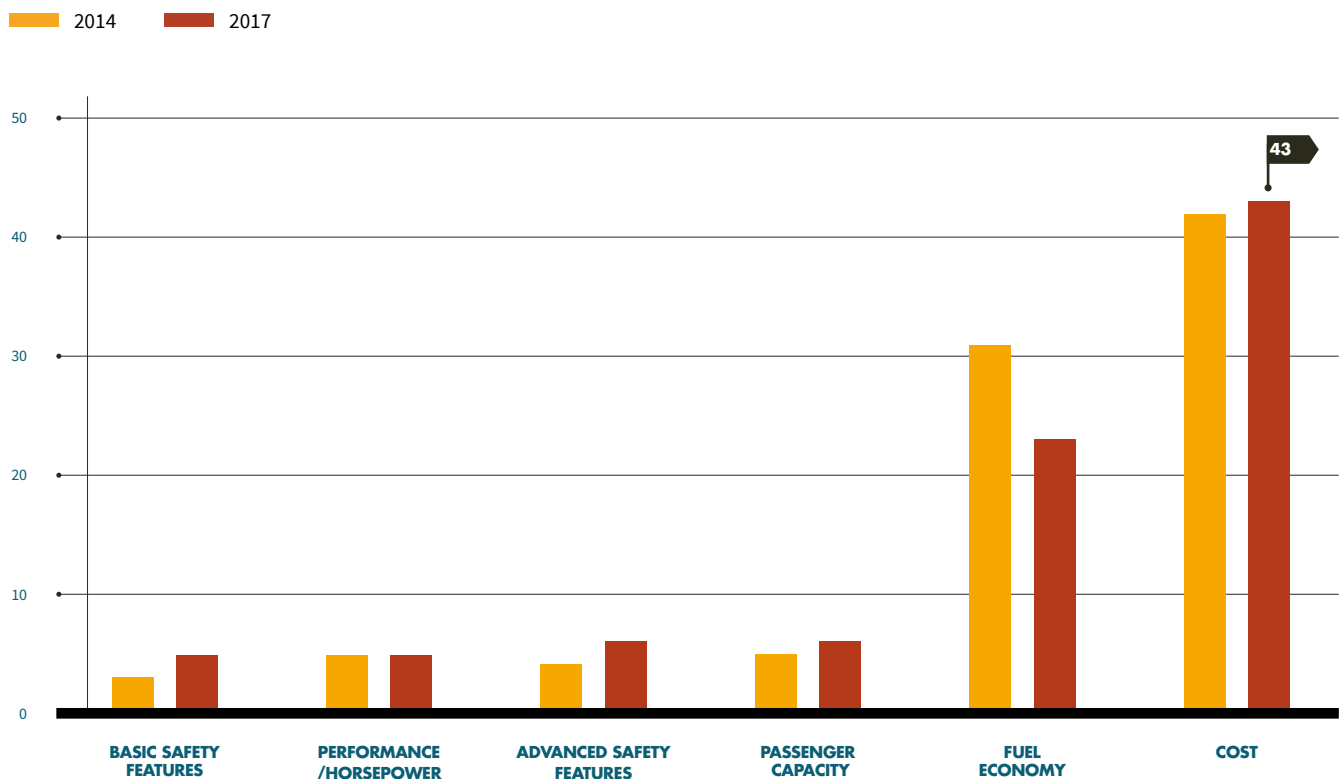
WHAT IS MOST IMPORTANT TO CONSUMERS?

According to the Fuels Institute report, Consumers and Alternative Fuels 2017, consumers who were in the market to purchase a vehicle within the next two years remained motivated primarily by vehicle cost and fuel efficiency, citing them as the two most influential attributes when selecting a vehicle.⁵



CONSUMERS WHO WERE IN THE MARKET TO PURCHASE A VEHICLE WITHIN THE NEXT TWO YEARS REMAINED MOTIVATED PRIMARILY BY VEHICLE COST AND FUEL EFFICIENCY

FIGURE 15: SINGLE ATTRIBUTE CONSUMERS FIND MOST INFLUENTIAL



Source: Fuels Institute

FUEL EFFICIENCY

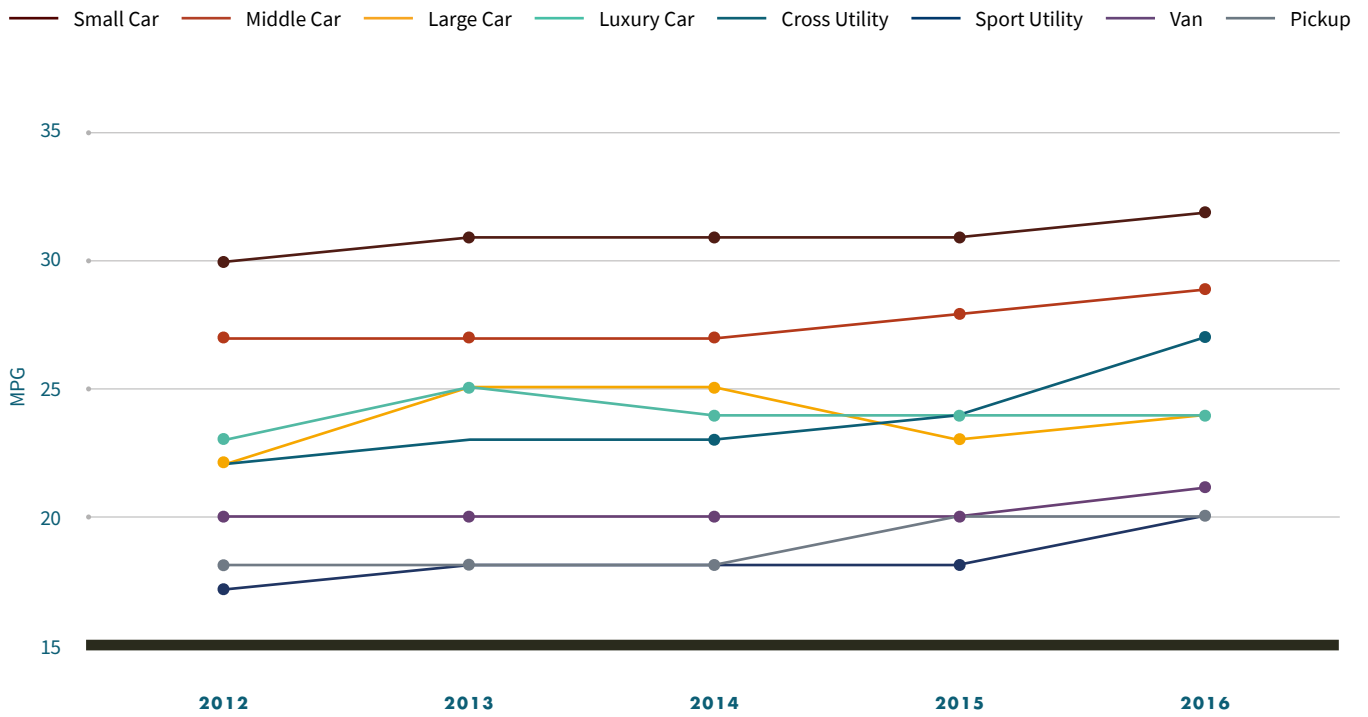
Despite a decrease of intensity from 2014 to 2017, consumers clearly remain concerned about fuel efficiency when considering which vehicle to purchase. This interest, combined with federal fuel efficiency requirements, has resulted in a steady improvement in fuel efficiency in the market. But it is not evident that an interest in fuel efficiency drives consumers to opt for a specific vehicle class.

Obviously not every consumer has the same needs. Where some purchase a minivan to get their kids to soccer and pick up groceries, some are grabbing their SUV to haul their boat to the lake with their family, and others drive more efficient vehicles for their commutes. Within the scope of these needs, and within appropriate classes of vehicles, consumers may indeed focus on fuel efficiency and vehicle purchase cost.

To that extent, improvements in efficiency are delivering value to consumers despite the class of vehicle they purchase. Since 2012, all vehicle classes have delivered improved fuel efficiency, as reported in the fuel economy index. The most notable change is the CUV, with average fuel economy increasing from 22 MPG to 27 MPG (a 23% improvement). In 2016, CUVs trailed only small cars and middle cars in average efficiency. Even the SUV and pickup classes, which are often maligned for delivering low miles per gallon, have improved their fuel efficiency by 11% and 18%, respectively.



