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Abstract

The concept of consumer-based brand equity has been discussed widely in the literature and there are a wide variety of both quantitative and qualitative measures used to assess it. For the most part, previous research has studied the way a brand and product attributes are *perceived* in a consumer's mind and the empirical data used in most studies is based on self-reported survey data. In this research, objective data from the largest German Automobile Association, including *actual* prices, objective quality ratings of product attributes and market share of brands are used to estimate their effect on the actual price set by the manufacturer and paid by consumers for those automobiles in Germany. By conducting multiple hedonic regressions we are able to explain the actual price of a car on the basis of it's product attributes, brand and the market share of that brand. Our results show that five out of the eight product attribute categories used in this research (chassis, interior, comfort, engine, and safety) influence the price paid by consumers. In addition, when brand dummy variables are added to the model the explanatory power of the proposed model increases. The paper also shows that product variety is positively related and market share negatively related to the price. Therefore, this paper provides an important contribution to existing literature on modeling and measuring the effect of product related attributes, market share and especially brand equity on price. It further provides important managerial insight as it shows which product attributes and how they are valued by consumers. In addition, the proposed model can be used by automotive manufacturers to approximate the price of existing and new automobiles.

Key words: International Marketing, Branding, Brand Equity, Automotive Industry, Hedonic Regression

1 Introduction

The concept of brand equity has become increasingly important as manufacturers continue to strive to develop global brands and strategies (1). From the consumer's perspective, this intangible asset can be a deciding factor in choosing one brand over another. Brand equity allows manufacturers to charge a premium price for a product that may ultimately be quite similar to its lower-priced competitors (2). It therefore represents an additional variable to be considered when setting a price that considers the consumer's willingness to pay.

In a world that is increasingly driven by consumerism and branding, it is important to understand the relationship between brand equity, product related attributes and price, and ultimately market share. Extensive research has been conducted about consumer-based brand equity and there are a wide variety of both quantitative and qualitative measures (3). For the most part, consumer-based brand equity models study the way a brand is *perceived* by consumers by collecting primary data using consumer surveys and interviews or by using conjoint analyses (3). Although the majority of researchers investigating brand equity have relied on self-reported data measuring consumer perceptions of a brand, they did not consider what consumers actually have to pay for that brand. It is our understanding that almost no study has empirically investigated the brand equity component of a product's actual price, nor has previous research addressed the valuation of brand equity for cars (1). One study by Randall, Ulrich and Reibstein (4) did attempt to empirically value brand equity by using price premiums as a function of the physical characteristics of the product, namely bicycles, as a metric for brand equity valuating. Inspired by that study, this research attempts to develop a generalizable model to empirically assess the value of product related attributes as well as brand equity using objective data from the automotive industry. Specifically, we investigate the extent to which the price and price premium, as a metric of brand equity, is influenced by specific product related attributes of selected cars.

2 Brand Equity

2.1 Literature Review

Brand equity has emerged as a core concept of marketing in recent years. The content and meaning of brand equity have been debated in a number of different ways and for a number of different purposes (1). There are many definitions of brand equity. One of the first attempts is from Farquhar (5) who defines it as "the added value" with which a given brand endows a product (5, p. 24). Among the most agreed-upon definitions is from Aaker (6) who argues that brand equity represents a set of brand assets and liabilities that can either add to or take away from the value of a product or service to the consumer. The term implies that these assets or liabilities are derived from the brand name or logo of the product. Brand equity can provide value to both customers and companies, albeit in very different forms.

Alternatively, Lassar, Mittal and Sharma (2) define brand equity as the enhancement in the perceived utility and desirability a brand name confers on a product. Higher brand equity can be viewed as a source of competitive advantage as it allows companies to charge a price premium, it increases the overall demand for the product and it provides the company with better overall marketing leverage and higher margins (7). This paper refers to *brand equity* as the intrinsic value that a brand adds to the tangible product or service (8). We therefore assume that the price difference between two identical products is reflected by brand equity. In other words, high brand equity generates a "differential effect" and in most cases a larger consumer response (9), thereby strengthening brand performance from both a customer and financial perspective.

