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Hybrid & Electric Vehicles

In the last two decades, the automobile industry in the United States has seen a major shift in the types of vehicles that are sold. Just twenty years ago, it would have been almost unheard of to be able to purchase a car that gets fifty miles per gallon, or a car that is fully electric and sold on the mass market. However, today, hybrid and electric vehicles are produced by nearly every major automaker and they can be found all around the country. The growing awareness about climate change and global warming has encouraged many people to do their part in attempting to lower the amount of greenhouse gases that are released into the atmosphere and their individual carbon footprint as well. As a result, many people have at least considered buying a hybrid or an electric vehicle. Industry experts and scientists alike tout these cars as having numerous environmental benefits, and many have similar performance and features when compared to standard gasoline cars. However, despite these benefits, many hybrid and electric cars have had very poor sales and many have failed to meet industry hopes. The main detractor in purchasing a hybrid/electric vehicle is the cost. Because of the advanced technologies that they employ, many hybrid and electric vehicles cost thousands of dollars more than their standard gasoline counterparts. This price markup dissuades many buyers and is one of the main reasons for the poor sales of these vehicles. At current gas prices, many

hybrid and electric vehicles will not save their owners any money for many years and some owners may never recover the added cost they paid for a hybrid, which makes the decision even tougher. Factoring in the current cost of gas as well as the state of the economy, and viewing the issue from a purely financial standpoint, buying a hybrid/electric vehicle does not make sense for most Americans due to the increased cost of the vehicles, coupled with the long time it takes to save money.

The first hybrid vehicle to hit the mass-market was the Honda Insight. In 1999, the Japanese automaker introduced the Insight to American buyers and people were amazed at its high MPG ratings as well as its features. Two years later, the Toyota Prius, which was first sold in the USA in 2001, offered American drivers high fuel efficiency as well as the standard features of a gasoline car. The Prius has gone on to become the highest selling hybrid/electric vehicle in the world and since 1997 the Prius has sold hundreds of thousands of units. As of 2012 there are now many different Prius models that are produced, including one that is completely electric. The advent of hybrid and electric vehicles was not random at all. Automakers had been working on this technology for quite some time, and production was fueled by increasing pressure from American citizens who yearned for a way to show their environmental consciousness. Most hybrid vehicles today are either series hybrids or parallel hybrids (Hybrid). In series hybrid cars the electric engine powers the car and the internal combustion engine is used to recharge the electric engine; in parallel hybrids both engines can be used together for optimal performance (Hybrid). Additionally, with plug-in hybrid vehicles or electric vehicles, there is no longer a need for a gasoline powered engine and this can further lower greenhouse gas emissions. However, this advanced technology and the materials

used to build these cars has caused hybrid and electric vehicles to cost substantially more than standard cars, and this is the primary driving factor in the reduced sales for hybrid/electric vehicles.

America was long known as the land of Cadillac Escalades and Hummer's, and hybrid and electric vehicles were seen as gamble in an American marketplace that favored large showy cars and SUVs. Initially, many skeptics of these hybrid and electric vehicles believed that these vehicles would allow automakers to sell more gas-guzzling vehicles, and as a result, would not help lead America towards environmental independence. A 2006 article in the *New York Times* titled "Buy a Hybrid, and Save a Guzzler" described a sentiment common half a decade ago that hybrid vehicles would do more harm than good. The article describes how the Environmental Protection Agency sets average MPG ratings that automakers have to meet. According to the article, hybrid vehicles were often given higher MPG ratings than they actually attain, however, this inflates the average MPG of a certain automaker and thus allows it to sell more of the very low MPG gas guzzlers (Leonhardt). According to the article, " in the government's road tests, which are conducted in a world without much traffic or any air-conditioning, the Prius gets 55 miles to the gallon. Consumer Reports says the car really goes 44 miles on a gallon of gas" (Leonhardt). However, this article was written in 2006 and since then dozens of new hybrids have been released onto the marketplace to rival the popular Toyota Prius, and MPG ratings has become more accurate. Today, hybrid cars use much more sophisticated technology and have accurate and improved MPG technologies.

