

The \$845,000 Porsche 918 Hybrid Spyder: Redefining the Supercar

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Introduction

As a result of the role of the automobile in contributing to carbon emissions and in symbolizing the overconsumption of scarce non-renewable fuel resources coupled with the increased media focus on climate change governments all over the world are intervening in the automobile market with regulation.

Rising world oil prices and consumer preferences for environmentally friendly goods has driven automobile manufacturers to research, develop and market alternative drive systems. Such advancements are now common in the family car market with hybrid electric as well as fully electric cars now available. However, Porsche are blazing a new trail with their introduction of the new 918 hybrid Spyder. They plan to trigger acceptance for low emission hybrid drive systems in a market that has had few viable or perhaps even acceptable alternatives to the gasoline combustion engine – the supercar segment.

Our paper addresses how Porsche will manage the risk of introducing their unproven technology of a plug-in hybrid and a new type of liquid-cooled lithium ion battery that charges on any regular electric network. We show how Porsche rationally reduce this risk by first staging the technology within an inelastic consumer segment enabling a higher price by making their supercar relatively exclusive. We explore how, by utilising economies of scale and scope, Porsche may be able to reduce the average total cost of mass-producing their new technology in the future while maximising economic profit. Technology adoption requires first achieving a critical demand. If that demand is met the technology is

more likely to be successfully adopted. Porsche realize this effect. By deploying the technology within a smaller submarket with highly inelastic demand such critical demand level is far easier to meet than it would be in a large market with elastic demand. The car however needs to be special and thus we begin by examining some key characteristics of the Porsche 918 that address the problem of consumer acceptance.

The Porsche 918 Hybrid Spyder Supercar

Until now hybrid technologies have been unable to have any significant impact in the supercar market, the most notable exception being the sports cars developed by Tesla Motors which too have unable to draw recognition as genuine supercars.

After testing the market receptiveness of the 911 GT3 R Hybrid race car and the 918 RSR hybrid concept vehicle, Porsche plan to break these final barriers of acceptance for hybrid supercars by combining high performance and efficiency with the production of their limited edition 918 hybrid Spyder. Named after the model's production run of 918 units, its premium price is US\$845,000 and will be on the road by 2013.

In the United States cars are assessed on their carbon footprint against vehicles of similar size not power. The penalties imposed on Porsche's smaller vehicles are comparatively greater than those imposed on the relatively larger yet equally powerful vehicles of their counterparts. . Hybrid versions of the Cayenne S and Panamera 4S have reduced the carbon intensity of Porsche's overall fleet.

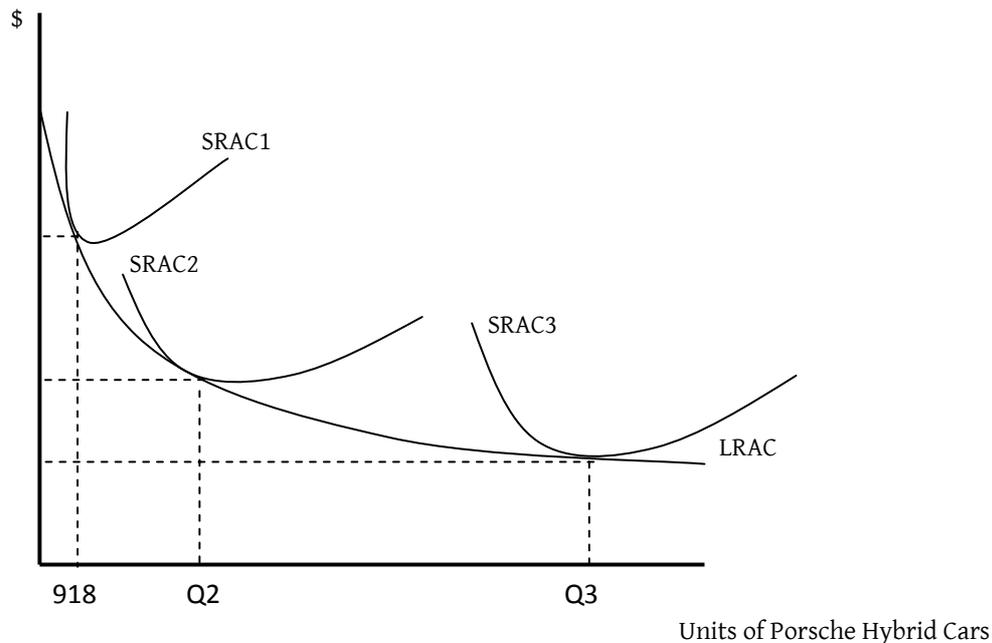
The role played by the 918 Spyder is to convince traditional Porsche 911 buyers to demand hybrid engines. The 918 Spyder is a plug in hybrid with a top speed of 320km/hour and an acceleration of 100km/hour in 3.1 seconds. Its estimated fuel consumption is a mere 3L/100km while CO₂ emissions are 70g/km. The plug-in recharge time is estimated at 7 hours in the USA with 110V/10A and its electric-only drive range is 16 miles