FIGURE 16: AVERAGE FUEL ECONOMY BY VEHICLE CLASS, 2012-2016



Source: Fueleconomy.com; WardsAuto



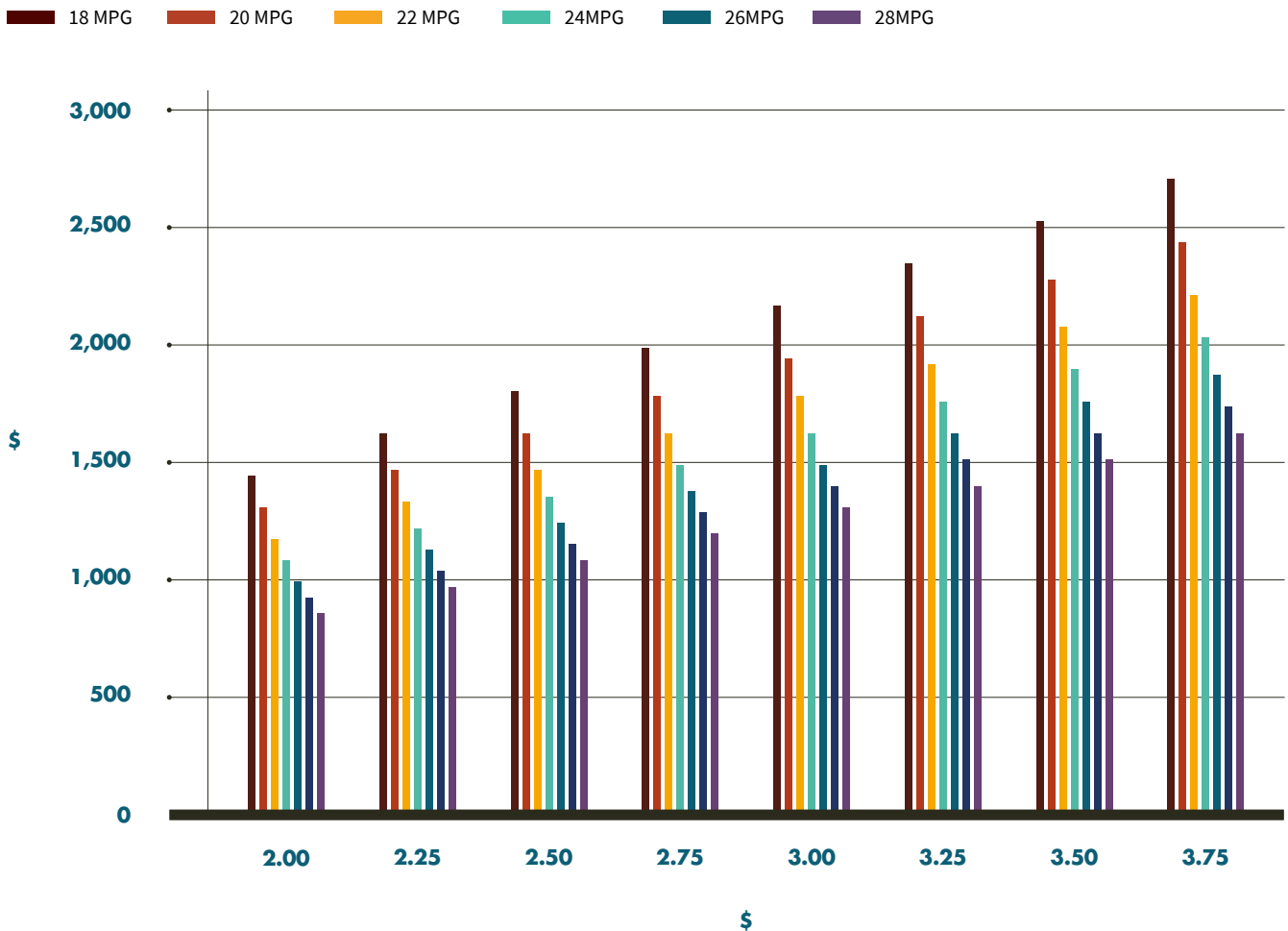
This might help explain why, even when retail fuel prices were climbing from 2009-2012, sales of CUVs and SUVs continued to grow. Consumers were able to obtain a vehicle that delivered the utility they desired and these vehicles delivered better efficiency, potentially negating some of the influence of escalating fuel prices.

This makes additional sense when one considers the diminishing rate of return as fuel economy improves. Improvements on vehicles with lower MPG deliver greater financial value than do similar improvements in more efficient vehicles. Using a straight economic calculation, it is possible to determine the direct economic value to the consumer of improving fuel efficiency.

In Figure 17, the annual cost of gasoline associated with driving a vehicle with a fuel efficiency rating between 18 MPG and 30 MPG is plotted against a range of gasoline prices. The calculations were based upon an average of 13,000 miles driven per year.

As can be seen in this chart, as the retail price of fuel increases so naturally does the annual cost of fuel, and the fuel efficiency of the vehicle helps to mitigate that expense. But the tangible value of improved fuel efficiency is less clear. By isolating one retail fuel price, it is possible to demonstrate the value of improved fuel economy on overall fuel expenditures.

FIGURE 17: ANNUAL COST OF FUEL AT CERTAIN FUEL PRICES AND VEHICLE MPG



Source: Fuels Institute



FIGURE 18: ANNUAL FUEL SAVINGS ASSOCIATED WITH INCREASES IN MPG AT \$3.00 GASOLINE

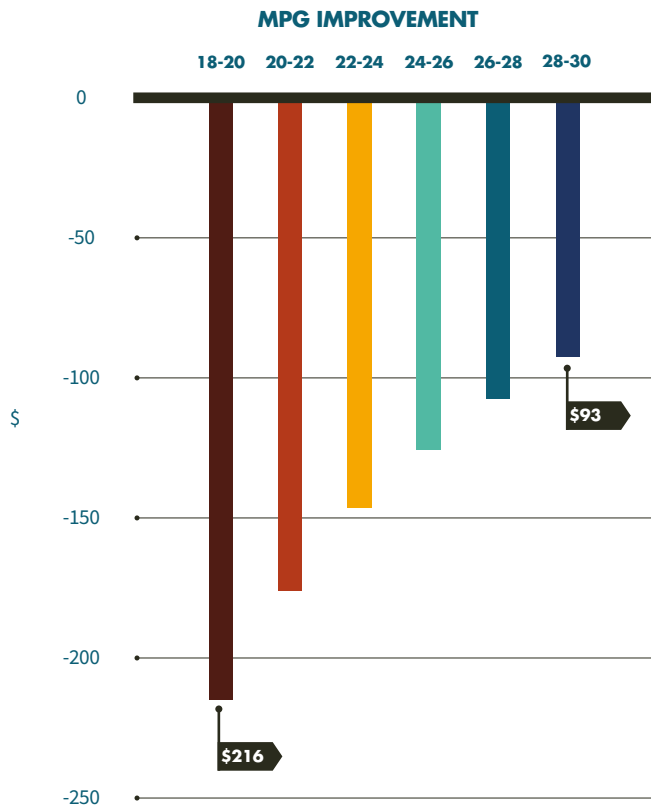


Figure 18 shows that as fuel economy improves, the consumer’s annual expenditure on fuel will continue to decrease but the rate of savings declines with each incremental improvement in MPG. For example, going from 18 to 20 miles per gallon delivers an annual savings of \$216. But going from 28 to 30 miles per gallon delivers a savings of only \$93. The rate of improved consumer benefit decreases with increased fuel efficiency. This provides some insight into consumers’ purchase of utility vehicles and their perceived and realized value in fuel efficiency gains.

THE RATE OF IMPROVED CONSUMER BENEFIT DECREASES WITH INCREASED FUEL EFFICIENCY.

Source: Fuels Institute

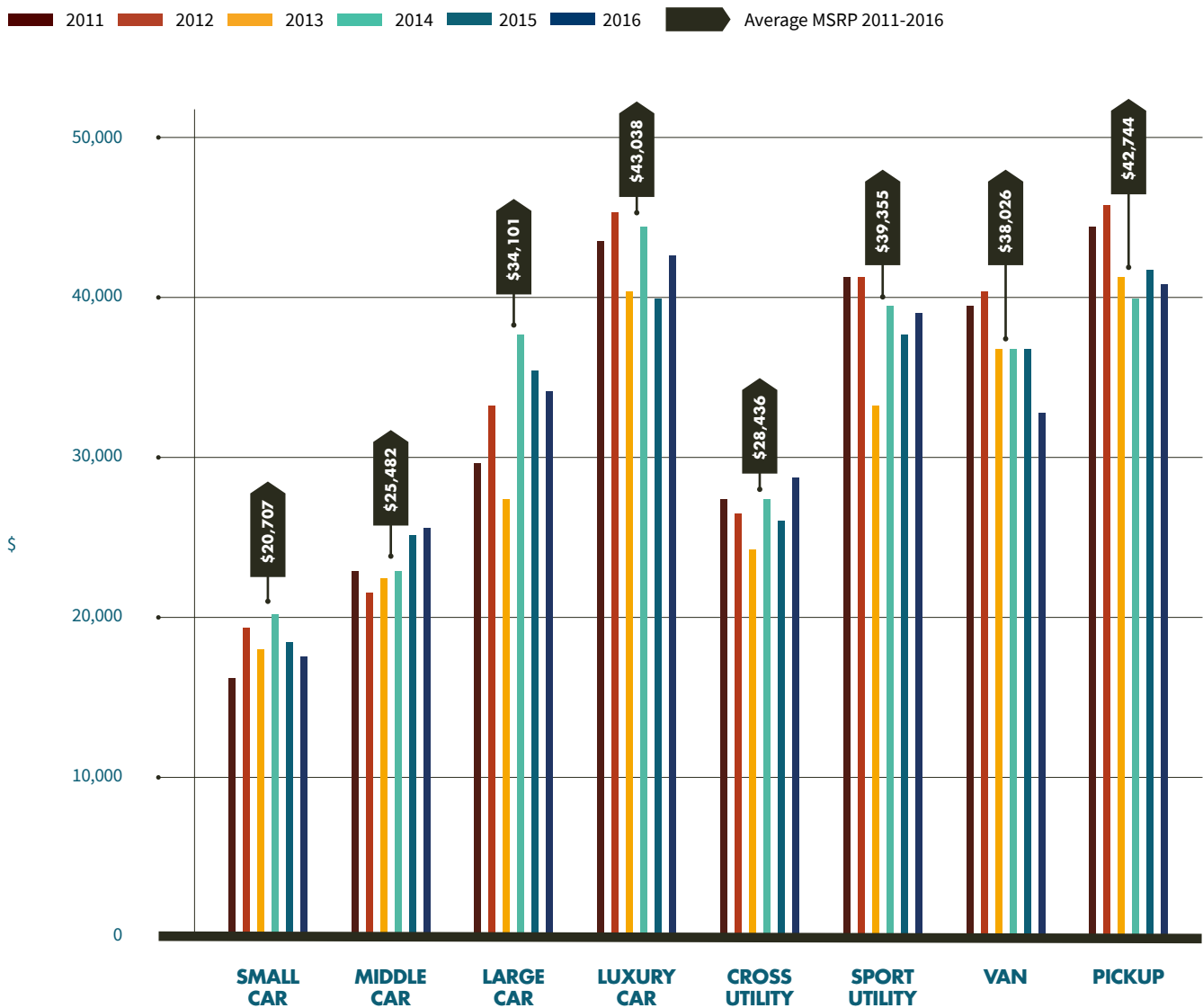
COST OF VEHICLE

The perceived and realized value of fuel efficiency is critically important when trying to understand consumer purchase decisions. According to the Fuels Institute consumer survey, only one vehicle attribute resonates as more important with consumers than fuel economy, and that is vehicle cost. For most consumers, their vehicle represents the second largest purchase in a lifetime behind a home. As consumers look for a vehicle to fit their utility needs, how different vehicle classes compete on purchase

price can help provide insight into the decision-making process.