Hybrid cars rely often on only an electric motor, with the gasoline engine being used to recharge the electric motor or as a backup in case of emergencies. In plug-in

electric vehicles, the car can function solely on an electric charge. Both hybrid and electric vehicles emit much less carbon dioxide and other toxins into the environment and both are very good for the environment. However, there is some difference in the effectiveness of hybrid and electric vehicles. In areas where the majority of the electricity is derived from coal-powered plants, hybrid vehicles will emit less greenhouse gas than electric vehicles because electric vehicles are indirectly using coal, which releases greenhouse gases (Hirsch). However, in regions such as Southern California where lots of the energy that is produced is from renewable sources and natural gas, electric vehicles are far better for the environment than hybrid vehicles are (Hirsch). However, regardless, both choices are strong steps in the right direction in terms of environmental consciousness and responsibility. Many industry experts predict that, assuming twenty pounds of carbon dioxide per gallon of gas, a sample hybrid vehicle using 38.7 MPG, compared to a regular car with 26.7 MPG, will save roughly 51.6 pounds of carbon dioxide for every 100 miles driven (Roos). Furthermore, electric vehicles, or plug-in hybrids, can have an even greater positive effect on the environment, assuming that the electricity is generated in a clean, renewable way rather than from a coal-powered plan (Roos). It is no surprise the hybrid and electric vehicles emit far fewer pounds of carbon dioxide and other greenhouse gases, however, what is preventing many Americans from buying these cars is the price.

While many Americans care about the environment and want to show that they are environmentally conscious, they often do not have the money to pay the large added upfront cost of a hybrid/electric vehicle. While overtime people may regain this added cost through savings, people looking for a cheap car or who are living paycheck-to-

paycheck often cannot wait ten years to simply regain their money. Take, for example, the Chevrolet Volt. The Chevy Volt, which is an all-electric vehicle and the pride of the future for the American automaker Chevrolet, can cost upwards of $40,000. According the Nick Bunkley of the New York Times, the Volt can take up to 27 years at most to payoff compared to the similarly featured Chevrolet Cruze (Bunkley). While this is certainly an outlier, it is clearly unreasonable to assume that a person will own a car for 27 years, and fifteen years is usually seen a reasonable maximum. Therefore buying a Chevrolet Volt from a fiscal standpoint does not make sense at all. A buyer who purchases the Chevy Volt will have to do so for environmental reasons because it is unreasonable to assume that a person will regain the added money they spent. Because the Chevy Cruze, which is a standard gas car, is so similar to the Volt in features, with the exception of the all-electric motor, it is no surprise that the Volt's sales are incredibly low while the Cruze is a successfully selling car. If Americans want a midsize, affordable sedan from Chevrolet and they are middle class then they will have choose the Chevy Cruze over the Chevy Volt, despite the Volt's environmental benefits. Even the U.S. Government's $7500 dollar subsidy on the Chevy Volt does not do much to help (Bunkley). As a result of these poor sales, Chevrolet had chosen to temporarily stop production of the Chevy Volt for a short period (Bunkley). This shows that while automakers are open to producing cars that are good for the environment, the steep cost is dissuading most buyers and as a result production will stop on the worst selling models. While the Chevy volt does have some sales, in order for electric cars to make a sizeable reduction in the carbon footprint they have to be bought by a lot more people and for this to happen the price has to be a lot lower. While not all hybrid and electric cars are like

this, many automakers have continued to struggle to find a balance between putting their profits and revenue as their number one priority and producing an electric car that is good for the environment but bad for sales.