Brand equity can be discussed mainly from two different perspectives: the company-based or the consumer-based perspective (1). The **company-based** perspective, which is often referred to in the literature as the financial perspective, emphasizes the value of the brand to firms (10). Proponents of the financial perspective define brand equity as the total value of a brand that is a separable asset (1). Simon and Sullivan (11) typify this perspective and define brand equity as "the incremental cash flows which accrue to branded products over and above the cash flows which would results from the sale of unbranded products" (11, p. 29). The company-based perspective is a top-down approach for measuring brand equity. It uses the information that encompasses the total

performance of a company, such as the firm's historical income statements, balance sheets and statements of cash flows. A top-down approach of this nature assumes a direct relationship between the firm's profitability and brand equity, where strong financial results mean a strong brand, and conversely, negative earnings may signal poor brand equity. In assuming this single cause-effect relationship, this approach fails to include key factors within the marketing mix that beg consideration (12). This approach is also limited by the data it considers. In order to measure brand equity it is necessary to include aspects of the marketing mix such as price and product attributes (12, p. 1).

When marketing practitioners use the term brand equity, they tend to mean brand strength and what the brand means to the consumer. They argue that for a brand to have value it must be valued by the consumer (1). This **consumer-based** perspective has also been discussed widely in the literature and it emphasizes the meaning of the brand and the value placed upon the brand by the consumer. This perspective places brand equity squarely in a marketing decision-making context (10). A definition of consumer-based brand equity is given by Keller (13) among others, as "the differential effect that brand knowledge has on consumer response to the marketing of that brand" (13, p. 60). Lassar, Mittal and Sharma (2) outline five dimensions of brand equity (performance, value, social image, trustworthiness and commitment), Aaker (6) also suggests five dimensions of brand equity but with a different perspective (brand awareness, brand associations, brand loyalty, perceived quality and proprietary brand assets). Keller (14) adopted two basic approaches, direct and indirect, to measure different aspects of brand equity such as brand awareness and brand image. The consumer-based perspective takes a bottom-up approach to measuring brand equity. In applying this approach, the researcher can study the branded product in itself. This comparison highlights an estimation of the products' marketing success, or "efficiency" (15). A consumer perceives brand equity as the value added to the product by associating it with a brand name.

2.2 Measurement of Consumer-based Brand Equity

There are various ways to value brand equity. For the most part, consumer-based brand equity models study the way a brand is *perceived* by consumers by collecting primary data directly from them through surveys and interviews (3). In addition to simple surveys,

conjoint analysis is another widely used technique that measures the value of each product attribute from peoples' overall choice or evaluations. Other possibilities are experiments such as blind tests where two or more groups of consumers rate the target brand and its key competitors. These various measurement methods have provided substantial insight and have been used in many studies. However, they measure the *perceived* brand equity of a product or hypothetical value of a brand in a controlled environment, but not the *actual* consumer behavior that results from brand equity. Moreover, they are limited in that they rely on self-reported data measuring consumer *perceptions* of a brand and the intended valuation and what consumers *might pay* for, without actually measuring what consumers *actually have to pay* or are *paying* for a product.

One method that has been previously used to measure consumer-based brand equity that circumvents the above-mentioned limitations is hedonic regression (4). The purpose of hedonic regression is to explain the actual price of a product as a function of its attributes. To run a hedonic regression, what is needed are the actual prices of the products in a given product category plus knowledge of their product related attributes (e.g., for cars, mechanical, interior, accessories, performance, comfort, style) and any other relevant variable such as product variety and market share. One might also use "objective" measures of quality from sources such as Consumer Reports (4). After running the regression, one obtains estimates of the value of each of the variables. Hedonic regression models, based on the hedonic pricing models, assume that products can be modeled as heterogeneous bundles of homogeneous characteristics. Brand dummy variables are usually added to capture the value of unobserved characteristics that are common to a brand (16).