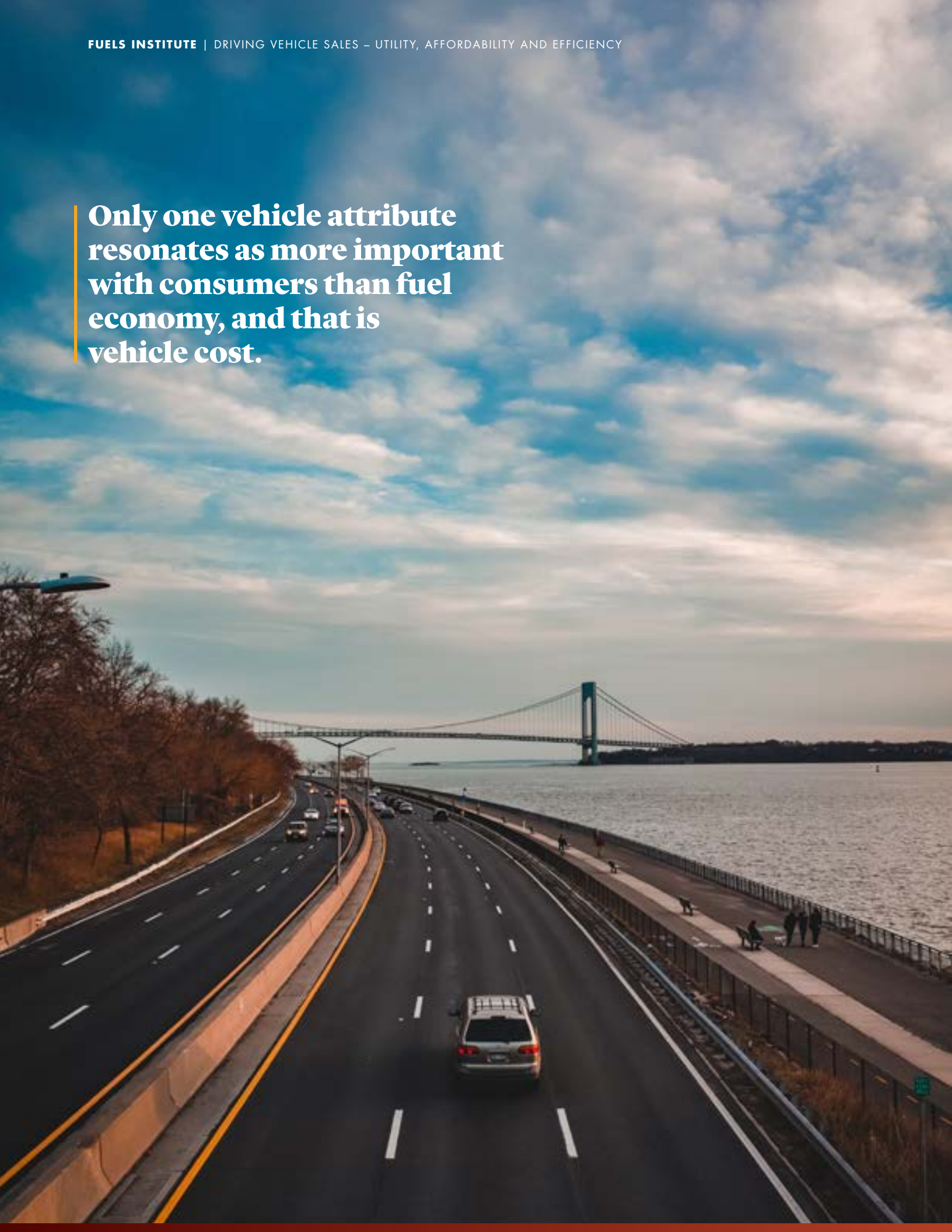
Figure 19 shows the average manufacturer suggested retail prices (MSRP), exclusive of incentives, for the top four models sold within each vehicle class from 2011 - 2016. From this data, it would appear that small cars, middle cars and CUVs compete within the same market basket purchase price; whereas SUVs, vans and pickups occupy another competitive set.

FIGURE 19: AVERAGE MSRP BY VEHICLE CLASS, 2011-2016



Source: newcartesdrive.com, Edmunds.com, WardsAuto.com

Only one vehicle attribute resonates as more important with consumers than fuel economy, and that is vehicle cost.



This data provides additional insight into the increasing popularity of CUVs. If the utility of these vehicles competes with that of an SUV, then the lower purchase price (on average more than \$10,000) would be an attractive motivator by itself. But when combined with a fuel efficiency that averages about 30% better than leading SUVs, it is understandable why CUVs have been able to capture 35% market share.

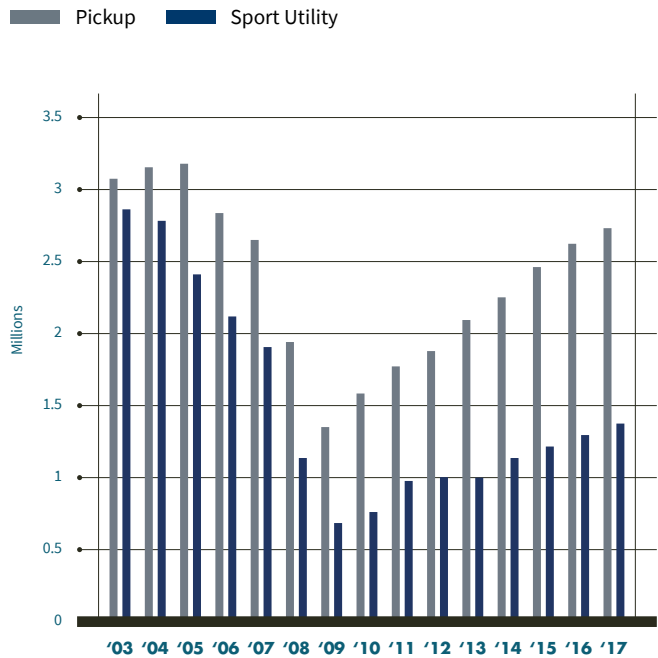
THE MYTHOLOGY OF A TRUCK CULTURE

The media often reports that there have been “record breaking” sales of trucks over the past several years, but the data tells a slightly different story. Indeed, pickup sales have been increasing since their lowest slump in 2009 and market share has increased 20% since 2009, but sales have yet to reach the same level they had pre-recession in terms of both units sold and market share. The market share for pickup trucks in 2017 still sits at 16% (2.74 million units) compared with the highest share they held in 2005 of 19% (3.18 million units).

SALES OF PICKUP TRUCKS HAVE YET TO REACH THE SAME LEVEL THEY HAD PRE-RECESSION IN TERMS OF BOTH UNITS SOLD AND MARKET SHARE.

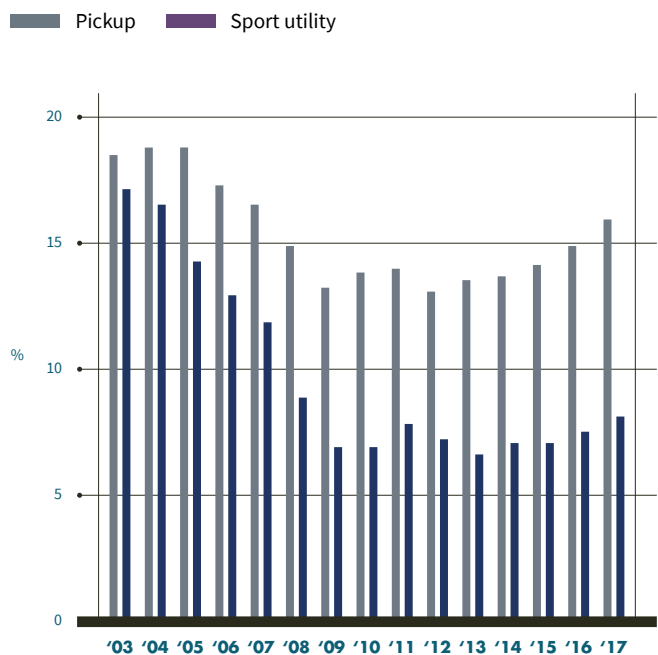
Meanwhile, SUVs have not come close to recovering to their pre-recession levels. At their peak in 2003, 2.86 million SUVs sold represented nearly 19% of the market. In 2009, sales dropped to 714,000 and a market share of less than 7%. Since then, recovery has been modest with sales growing to 1.39 million units in 2017 for a market share of 8%.