Another example of the large price difference in hybrid/electric vehicles is the Nissan Leaf. The Leaf is the first electric car from Nissan and while it is much less expensive than the Chevy Volt, it still charges a substantial markup. The Leaf costs around $37,000 dollars, however, it's only around $30,000 when you take into account the $7500 dollar government rebate. However, even at thirty thousand dollars, the leaf costs approximately ten thousand dollars more than the comparable Nissan Versa, and would take owners nearly a decade to pay off (Bunkley). The Leaf and the Chevy Volt are not alone in having long payback times, count the Ford Fusion hybrid and others as well among the ranks. Only three hybrid vehicles, the Volkswagen Jetta TDI, the Toyota Prius and the Lincoln MKZ hybrids, will have payoff times less than two years at $4 per gallon gas prices (Batiwalla). However, these estimates are calculated on $4 per gallon gas prices and are highly variable. If gas prices raise to $5 or $6 per gallon, many hybrid car owner will be able to earn back the added cost within five years, making it a much more reasonable purchase for a frugal buyer. The qualm that many buyers have is that it is hard to predict where gas prices will be in five to ten years. Conceivably, gas prices could steadily rise if consumer demand stays steady or grows, or if wars of conflicts reduce American petroleum imports. However, gas prices could also remain steady or fall depending on supply amounts and whether America chooses to drill for oil at home.

As demonstrated, even a one-dollar increase in gas prices can drastically alter the time it takes to pay back the added cost of a hybrid or electric vehicle. If the petroleum

prices in America were to be six dollars per gallon hybrid cars would end up being akin to free money for their owners after two years and people would start saving a lot of money. However, if gas prices fall to three dollars a gallon many people will have given away their cars before they will have fully recovered the cost of the electric Chevy Volt or Nissan Leaf. An article in *Bloomberg Businessweek* demonstrates the profound impact that rising gas prices will have on the hybrid/electric car industry. According to the article "Electric-drive vehicles, including hybrids, plug-in models and pure battery-powered cars, were the fastest-growing segment in the U.S. auto market in the first quarter, according to data compiled by Bloomberg. Sales of those models rose 49 percent to 117,182 vehicles in the first quarter, from 78,527 a year earlier" (Naughton). Despite this surge in sales, electric-drive vehicles still hold a miniscule percentage of all US automobile sales and many people wonder whether they have a doomed future or not. Some critics claim that electric vehicles are already doomed and that they will forever be too expensive and funky to catch on in the mainstream market whereas other say that by the end of this decade electric-drive vehicles could hold nearly ten-percent of the total market share (Naughton). The Chief Executive Officer of Nissan Motors, Carlos Ghosn, remains optimistic that one in ten cars will by electric/hybrid by 2020 however, LMC Automotive, a leading producer of automobile forecasts and market predictions says that a more realistic number for hybrid/electric vehicles is 2% market share by 2020, not 10% (Naughton). Ghosn, CEO of Nissan, states, "There are a lot of concerns today that the electric car is going to solve…People don't want to have to go to the gasoline station. They just want to fill their tank at home. They want to make sure they're not paying too much money for their gasoline bill every month." However, Mike Omotoso, a senior

manager at LMC states that the 10% market share forecast is, "way too optimistic…Ten percent share for hybrids is achievable, but not for EVs. They will still be too expensive to become a mass-market product within the next 10 years" (Naughton). What these quotes demonstrate is the varying degrees of confidence that different industry experts have in the future of electric vehicles. They are clearly taking a gamble and risking low sales however the success of these electric vehicles in the long term will be directly a result of what percentage of the total car market share they hold.

Whether or not hybrid/electric vehicles will be able to capture the market share that different experts are hoping for is directly dependent on the state of the American economy and the state of the American consumer. Regardless of how long or short it will take to earn back the added cost of a hybrid, people still have to have enough money to pay the added cost upfront. If a person is living paycheck-to-paycheck and does not have a lot of money, then he/she cannot spend the extra ten thousand dollars to buy a hybrid even if he/she will earn back the difference within five to ten years. According to Reuters, electric vehicles control only a 0.1% market share and it's dicey as to whether it can increase a substantial amount in the next decade (Klayman). One of the driving factors behind people purchasing electric vehicles is the $7500 dollars subsidy provided by the US Government on these purchases. Without this sum of money, electric cars such as the Chevy Volt and the Nissan Leaf would be even further out of reach for American consumers. With Chevy already having temporarily stopped production on its Volt due to lagging sales and other factors, the $7500 dollars government subsidy is clearly a necessity for the electric car business to stay afloat. However, according to the Reuters article, this November 2012 election could determine the state of the $7500