Porsche have a history of producing highly priced limited production vehicles capitalizing on significant brand value in the market. Brand loyalty amongst 911 owners is legendary and it is therefore no mistake that the 918 Spyder is visually similar to the earlier Porsche

Carrera GT supercar. It communicates to this group of aficionados that hybrid drive systems are the new engine of choice. We now explain how Porsche will manage the risk of introducing this unproven technology into the market.

Defraying the Cost of New Technology in the Short Run- Economies of Scale

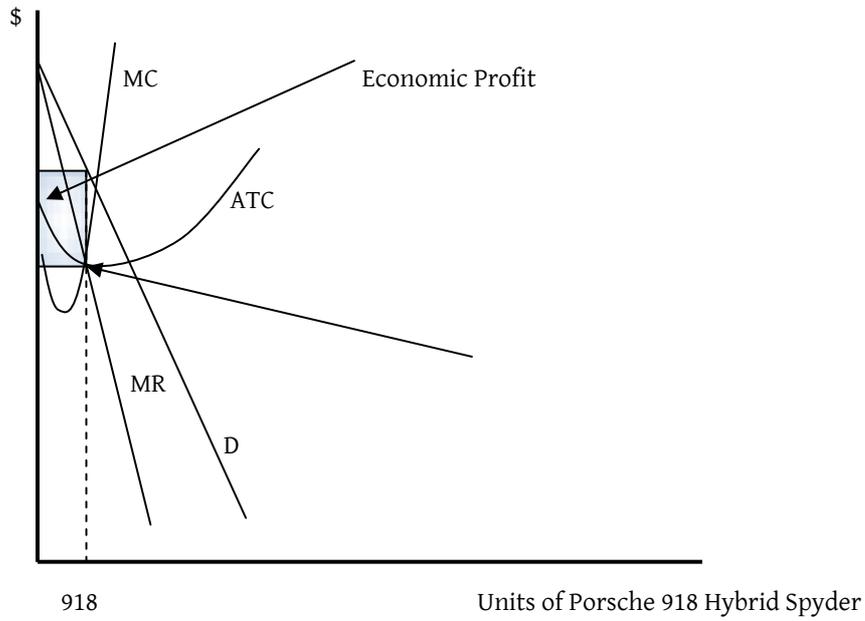
Figure 1- Path Dependency Cost Curve of Porsche's Hybrid Technology



The vehicle's new technology comes with prohibitive fixed upfront research and development (R&D) costs undertaken in two stages - development at Porsche's Weissach research facility and then assembly at its Zuffenhausen plant. The limited production run

of 918 units limits Porsche from capitalising on economies of scale. However future acceptance of hybrid engines by Porsche’s consumers would facilitate mass production allowing them to reduce average costs. Accounting for the high initial R&D costs, Figure 1 depicts a theoretical change in Porsche’s short-run Average Total Cost (ATC) curves from producing hybrid vehicles along with their long-run Average Total Cost.

Figure 2: Economic Profit from the 918 Hybrid Spyder



With higher initial production costs Porsche is operating in a world where the short-run average costs are likely to be high, as depicted by SRAC1 in Figure 1. It is no surprise

therefore that manufacturers are often unable to recover these high average costs expended on such novelty supercars. For example, Bugatti makes a loss on each Veyron they sell in spite of the million-dollar price tag it carries (Skentzos 2008). As a differentiated product enjoying a small market share and commanding powerful brand loyalty supercar manufacturers are in monopolistic competition. The 918's restricted production, premium price and small number of buyers has a relatively inelastic demand curve which can help offset the high initial start up costs of its new technology. This would likely allow Porsche to make a small economic profit whilst minimising the financial risks of manufacturing and marketing their hybrid supercar (Figure 2).

Packaging products with other products with higher profit margins allows firms a further avenue for recovering costs. In the case of the 918, for instance, buyers receive the option to purchase a 911 Turbo S "Edition 918 Spyder" (limited to 918 units) at retail price featuring the 918 Spyder's logos, along with other elements such as its instrument cluster needles and illuminated door entry guards. A badge on the glove box denotes their 918 Spyder order number. Porsche receive additional marginal revenue and economic profit at minimal marginal cost, further defraying the firm's development costs. Furthermore Porsche's policy for building the vehicle only when it is paid for in full by the consumer, is another strategy to reduce the company's exposure to risk in the occurrence of any internal or external shocks. Porsche's economic profit however is limited if they are unable to transfer the 918 Spyder's hybrid technology to their core 911 product. We will now show that Porsche could enjoy larger economic profit from its new technology through economies of scope.

