

## Vehicle purchase decision

For most households, purchasing a vehicle is the second largest purchase they make in their lifetime, after buying a house. Modern cars easily last more than 200,000 miles or 300,000 kilometers. With an average annual mileage of about 20,000 kms this means that a typical car last 15 to 20 years. Any brand new car that is sold with a fossil fuel driven engine today, is bought with the implicit understanding that the *customer can count on being supplied with fossil fuel for at least the next decade*. Let us therefore have a look at what drives the vehicle purchase decision of consumers and how policy makers can intervene in this.

Although *vehicle purchase motivations* vary from country to country, the main motivation for buying a new car, or a used car, is to fulfil the travel needs of the household. The purchase decision may also be driven by new needs, such as the need for a bigger car after a family expansion, or by new technology on the market, which may bring better fuel efficiency or new features to be enjoyed by the car owner. Such reasons also play a role, but they are far less important than the basic travel need to be fulfilled.

This insight is highly relevant from the perspective of the policy maker, as the

## Ways to fulfil travel needs

personal vehicle is *not the only option to fulfil travel needs*. Investments in good, safe and reliable public transport, such as buses, trains, light rail and subway systems may for many commuters eliminate the need for car ownership. This is much more sustainable from an environmental and mobility perspective than



trying to persuade them into buying an electric vehicle. However, rather than discouraging car ownership, many municipal governments *have for decades been accommodating car ownership* in densely populated areas. They have chopped trees to make new roads and to make existing roads wider, with utter disregard for the comfort and safety of pedestrians. Encouraging citizens to abstain from buying cars, thus involves dedicated infrastructure planning to provide safe, reliable and comfortable alternatives, for public transport as well as for walking and cycling.

## Electric car sharing

A good addition to public transport is *vehicle sharing*. Shared vehicles are especially popular with the younger urban population. Members of car sharing schemes are known to *refrain* from purchasing an individual vehicle. Car sharing thus reduces the number of cars on the street, whether driving or parked. More and more often, we see electric cars being used in sharing schemes. As they are mainly used for short trips, the driving range is not perceived as a problem. Do keep in mind, however, that rural and urban areas have different needs. As a consequence of the general trend of people flowing from the countryside to the city, the density of services in rural areas has *dramatically decreased* in many countries. People have to cover larger distances to reach schools, hospitals, banks, shops, and so forth. At the same time, public transport is often not very economical in rural areas, leading to a low frequency of service. Hence it is no surprise, that personal vehicle ownership is the preferred alternative for most people in rural areas, if they can afford it.



## The purchase decision

So let us assume, that as a policy maker you have exploited your options to promote public and shared transport. Still a significant part of the population is inclined to buying a vehicle for personal use. What are the main factors that drive the *purchase decision*?

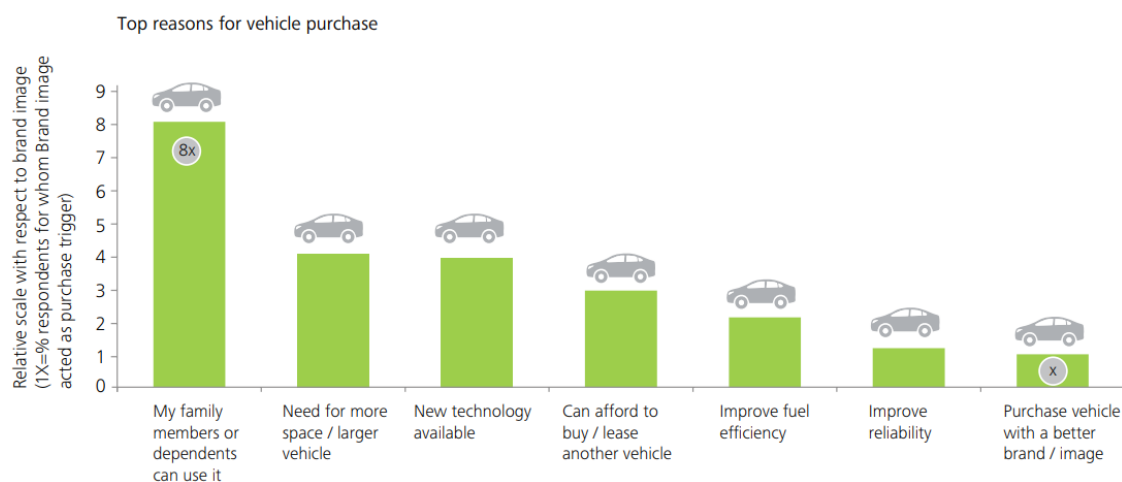


Figure: Top reasons for vehicle purchase. Source: Deloitte (2014) *Driving through the consumer's mind: Steps in the buying process*.