FIGURE 20: SALES OF PICKUP TRUCKS AND SUVs, 2003-2017



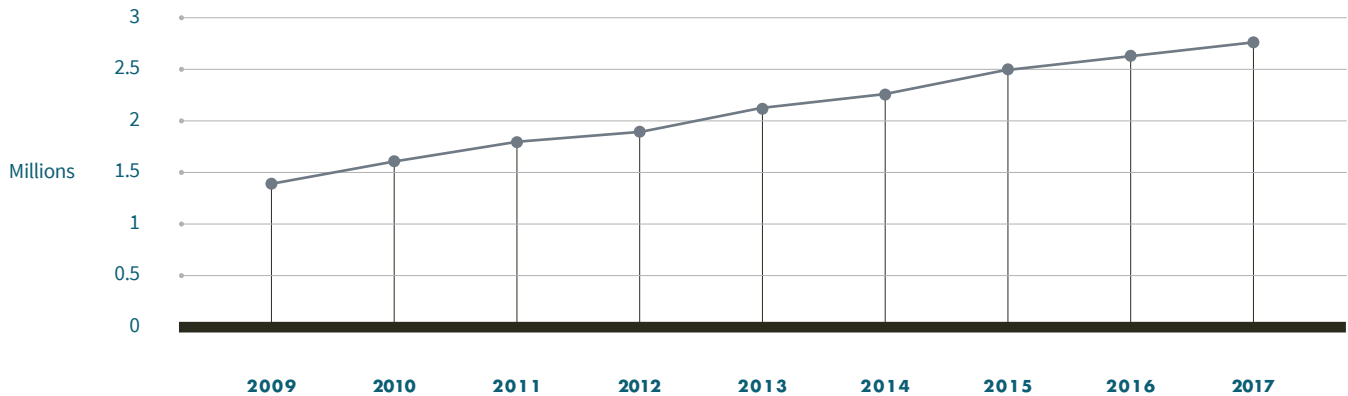
Source: WardsAuto

FIGURE 21: MARKET SHARE OF PICKUP TRUCKS AND SUVs, 2003-2017



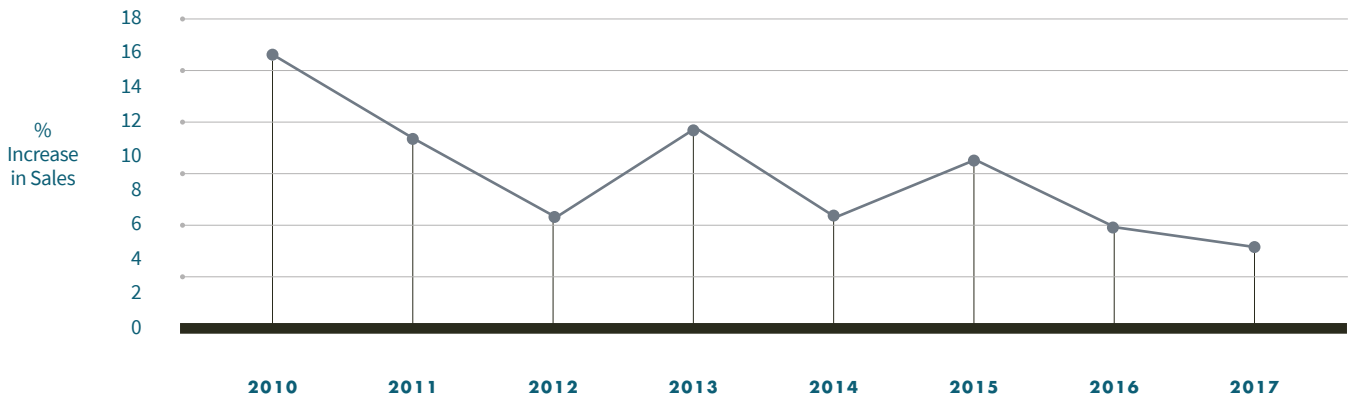
Source: WardsAuto

FIGURE 22: UNIT SALES OF PICKUP TRUCKS, 2009-2017



Source: WardsAuto

FIGURE 23: PICKUP TRUCK ANNUAL SALES GROWTH

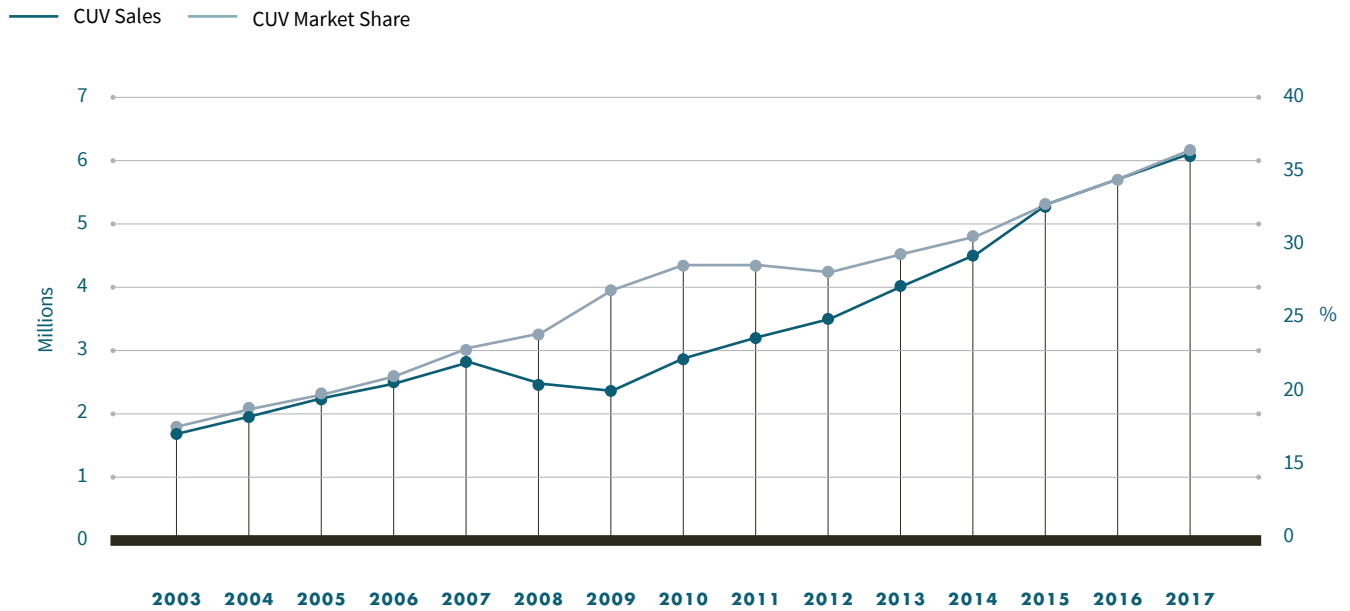


Source: WardsAuto

With specific regard to pickup trucks, sales growth in units sold since 2009 has been strong at a cumulative 133%. However, annual year over year growth in sales volume since 2009 has varied significantly and has slowed in recent years. This slowing rate of growth could be attributed to the higher volume of unit sales, which makes it more difficult to record significant percentage-based increases each year. If pickup truck sales continue to increase at 5.5% annually (which was the average rate of growth in 2016 and 2017), unit sales of pickup trucks finally would match their 2005 sales record by the year 2020.

The strong rate of growth in pickup truck sales since 2009 might explain why many are claiming that truck sales are dominating the market. But, another answer can be found in the classification of many CUVs as light trucks. In 2003, 1.67 million CUVs held a 10% market share, but by 2017 sales increased to 5.99 million units and market share surged to 35%.

FIGURE 24: SALES OF CROSS UTILITY VEHICLES, 2003-2017



Source: WardsAuto

Does a CUV technically count as a truck? According to federal regulations, a light duty truck is defined as having a gross vehicle weight of less than 8,500 pounds, a curb weight of less than 6,000 pounds, a frontal area of 45 square feet or less and is designed to 1) transport property or is a derivation of such vehicle; or 2) has a capacity of more than 12 persons; or 3) is available with special features enabling off-street or off-highway operation and use. This specific definition is related to regulations for controlling vehicle emissions⁶. Most trucks and SUVs and many CUVs and utility-based cars fall within this definition of “light duty truck.”

But, this regulatory classification has led to some common misplaced comparisons between CUVs and what most would consider a “truck.” When SUVs gained popularity towards the end of the 20th century, the most efficient way for automobile manufacturers to satisfy market demands was to rebody the pickup truck, which is known as “body-on-frame” construction. As demand increased and fuel economy became a higher priority, manufacturers replaced this structure with uni-body

CUVs. In essence, a CUV is based on a car’s platform, compared with a SUV which uses the chassis of a truck. For example, the popular Toyota Highlander uses the architecture of the Toyota Camry with a lifted frame, but is marketed as an SUV. Because of their different structure, CUVs offer improved fuel efficiency and ride quality along with price points that are competitive with your common mid-sized car, but they deliver passenger and cargo capacity and performance similar to that of an SUV.

To better understand why sales of CUVs continue to grow and represent more than one-third of the market, the Fuels Institute analyzed current marketing trends used by automobile manufacturers to drive demand for their top CUVs, SUVs, and pickups to see what features resonate most with consumers. This research was done by viewing the ads and brochures that target consumers for the top 10 selling vehicles in the CUV, SUV and pickup classes and making note of the concepts that each company believed would be successful to advertise to the consumer. The automaker marketing strategies are based upon extensive market and



consumer research, reflecting the companies’ familiarity with their customers. By examining their marketing strategies, it is possible to highlight the differentiating features between vehicles that consumers look at when purchasing a CUV, SUV or pickup.

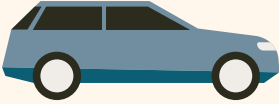
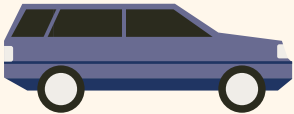
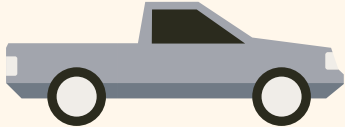

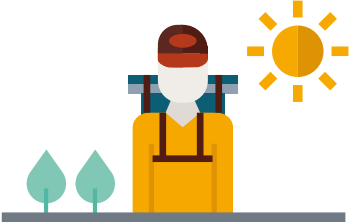




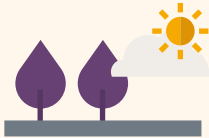





CUVs are generally marketed as more fuel-efficient SUVs. What consumers may sacrifice in size, the CUV makes up for in fuel efficiency and cost savings compared to the traditional SUV. The CUV has a unique role in the market. While automakers not only stress CUV fuel-efficiency, several commercials featured images of families. From images of a father taking his daughter surfing for the first time, or a son heading off to college and packing up his belongings, it’s easy to notice that space for the family and outdoor performance are being stressed.