dollar rebate because differing politicians view its effectiveness differently (Klayman). The Obama Administration is has "been a strong proponent of electric vehicles like the Volt and set a goal of getting 1 million battery-powered vehicles on the road by 2015. Lux Research estimates that number will actually be fewer than 200,000" (Klayman). The debate amongst politicians is how to best convince the American people that electric vehicles are the best economic option because it is clear that sales have not met industry expectations. After this November's election it seems likely that the $7500 rebate on electric vehicles will either be maintained, dropped completely, or even raised up to $10,000 (Klayman). Whatever the rebate is, there must be a collective effort on the part of the government and the automakers to produce environmentally friendly vehicles at a reasonable cost so that electric vehicles can grow from a 0.1% market share to a 5% or even 10% market share in the next ten to twenty years.

Costs aside, many people see hybrid and electric vehicles as the face of the future. Furthermore, electric vehicles can completely eliminate the need for gasoline in automobiles if they can produce a reliable and long-lasting travel time based on an effective single charge. However, there are still many problems to be smoothed out, especially with electric cars. The issue is caused by core debate over whether gasoline or gasoline hybrid vehicles can provide the future of automation and whether electric car production should be stopped. Many automakers are working towards hybrid vehicles that can reach up to sixty MPG and while these still rely partially on a gasoline engine, they have many pros against electric vehicles. As stated earlier, electric vehicles, which have the potential to eliminate the need for gasoline, still can cause a lot of greenhouse gas emissions, even more than an average hybrid (Hirsch). This has to do with how the

electricity is being produced. In many areas of the country the electricity is still produced in coal-powered plants, which would indirectly cause electric vehicles to be worse culprits of global warming than hybrid vehicles are (Hirsch). Consumers should be mindful to take in the location where they will live when considering whether to buy a hybrid or an electric vehicle. Another reason that hybrid vehicles may be more popular than electric vehicles in the future is ease of convenience. For people going on road trips and such they will need to stop each night or every few hours to charge their electric cars. These types of facilities don't exist in most places right now and it becomes a large hassle to own an electric vehicle sometimes. While many more charging stations will be built if more people by electric cars, people are weary of buying electric cars until more charging stations are built (Aston). If hybrid cars can continue to be even more fuel-efficient these types of dilemmas can be avoided because, although hybrid cars will need to go to gas stations less frequently, gas stations already exist in adequate numbers. Electric vehicles are still very rare, just 17,000 Chevy Volt and Nissan Leaf cars have been sold and this is partially because potential owners fear range and infrastructure issues (Aston). Furthermore, electric vehicles cost a lot more to produce than hybrid vehicles because of the new technology and this represents an economy of scale scenario. This production costs for electric vehicles will be able to decrease if more people by them however that is not happening right now. For these reasons alone, as of now, a future with more efficient hybrid vehicles may make more sense than one with electric vehicles.

Buying a hybrid vehicle is certainly a risk for some people in this economy due to the large up-front costs and the long amount of time taken to earn back the difference. As a result of this, many owners of hybrid vehicles often express discontent with their