Defraying the Cost of New Technology in the Long Run-Economies of Scope

Consumers faced with making a purchase decision on purchasing a sports car with imperfect information are likely to view all hybrid vehicles as an equivalent to the humble Toyota Prius. For Porsche 911 owners, the current cross-price elasticity for a choice

between a hybrid or gasoline combustion engine is likely very close to zero. Porsche aims to remove this asymmetrical information barrier of acceptance for hybrid vehicles by signalling to the market that the 918 Spyder is an equal substitute for any supercar in the market and that the opportunity cost of lost driving performance is negligible if any. Porsche are attempting to redefine the hybrid sports car by engaging in the Schumpeterian idea of creative destruction.

The rarity of the 918 Spyder suggests that it can be considered as a snob good with marginal utility increasing owing to its price and list of innovative features. The role of the model's groundbreaking fuel efficiency and performance backed by Porsche's image for reliability and fine engineering is to trigger the acceptance of hybrid engines in the sports car market. Once the hybrid vehicle becomes a genuine substitute for the gasoline combustion engine, Porsche will have raised the cross-price elasticity between the two choices.

The Second Law of Demand states that demand for a product becomes more elastic the longer the consumer is given to adjust to the market change. The 918 Spyder's economic profit will attract competition into the market. Ferrari's 599 Hy-Kers will be on sale and on the road in 2015, 2 years later than the 918. If the supercar market accepts hybrids and demand becomes more elastic, Porsche will be able to diversify this new technology to their core 911 product line along with their Cayman and Boxster range, consequently allowing the firm to capitalise on economies of scope. Capitalising on economies of scope will further reduce the firm's average costs and increase their economic profit. We now discuss how Porsche may maximise economic profit in their market through pricing.

Economic Profit Maximisation-Price Discrimination

Price discrimination occurs in monopolistic (imperfect) competition on the back of a degree of market power the firms possess demonstrated by a downward sloping demand

curve. The premium price and scarcity reinforces the Porsche 918 Spyder as a luxury good whereby demand for the good increases with income.

Porsche's approach to price discrimination for the 911 is widely acknowledged among automobile journalists. They price 911s closer to the maximum price consumers are willing to pay by simply creating a very large number of variants and by providing a dizzying array of options. The basic price of cars runs from US\$77,800 for a Carrera in the US to US\$245,000 for a GT2 RS. This allows greater producer surplus as Porsche's pricing is highest to groups with the most inelastic demand. Lower prices are charged to buyers of the more basic variants of its models where demand is more elastic, allowing profit maximisation in that case by increasing the quantity of units sold.

Additionally, the US\$845,000 price and limited model run reduces the risk of the 918 cannibalising global sales of the 911 model allowing Porsche to make additional economic profit. In the long run Porsche will maximise the firm's economic profit when it offers the choice of a hybrid engine for all its model ranges. The new technology of the Porsche 918 Spyder could trigger progression in the automobile market through consumer acceptance of the hybrid drive system as their engine of choice perhaps ultimately even replacing the gasoline combustion engine. We conclude by showing how Porsche's strategy today is one that is relevant to all firms operating in imperfect competition.

Conclusion

Firms face economic uncertainty, operating with a scarcity of resources and regulatory constraints. Porsche's technological response to the external forces of peak oil concern, shifting consumer mentalities and climate change could reduce the firms' carbon intensity addressing actual and implied government interventions.

Our paper shows Porsche's strategy in tackling the challenges of acceptance for hybrid drive systems has been that of internalising an externality into the firm's cost structure but increasing profitability by simultaneously engaging in creative destruction. We conclude that by using economies of scale and scope Porsche aim to minimise the marginal and thus

average total cost of the required new technology by introducing hybrid systems into their more inelastic product lines and once successful eventually transferring this technology to their less inelastic products. This is a profit maximisation strategy that is available to any firm in monopolistic competition.

Firms that practice creative destruction in their marketplace make prior products and technology obsolete. We believe Porsche have addressed the challenge of acceptance for a new engine of choice and may successfully usher in a new era for the sports car.

Epilogue

Lessons learned in Porsche's creation of the 918 Spyder supercar has led to the development of the Boxster E. Porsche revealed at the 2011 Michelin Challenge Bibendum in Berlin their rear and an all wheel drive Boxster E, electric prototypes that are now being trialled to establish the practicalities of daily commuting and recharging.

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