Estimating the Effect of Design in the U.S. Car Market

By analysing user generated content, specifically customer ratings, this paper disentangles the role of different dimensions of perceived product quality in influencing consumer choice in the context of new car sales in the U.S. We use a structural estimation model with endogenous prices and heterogeneous customer preferences to show that “design” (and not other dimensions of quality such as conformance and reliability) is the most salient factor of perceived product quality in determining a new model's market share. Our results have important implications for an automobile manufacture's internal resource allocation strategy.

Understanding how consumers perceive quality is essential to developing marketable products. Prior work in economics and more recently in operations management has investigated the impact of measurable, therefore objective, product characteristics in influencing consumer choice (Berry et al. 1995, Guajardo et al. 2015). These studies treat a product's quality as a function of its objectively measurable characteristics. We argue that perceived quality, which is a consumer's judgment of quality based not only on product characteristics but also on how the consumer experience the product, should have an independent effect on product success.

Furthermore, if design (or product form) guides use and shapes the user’s experience as to help her understand the product's functionality, it should play an important role in shaping the consumer's perception of quality. Yet, aside from a recent study that has shown the positive effect of winning design awards on stock market returns (Xia et al, 2016), there is little empirical investigations on how design influences product success. Primary reason for this is that design quality is a very subjective measure; Luchs and Swan (2011) find 17 different definitions of design in the literature.

Instead of relying on subjectivity of any single organization or individual, we leverage the wisdom of crowds to determine design quality by aggregating design ratings from a large database of customer reviews in the automobile industry. By doing so, we are able to contribute to the emerging literature that examines the relationship between design and product success. Specifically, we study the effect of both objective product characteristics and subjective perceived product qualities on consumer choice.
The U.S. car market presents as an interesting context to study the role of perceived quality and design. Firstly, a car is a complex good whose quality is multi-dimensional and difficult to comprehend. An average consumer is likely to have a hard time understanding tangible benefits from reading the engineering specification sheet, which is full of technical jargon. In addition, the industry is highly innovative, and manufacturers often incorporate latest technology to update their models. This setting highlights a clear need for well-designed product that can translate these numerous and continuously updating technical functionalities into perceivable benefits. Hence, it is entirely unsurprising that industry experts highlight the importance of product design as an instrument for growth and a key attribute for competitive positioning (Chung et al. 2014, Gartman 1994). Secondly, the automobile industry is a mature industry with high competition and high product differentiation. The industry also happens to be highly regulated in terms of safety and environmental impact. These industry characteristics put pressure on firms to compete on multiple fronts all the while firms are constrained by their finite resources.

Because developing new products inevitably involves performing trade-offs, the firm needs to prioritize certain product attributes over others depending on the predicted effect of these attributes on product success (Ulrich and Eppinger 2012). Therefore, we argue that different product attributes, including functionality, safety, reliability, and design, offer levers for product differentiation, and understanding their relative perceived benefits to consumers is vital to the new product development strategy of the firm.

Our work crosses the boundaries of operations management and marketing in order to study how on-line customer reviews capture various dimensions of perceived product quality, which can then be related to product success in the marketplace. Methodologically, we build upon well-established models in economics (Berry et al. 1995) to empirically estimate the relationship between perceived quality of a product and its market share, taking into account endogenous product pricing decisions by the firm as well as heterogeneity of customer preferences.

Our empirical results provide strong evidence in support of design as an important factor in influencing consumer choice. Interestingly, we find that other dimensions of perceived quality
such as conformance or reliability do not influence consumer choice in the time period studied in this paper (2002-2013). We find that for an average car, the impact of a 1% increase in the design ratings is equivalent to a 4.42% decrease in price. Our results have important implications for automobile manufacturers: product design is a strategic lever for product differentiation, and other measures of product quality are not as important.

Our findings also highlight the evolving role of product review websites such as Edmunds.com, cars.com, and kbb.com. Previously, players such as Edmunds.com were considered as “infomediaries” that were responsible of passing public information (e.g., prices, specifications) to the end-customer. Now, with its own large database of customer reviews, they are uniquely positioned to transfer information in the reverse direction, i.e., informing automobile manufacturers about customer perceptions regarding their products. This information has important implications for how these manufacturers should strategically allocate resources for their engineering and design teams that are engaged to work on the next generation of products.

References