purchase of a hybrid vehicle. Gas prices in the United States still remain lower than in many European nations, and as such buying a hybrid vehicle here is not as good as a financial investment as it may be in other countries, assuming the car costs the same amount. R.L. Polk, which is a company that conducts statistical automobile research, conducted research on the percentage of hybrid vehicle owners who purchased another hybrid when looking to buy a car in 2011. The results were very surprising. The study showed that " only 35-percent of hybrid owners purchased another gas-electric vehicle when trading in during 2011. Repurchase rates vary across hybrid models, with the highest percentage of hybrid loyalty going to the Toyota Prius. Removing that car from the model shows a repurchase rate under 25-percent" (Johnson). This study is very significant because it shows an obvious dissatisfaction in hybrid car owners. If hybrid car owners were truly very satisfied with their hybrids then the percentage of hybrid owners buying another hybrid when looking for a car would be probably upwards of eighty percent. However, there must be some variables that cause this low repurchase rate. If only around one-third of hybrid car owners are satisfied with their hybrid cars it could be due to economic factors. While the article does not provide any reasons in to why the repurchase rate is so low, based on my inference, it can be attributed to the price of hybrid vehicles and the state of the economy. In 2011, the US Economy was still pretty bad and as a result many Americans were having financial struggles. Even those people that could afford the premium price for hybrids in the past may not have the financial means or desire to spend on a hybrid car again. The fact that nearly two-thirds of hybrid users would not by another may also be linked to the long payback time in the added cost. Many of the hybrid car owners may have seen that they are just starting to

save money on the hybrid by the time it is time to sell their car, because sometimes it takes a decade to earn back the difference in price. Many of these buyers may not be willing to make the same investment again, knowing that they wont reap benefits on their investment in a hybrid car for up to a decade. In addition, older buyers may not feel like they have a decade to wait for fiscal savings when there are gas-only cars that are a lot cheaper and are still getting decent gas mileage. Whatever the reason, it is clear that, with the exception of the Toyota Prius, many owners of hybrid cars would not make the same purchase again.

Despite all the financial pros and cons of purchasing a hybrid vehicle, there is one hybrid car that remains very successful and serves as a symbol for what the future may hold and that car is the Toyota Prius. The Toyota Prius is the highest selling hybrid car in America and this year already it is ahead of pace on meeting Toyota's goal of selling 220,000 units in the United States (Ohnsman). Bob Carter, who is the Vice President of Sales in the United States for Toyota says that he has "rdered additional production. I'm confident we'll get additional production, but globally we're seeing high demand, particularly in Japan" (Ohnsman). Sales of the Toyota Prius have raised 56% this year from last year and represent 55% of all the hybrid cars sold in America (Ohnsman). The success of the Prius is an example of both financial responsibility and legacy and it sets and example for the future of car ownership. Unlike other hybrid or electric vehicles, which can cost nearly $40,000, the smaller version of the Prius, the Prius C, costs around $19,000 dollars MSRP and still gets great gas mileage. This allows owners to feel confident that they are making a positive contribution to decreasing carbon emission and they are also making a financially sensible choice. The owners of the Prius C and even

the regular Prius will see monetary savings well within the lifespan of owning the car and will also be helping the environment. Additionally, the Toyota Prius is the second oldest hybrid on the US market and over time it has garned a positive reputation and legacy. If other hybrid vehicles can offer low prices similar to the Prius or Prius C then over time hybrid car sales should continue to increase.

The hybrid and electric car market is still evolving. Over the past few years alone there have been many new hybrid and electric vehicles released, and the technology is increasing at a rapid rate. Many American industry experts note that the change will be slow and it will take time for America as a whole to shift to cars based on electric or hybrid-electric engines and many factors will effect when this happens. One of the main factors, especially in this economy, is price. As the technology is still developing and many automakers like Ford, Tesla, and Nissan are beginning to produce electric vehicles the cars will naturally be expensive. Hybrid vehicles as well are still expensive compared to standard cars, however, how long it takes for owners to reap savings is variable based on the model. With that said however, with current fuel prices and hybrid and electric car costs, it does not make financial sense for people to buy these vehicles right now. Many of the hybrid and electric vehicles can take up to a decade to start giving their owners savings. Additionally, many electric car owners are skeptical of the lack of mileage and infrastructure. Whereas it may not make financial sense for people to by hybrid/electric vehicles at current prices, this does not mean that the industry should stop producing these vehicles. They are still the step in the right direction for leading America down the path of reducing its carbon footprint and in the future when the costs of hybrid/electric vehicles are decreased many more Americans will be able to purchase them.

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