Marketing for true SUVs, on the other hand, focus almost exclusively on showing off outdoor performance and safety technology, with very little reference to fuel efficiency. Commercials feature images of the vehicle traveling through rocky terrain, and even clips of the people in the vehicle going on adventures in their SUV.

While the SUV is advertised with a more adventurous and sporty vibe, the pickup advertisements focus specifically on power displays. Often accompanied with electric guitar riffs, the manufacturers showed off how much their pickups could carry or pull. References to fuel efficiency focused on comparison within “class.”

In sum, while most CUVs were marketed as a more fuel-efficient SUV, the actual SUV was marketed more for outdoor performance. Pickups, on the other hand, only had to compete with other pickups.

FIGURE 25: OBSERVED MESSAGE STRUCTURE OF CUV, SUV, AND TRUCK MARKETING

CUV	SUV	PICKUP
		
 <p data-bbox="329 821 399 890">TOP CUV</p>	 <p data-bbox="670 816 951 886">“FOR THE OUTDOORSMAN”</p>	 <p data-bbox="1122 816 1403 886">“FOR THE WORKING MAN”</p>
<p data-bbox="289 982 446 1052">FUEL EFFICIENT</p>  <p data-bbox="256 1312 479 1381">SAFETY TECHNOLOGY</p>  <p data-bbox="285 1648 456 1717">SPACIOUS & SPORTY</p>  <p data-bbox="183 1921 375 1948"><i>Source: Fuels Institute</i></p>	<p data-bbox="691 982 932 1052">OUTDOOR PERFORMANCE</p>  <p data-bbox="699 1312 924 1381">SAFETY TECHNOLOGY</p>  <p data-bbox="732 1648 902 1717">SPACIOUS & SPORTY</p> 	<p data-bbox="1138 982 1377 1052">OUTDOOR PERFORMANCE</p>  <p data-bbox="1179 1312 1336 1381">FUEL EFFICIENT</p>  <p data-bbox="1146 1648 1369 1717">SAFETY TECHNOLOGY</p> 

These marketing strategies, as well as government requirements for improved fuel efficiency, provide insight into why CUV sales have flourished. While consumers often seek greater cargo and passenger capacity, coupled with enhanced visibility and perceived safety advantages of a higher-riding vehicle, they rarely use the off-road or power performance capabilities of a traditional SUV. These same qualities can be acquired with a CUV, coupled with a lower price point and greater fuel efficiency. This combination matches well with consumers' interest in saving money, both on fuel and at the point of purchase, as well as the

automakers' requirements to satisfy increasingly stringent efficiency regulations. (Light trucks have a less stringent fuel efficiency standard than do passenger cars, and with many CUVs classified as light trucks automakers have additional flexibility to satisfy their obligations while satisfying their customers.) The result has been a product that has performed exceptionally well, eclipsing every other class since 2009. But to use the success of the CUV market to argue that the American consumer is addicted to trucks would be a mischaracterization of the market.



ALTERNATIVE POWERTRAIN VEHICLES

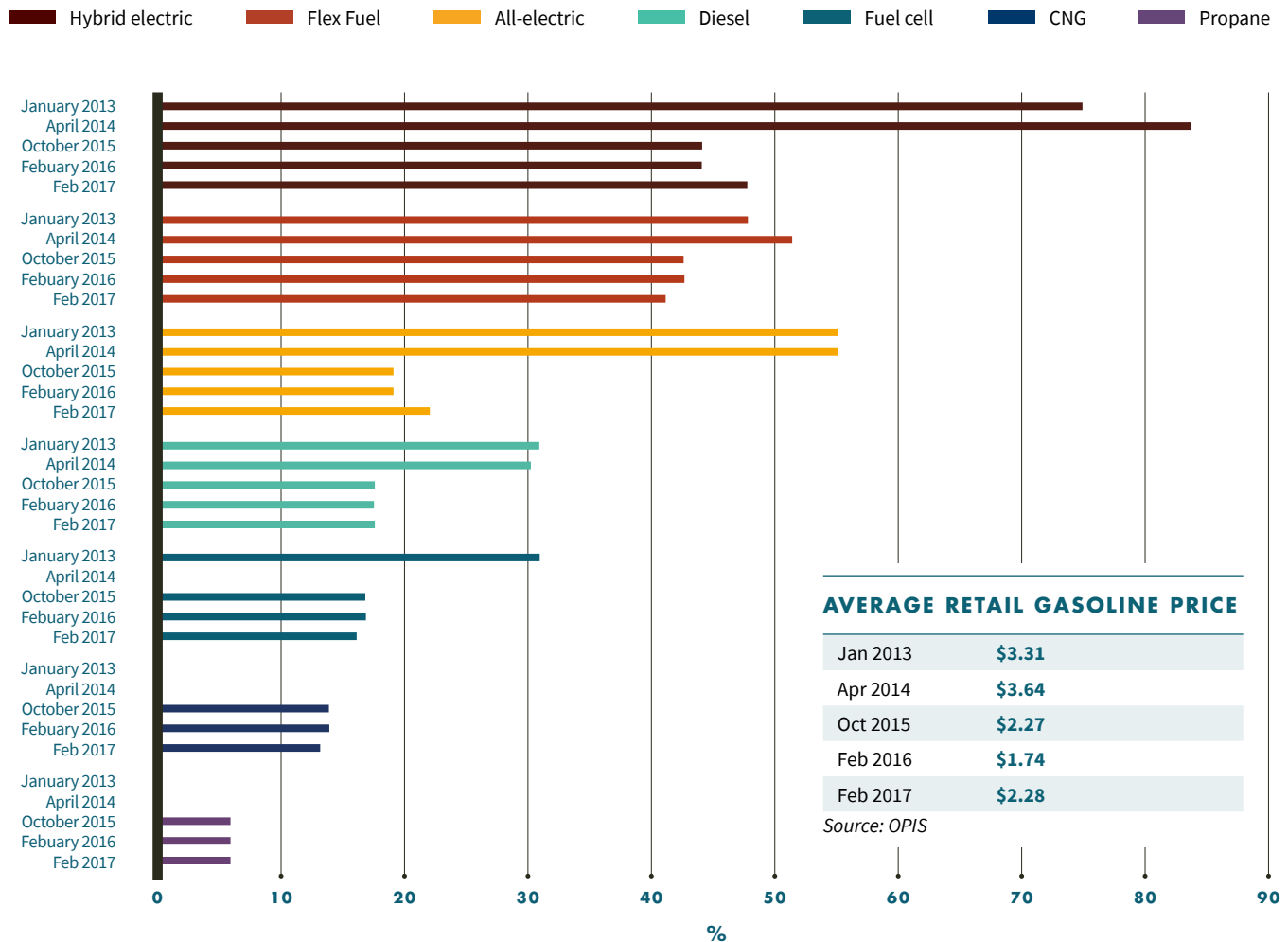
Because the cost of the vehicle and its fuel economy rank as the top two criteria identified by consumers when considering a vehicle purchase, it stands to reason that these factors could also play significantly in a consumer’s decision to consider an alternative fuel vehicle. Historically, volatility in fuel prices has led to consumers exploring alternative powertrains, including diesel, electric, hybrid, plug-in hybrid, natural gas and fuel cell vehicles.

According to the Fuels Institute report, *Consumers and Alternative Fuels 2017*, the percentage of consumers in February 2017 who were very or somewhat likely to consider an alternative fuel

vehicle for their next vehicle purchase fell below 50% for all powertrain types. There is a strong correlation between this change in consumer interest and the corresponding decline in retail fuel prices. For example, in 2014 when retail gasoline prices averaged close to \$3.50 per gallon, interest peaked for all alternatives. But with the decline in retail prices to the low \$2.00 per gallon range, interest dropped significantly.

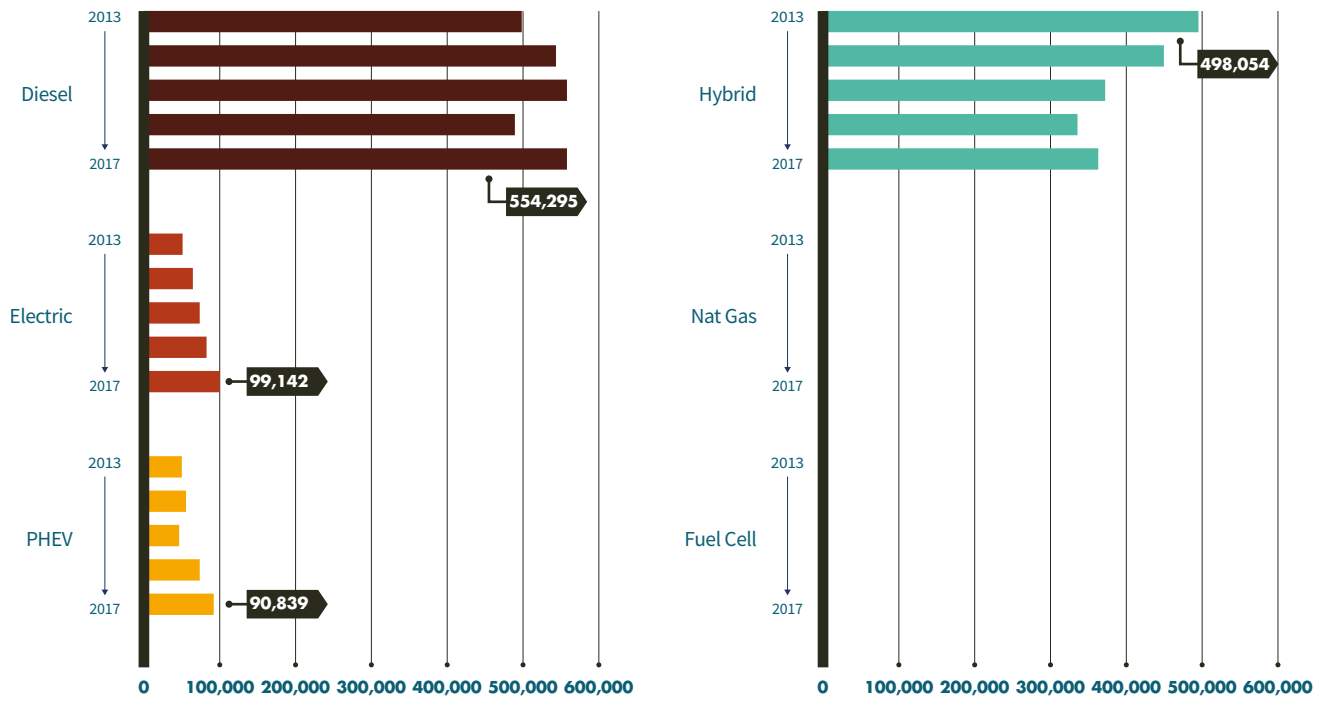
Sales of most alternative fuel vehicles have likewise suffered, in terms of total vehicles sold and market share.