The main driver behind vehicle choice is the cost. Most of us have a limited budget for buying a vehicle. Cars are a substantial purchase and the price we can afford is limited by the household income. In this respect, electric vehicles come at a major disadvantage, as the high battery costs make the upfront investment for an electric vehicle much higher than for a conventional car with an internal combustion engine. The high upfront investment cost of an electric vehicle is compensated by much lower variable costs for fuel and maintenance, but interestingly, car buyers



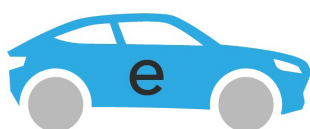
*do not truly value* the savings on variable costs. They tend to value these up to *three times lower* than the actual economic value of these savings. As a policy maker you see a point here where you may successfully influence the car buyer's decision. You may decide to reduce the purchase costs, for example by offering subsidies or tax exemptions, or you could consider investing into battery research and development, in order to structurally reduce battery costs in the longer term.

## Battery swapping

Given the substantial share of battery costs in the costs of an electric vehicle, there is an alternative approach offered by Better Place, a company founded in 2007. The idea of Better Place was that customers would buy an electric vehicle without buying the battery. Instead, they would purchase driving distance by subscribing to an electric fuel contract with Better Place, covering battery use, daily charging and battery swaps, in turn for monthly payments, based on a per-distance fee.



Figure: Battery swapping station from Better Place



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Better Place developed this concept, including dedicated battery swapping infrastructure and a charging infrastructure network. The latter was based on a smart grid software platform, designed to enable economical recharging of hundreds of thousands of battery packs simultaneously by shifting recharging to off-peak demand hours. Unfortunately, Better Place did never serve hundreds of thousands of cars. The company ceased to exist in 2013. Better Place claimed battery swaps in 59 seconds, which is certainly faster than fast recharging services available today. The concept of battery pack switching, however, requires international standards for battery packs, which were not yet accepted in 2007. It is just another example of the crucial role of standardization, where governments can play a role.

## Vehicle model choice

Let us get back now to the purchase decision of prospective car buyers. Other *important factors in the purchase decision* are the vehicle features, the type of engine and the vehicle model, the latter being related to the specific needs of the household. A family of six is more likely to look at a large family car rather than a small coupé. Looking at the electric vehicles currently on the market, it is interesting to note that an overwhelming number of electric car models available are luxury sedans and large SUVs. Although it was long predicted that electric vehicles would enter the market as *small city cars*, Tesla approached the market with a sports car and a luxury sedan. Other car manufacturers have followed this example, and it makes sense, because it plays into the strengths of electric vehicles and downplays their weaknesses. A particular strength of electric cars is the fast acceleration, which is an attractive feature for sports cars. Car enthusiasts are willing to pay a premium for this additional speed. The choice for luxury sedans makes sense as the relative additional cost for luxury in electric cars with sufficient range is minimal.



### Ease of Use

Another important factor that plays a role in the relatively slow adoption of electric vehicles is concerned with the *ease of use*. This relates amongst others to the limited driving range and the sparse availability of charging infrastructure. Limited driving range is an issue that is likely to be solved. Automakers have estimated that a driving range of more than 300 km should resolve range anxiety. For future models it is the question whether automakers will invest in more range or in lowering the vehicle costs. This trade-off could *well influence* the speed of adoption. Investing or stimulating investment in charging infrastructure may well be one of the more crucial interventions a policy maker can make. At the same time, policy makers can discourage us from buying gasoline and diesel fueled cars, for example by increasing fossil fuel taxes, or by enforcing environmental zones, designed to keep polluting cars out of city centers.

Once electric car ownership catches on, another mechanism influencing the purchase decision comes into play. Most consumers are influenced by what *others in their social circle* do and learn: the more of your friends, relatives, colleagues and neighbors buy electric vehicles and report good experiences, the more you will be inclined to buy an electric vehicle too. This is one of the *mechanisms at play* in the S-curve of new technologies, that shows exponential growth after a slow start. The features that encourage us to adopt a new technology may not always be fully grounded in *rationality*: especially with cars, emotional values are part of the picture.