FIGURE 26: CONSUMERS LIKELY TO CONSIDER ALTERNATIVE POWERTRAIN VEHICLES



Source: Fuels Institute

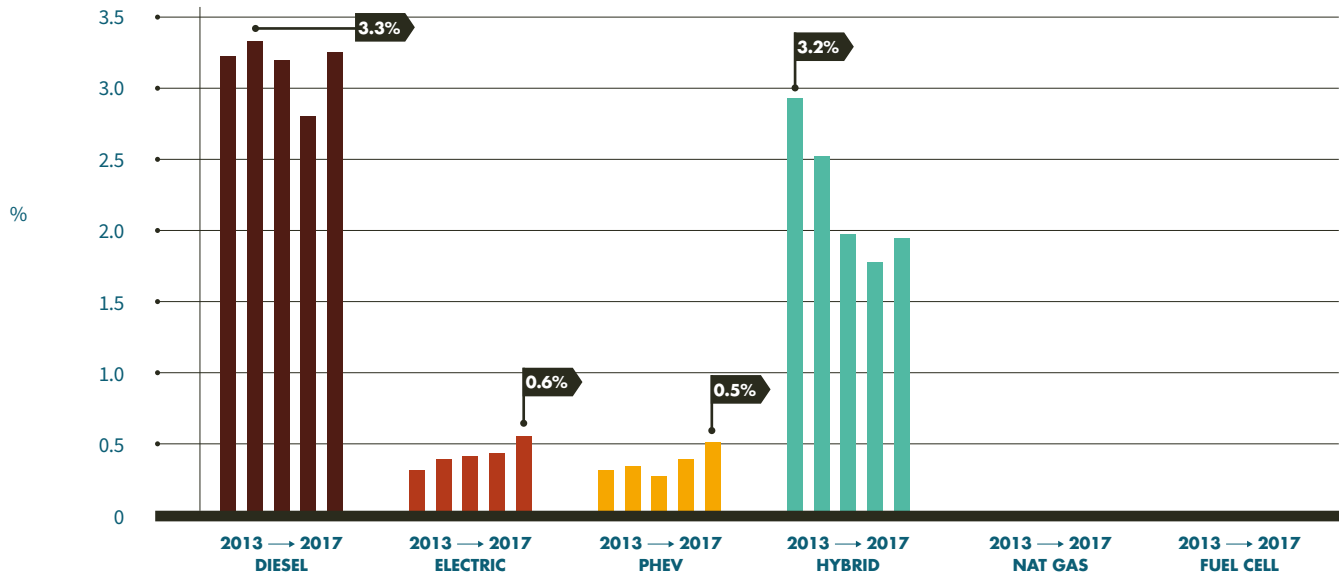
FIGURE 27: SALES OF ALTERNATIVE POWERTRAIN VEHICLES, 2013-2017



Source: WardsAuto



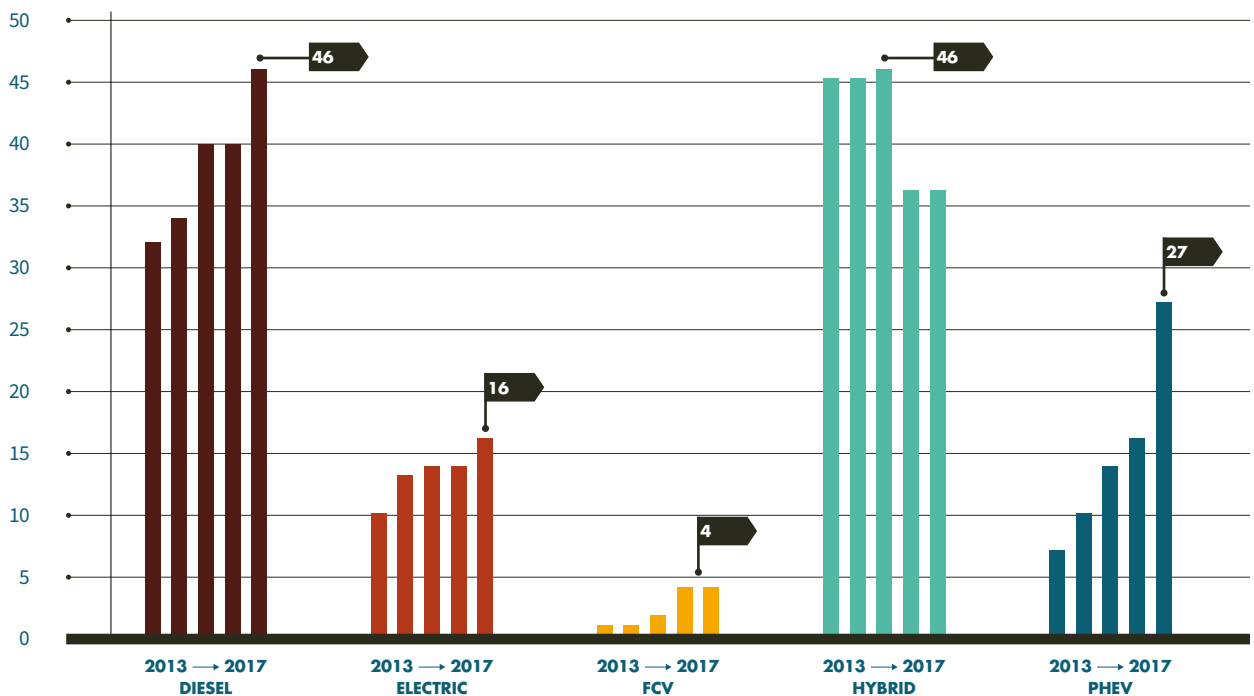
FIGURE 28: MARKET SHARE OF ALTERNATIVE POWERTRAIN VEHICLE SALES, 2013-2017



Source: WardsAuto

Despite this change in consumer interest, automobile manufacturers continue to offer for sale a significant number of alternative powertrain models

FIGURE 29: NUMBER OF VEHICLES AVAILABLE BY POWERTRAIN, 2013-2016⁷

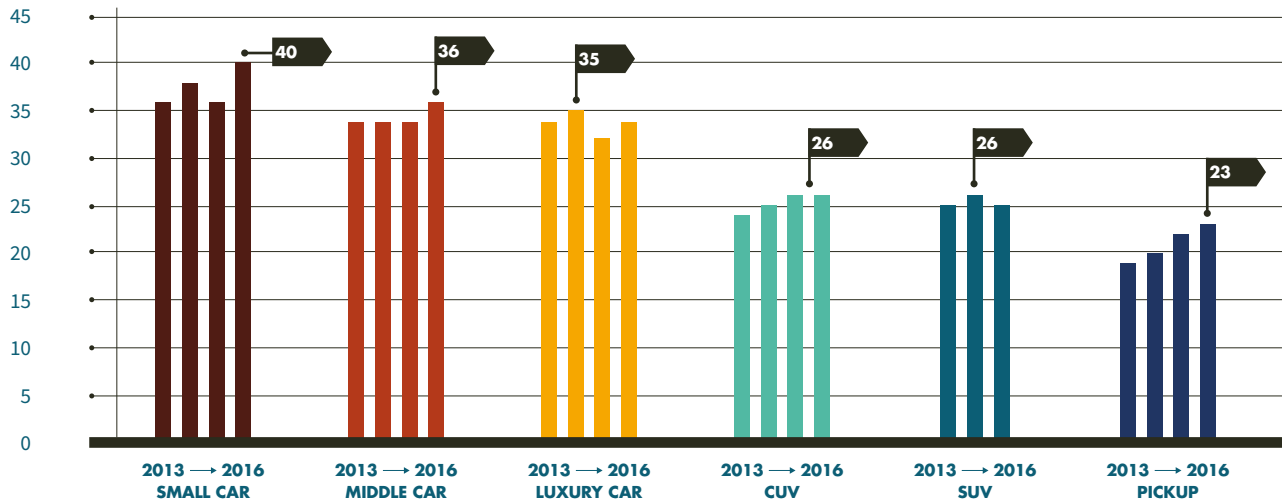


Source: WardsAuto

One of the strongest marketing angles available to promote alternative powertrain vehicles is improved fuel efficiency. And indeed, fuel efficiency for each alternative powertrain vehicle exceeds that for traditional gasoline internal combustion engines. The relative fuel efficiency of the four most plentiful alternative powertrain vehicles is presented in Figures 30-33 (For a reference, the average MPG by class for gasoline vehicles is presented in Figure 16):

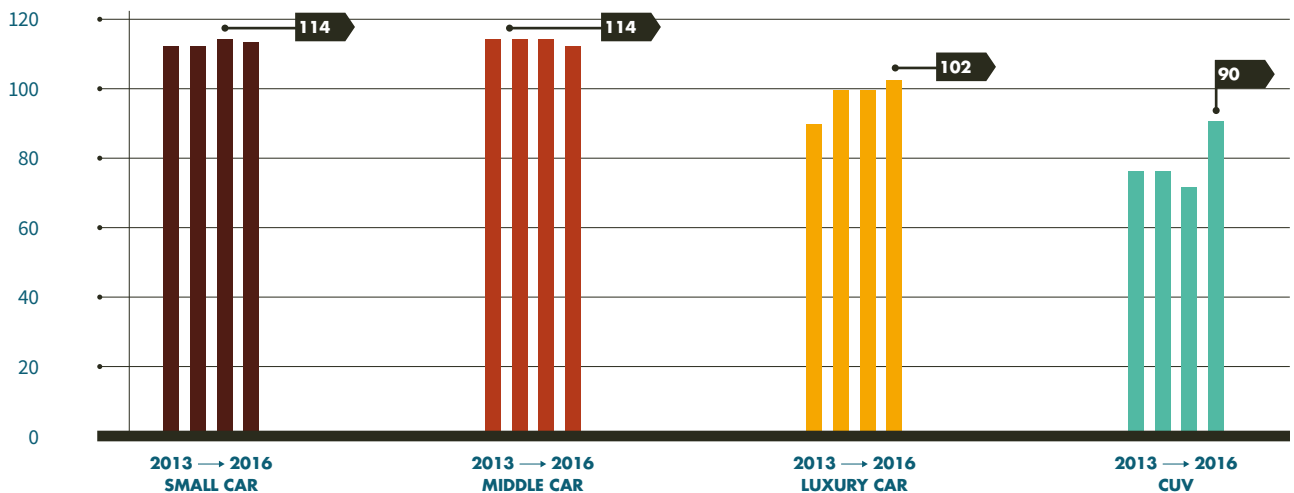
FUEL EFFICIENCY FOR EACH ALTERNATIVE POWERTRAIN VEHICLE EXCEEDS THAT FOR TRADITIONAL GASOLINE INTERNAL COMBUSTION ENGINES

FIGURE 30: AVERAGE MILES PER GALLON BY CLASS, DIESEL FUEL



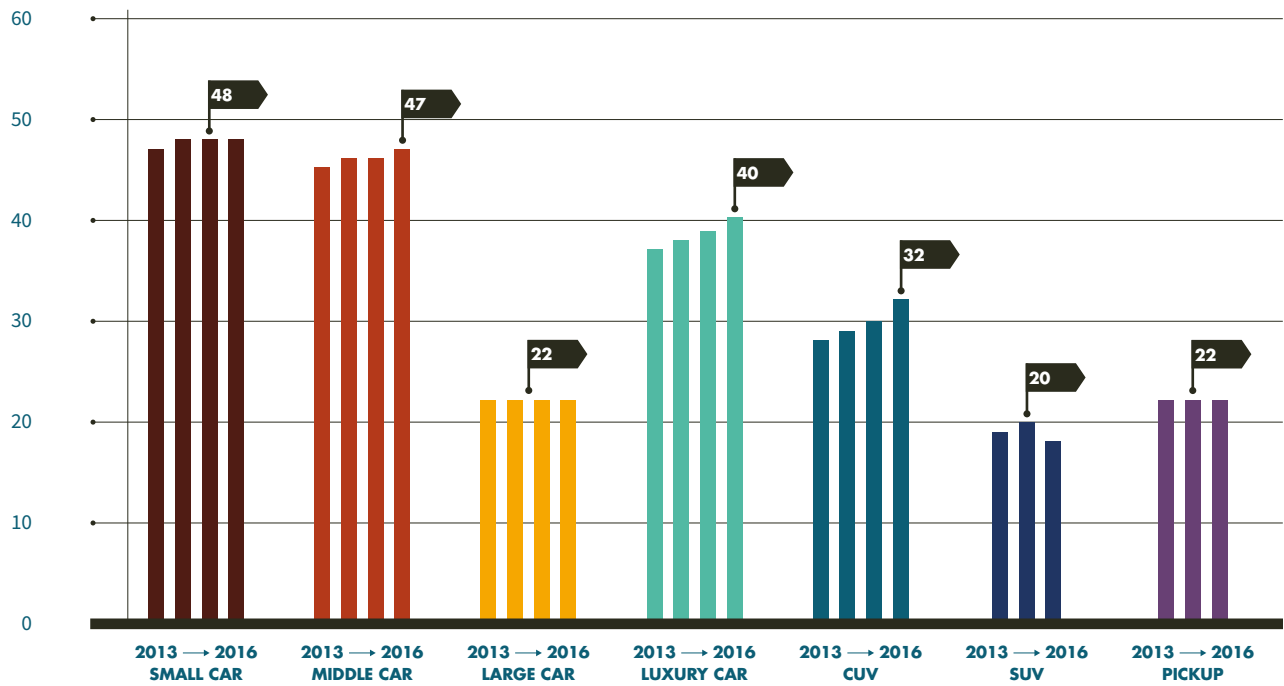
Source: Fueleconomy.gov; WardsAuto

FIGURE 31: AVERAGE GGE^s MILES PER GALLON BY CLASS, ELECTRIC



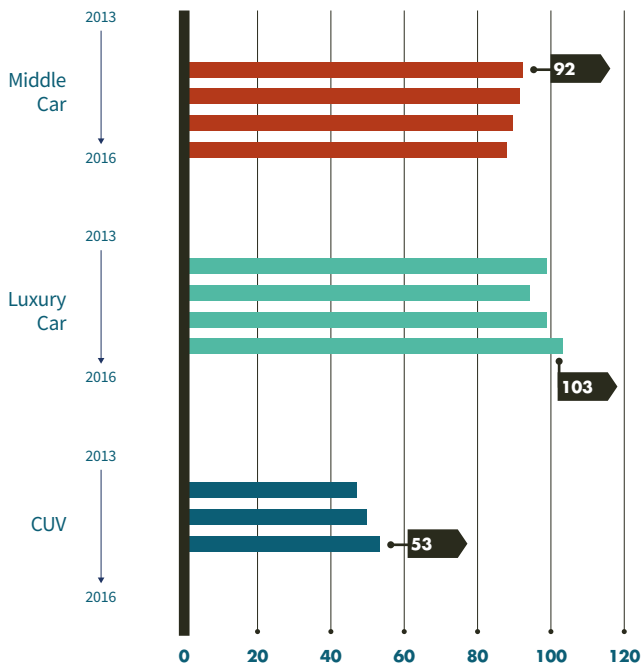
Source: Fueleconomy.gov; WardsAuto

FIGURE 32: AVERAGE MILES PER GALLON BY CLASS, HYBRID



Source: Fueleconomy.gov; WardsAuto

FIGURE 33: AVERAGE GGE MILES PER GALLON BY CLASS, PHEV



Source: Fueleconomy.gov; WardsAuto

Despite these fuel efficiency advantages, and the increasing number of models offered for sale, sales for none of these vehicles have ever surpassed 4% market share. And perhaps one reason might be their purchase cost relative to the gasoline-powered competitors.

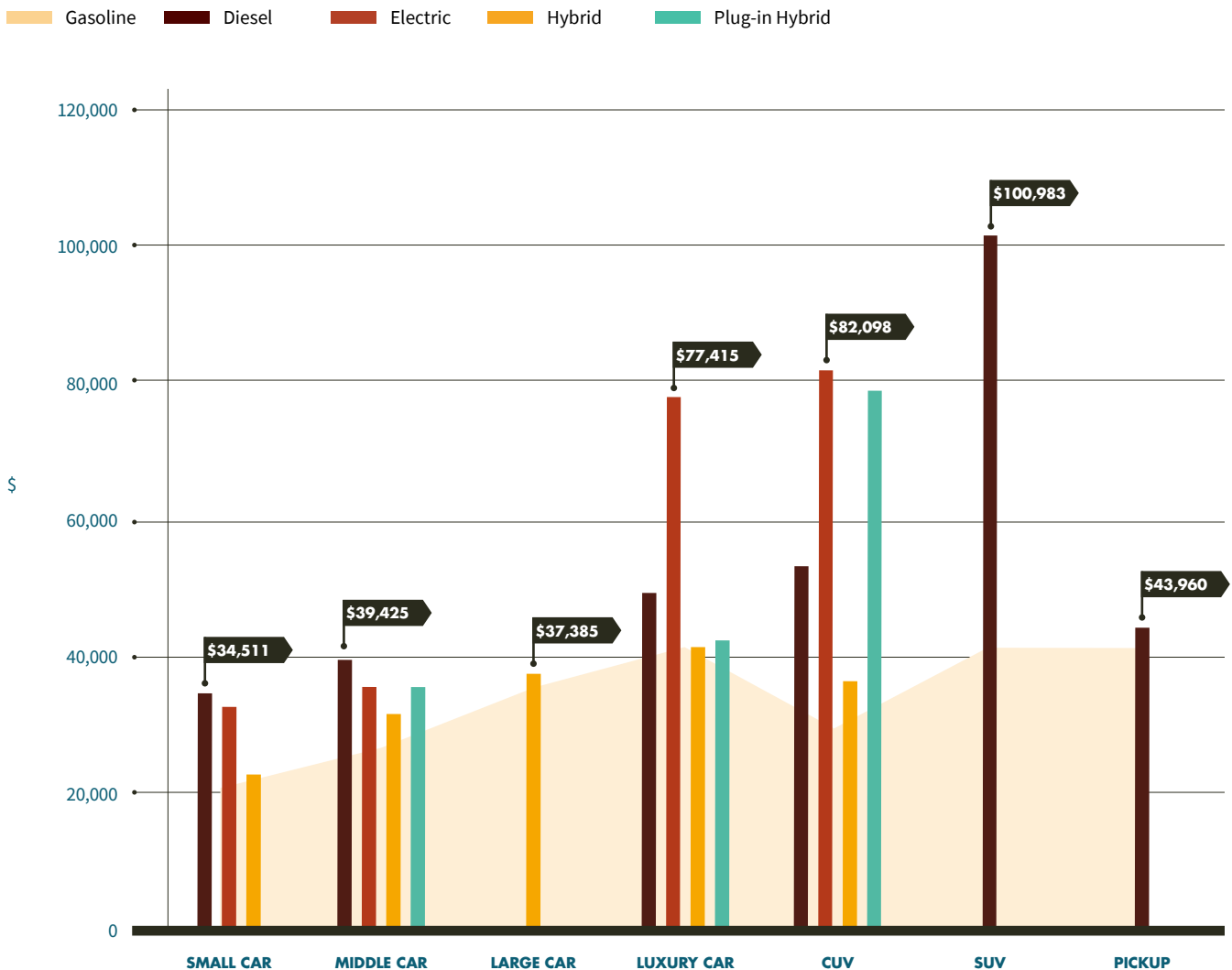
Alternative powertrains are commonly more expensive than their gasoline counterparts. To explore the cost of purchasing these powertrains, Figure 34 presents the weighted average MSRP per their sales in 2016. (Note: With regard to diesel vehicles, another factor affecting sales is that they are predominantly offered in the pickup truck vehicle class. Pickup trucks compete for a different customer than do passenger cars, which adds another level of complexity to analysis of that market.)

In the end, if consumers are to be believed, then these price differences are significant enough to sway consumers to purchase a gasoline vehicle over an alternative powertrain vehicle. The recent low price of gasoline makes the internal combustion engine market the most desirable due to the sheer number of options available and the difficulty for the consumer to justify the purchase price premium based upon a return on investment through fuel efficiency.

THE RECENT LOW PRICE OF GASOLINE MAKES THE INTERNAL COMBUSTION ENGINE MARKET THE MOST DESIRABLE

Without a dramatic change in government incentives or regulations, the retail price of gasoline or the price to purchase alternative powertrain vehicles, alternative powertrain vehicles are unlikely to overtake their gasoline counterparts in the near future.

FIGURE 34: MSRP BY POWERTRAIN, 2016



Source: newcartestdrive.com; Edmunds.com; WardsAuto



Conclusion

The light duty vehicle market is complex and dynamic, as are the factors that influence a consumer's decision to purchase one vehicle over another. Common considerations such as utility, safety, cost, fuel efficiency, desired comfort features, reputation, etc., are not weighed evenly by all consumers and, consequently, their influence varies greatly. Assuming one feature is more influential than others is impossible to prove, especially when considering the market as a whole.

Too often, however, some seek to simplify their analysis of the market by focusing on one factor. This type of analysis can lead to very misleading conclusions. For example, many have suggested that retail fuel prices drive consumer vehicle purchase decisions. But the relationship between fuel prices and vehicle purchases is not that simple – there are too many factors that contribute to a consumer's purchase decision and to suggest that consumers can be swayed by this one, volatile factor is overly simplistic.

This report's analysis of 15 years of vehicle sales data and 13 years of retail fuel prices yields the following observations about the market:

- Only one class of vehicle has gained any significant market share since 2003 –cross utility vehicles (CUVs). This growth came at the same time that nearly all other classes lost market share (except small cars, which gained 1%), with mid-sized cars and sport utility vehicles (SUVs) losing the most.
- While fuel efficiency remains a top concern for consumers, surveys indicate its level of importance has declined significantly since 2014. Concurrently, consumers have experienced a period of sustained lower fuel prices and have benefited from fuel efficiency improvements across all classes of vehicles.
- The theory that Americans are addicted to trucks is misleading. The number one class of vehicle sold in the U.S. is the CUV, which are often technically classified as light trucks but are built on a frame similar to a car and boast many of the economic advantages of a car. Meanwhile, pickup trucks have lost market share over the years and SUVs have seen their market share cut in half.
- Retail fuel prices have less of an effect on consumer's decisions concerning what class of vehicle to purchase than many media reports have suggested. While there is a correlation between fuel prices and consumer interest in alternative fuel vehicles, a correlation between fuel prices and the class of vehicles consumers purchase is far less apparent.
- Alternative fuel vehicles capitalize on consumer interest in fuel efficiency, but typically fail to deliver on consumer concerns about cost of purchase and have to date failed to capture significant market share of vehicles sold.



Sources

1. NACS Consumer Fuels Report, www.convenience.org
2. For a description of vehicle classes used in the report, see Appendix A.
3. The National Bureau of Economic Research defines the Great Recession as beginning in December 2007 and ending in June 2009. For purposes of this analysis, we will use 2008 as the mid-point for defining the period before and after the Great Recession, excluding that year from both periods.
4. Data prior to 2011 lacked sufficient data to include in this analysis. In calculating the number of models sold each year, the Fuels Institute included all models that recorded at least one unit sold in a calendar year, ignored variations in powertrains within a model – gasoline, hybrid and diesel variants resulted in just one model within that class - and did not include medium-duty or chassis trucks in the count of available pickup trucks.
5. Consumers in this referenced Fuels Institute survey were able to select their preference from a finite set of options. Surveys by other organizations have evaluated consumer preferences among more than 20 different vehicle attributes and found that fuel efficiency ranked much lower in the list of influential vehicle attributes. <https://autoalliance.org/energy-environment/consumers-and-auto-sales/>
6. Code of Federal Regulations - Title 40 Protection of the Environment, Chapter 1 Subchapter C – Air Programs, Part 86 – Control of Emissions from New and In-use Highway Vehicles and Engines, Section 86.082-2 Definitions.
7. This chart presents WardsAuto data of total models with a particular powertrain that sold at least one unit in a given year, excluding duplicate models available in the same year.
8. To compare fuel efficiency of vehicles equipped with electric powertrains to those powered by gasoline, the figure used is “Gasoline Gallon Equivalent,” or GGE. This is calculated as kWh = 0.031 gasoline gallons. <https://epact.energy.gov/fuel-conversion-factors>

Appendix

Description of Vehicle Classes Presented in Charts of WardsAuto Data

EXAMPLE OF MODELS WITHIN THIS CLASS	OTHER CHARACTERISTICS
<p>SMALL CAR Toyota Corolla, Honda Civic, Nissan Sentra</p>	<ul style="list-style-type: none"> • 4- or 5-door the dominant body style • Predominately 2-door, 4-passenger or 2+2 seating
<p>MIDDLE CAR Toyota Camry, Honda Accord, Nissan Altima</p>	<ul style="list-style-type: none"> • 4- or 5-door the dominant body style • 2-door, 4-passenger or 2+2 seating
<p>LARGE CAR (Chevrolet Impala, Dodge Charger, Chrysler 300)</p>	<ul style="list-style-type: none"> • Large sedans that are higher in price, or have overall dimensions bigger than typical Upper Middle vehicle
<p>LUXURY CAR BMW 3 Series, Mercedes-Benz C Class, Nissan Maxima</p>	<ul style="list-style-type: none"> • 4- or 5-door the dominant body style • 2-door, 4-passenger or 2+2 seating • 2-passenger or 2+2 seating with performance a dominant characteristic
<p>CROSS UTILITY VEHICLE Honda CR-V, Ford Escape, Chevrolet Equinox</p>	<ul style="list-style-type: none"> • Typically wagon body style with unibody construction, front- or all-wheel-drive and passenger vehicle qualities the dominant characteristic with limited off-road capability.
<p>SPORT UTILITY VEHICLE Ford Explorer, Jeep Grand Cherokee, Toyota 4Runner</p>	<ul style="list-style-type: none"> • Off-road capabilities a strong characteristic, body-on-frame or unibody construction, offering standard or optional low-speed transfer case gearing or all-terrain management system and minimum 7.5-in. (91-mm) ground clearance.
<p>VAN Toyota Sienna, Dodge Caravan, Honda Odyssey</p>	
<p>PICKUP Ford F150, Chevrolet Silverado, Ram Pickup</p>	<ul style="list-style-type: none"> • Heavy duty features • Cargo space

About the Fuels Institute

The Fuels Institute, founded by NACS in 2013, is a 501(c)(4) non-profit research-oriented think tank dedicated to evaluating the market issues related to vehicles and the fuels that power them. By bringing together diverse stakeholders of the transportation and fuels markets, the Institute helps to identify opportunities and challenges associated with new technologies and to facilitate industry coordination to help ensure that consumers derive the greatest benefit.

The Fuels Institute commissions and publishes comprehensive, fact-based research projects that address the interests of the affected stakeholders.

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For more about the Fuels Institute, visit fuelsinstitute.org

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The Fuels Institute was founded in 2013 by NACS, the international association that advances convenience and fuel retailing. Through recurring financial contributions and daily operational support, NACS helps the Fuels Institute to invest in and carry out its work to foster collaboration among the various stakeholders with interests in the transportation energy market and to promote a comprehensive and objective evaluation of issues affecting that market and its customers both today and in the future. NACS was founded August 14, 1961, as the National Association of Convenience Stores, and represents more than 2,100 retail and 1,600 supplier company members.

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FUELS INSTITUTE STAFF

JOHN EICHBERGER
 Executive Director
jeichberger@fuelsinstitute.org

AMANDA APPELBAUM
 Director, Research
aappelbaum@fuelsinstitute.org

DONOVAN WOODS
 Director, Operations
dwoods@fuelsinstitute.org

Fuels Institute

OBJECTIVE • COLLABORATIVE • RESEARCH

(703) 518-7970
FUELSINSTITUTE.ORG
@FUELSINSTITUTE

1600 DUKE STREET
SUITE 700
ALEXANDRIA, VA 22314