2.3 Modeling Brand Equity

We therefore can write the following. The parameter $x_i \in X$ where X represents the total number of products of one brand (m), each product x_i has a certain number of product attributes y_j where the total number of attributes is expressed with Y. Each attribute has a certain quality value expressed as v_{yj} indifferent of the brand. Each product attribute might also have a different degree of importance to consumers, consistent with the

Fishbein Model (17). An additional variable must be used to account for the importance weight of each attribute y_j, expressed with the variable w_{yj} where the sum of $w_{yj} = 1$ and each w_{yj} is between 0 and 1. Each product also has a certain brand equity based on the brand of the manufacturer (e_{xi}) of the product x_i. Each product x_i also has a specific price p_{xi}.

Depending on the type of market, the brand's positioning in this market and current market share, firms with high market share may benefit from economies of scale, allowing them to price lower than competitors with a smaller market share. Firms may also sacrifice price premiums in the short run in order to penetrate the market further and increase their market share which all depends on their pricing strategy (4). Therefore, an additional variable, s_i is introduced to account for the intended increase or decrease in price for the model x_i due to market power.

Finally, Baumol (18) suggested that consumers value variety, and Reibstein et al., (19) shows that customers will pay more to have a greater choice of products. This implies that brands offering more models within a given range of products may be able to command higher prices. We therefore introduce the variable r_i indicating the intended increase or decrease in price due to product variety. We present the following general equation for a product x_i: with $x_i \in X$; $X = \sum_{i=1}^{m} x_i$ where i is between 1…m; and $y_j \in Y$; $Y = \sum_{j=1}^{n} y_j$ where j is between 1…n.

$$p_{x_i} = \sum_{j=1}^{n} (v_{yj} * w_{yj}) + e_{x_i} - s_{x_i} + r_{x_i} \quad and\ therefore\ get: e_{x_i} = \frac{p_{x_i}}{\sum_{j=1}^{n} (v_{yj} * w_{yj})} + s_{x_i} - r_{x_i}$$

While the Fishbein Model (17) suggests that consumer *perceptions* of the product attributes of a brand determine their *perceptions* about the brand itself and ultimately the price, our model uses a more direct approach by taking into account the actual price as the dependent variable, instead of consumer perception or expressed willingness to pay used by previous studies.

Based upon the previous discussion and using the general equation above as a model for our investigation, the following hypotheses can be stated and are tested in this paper.

Hypothesis 1: There is a direct and *positive* relationship between the quality of product attributes and the price.

Hypothesis 2: There is a direct and *positive* relationship between brand equity and price.

Hypothesis 3: There is a direct and *negative* relationship between market share and price.

Hypothesis 4: There is a direct and *positive* relationship between product variety and price.

3 Method

We use an approach similar to that of Randall, Ulrich, and Reibstein (4), where we regress the price of each car against objective measures of tangible product-related attributes and market share using dummy variables to represent the different brands. We use the resulting estimated coefficients of the brand dummies as estimates of the price premium for each brand and hence for brand equity. This approach directly tests the hypotheses mentioned above. In the empirical analyses, we make the assumption that all product attribute categories are of equal importance, and we therefore do not address the importance weights in our analysis. This decision was made for two reasons. First, the unavailability of objective measures of relative importance would make it necessary to rely on subjective evaluations, rendering our evaluation at best, suspect. Second, given that the objective of this research is the development of a generalizable model of measuring brand equity by using actual prices rather than consumers' perceptions or their willingness to pay, it is prudent to begin with a simplified version of the model which can be developed further in the future.

3.1 Data Source

Allgemeiner Deutscher Automobil-Club (ADAC) is one of the largest automobile clubs in Europe. This independent organization conducts some of the most rigorous testing on automobiles from all over the world that are sold in Germany. They publish very detailed reports, which include eight product attribute categories with 33 underlying measurement items. Each of the 33 items are rated with a score from 0 to 5.5. This is based upon the German rating system in which a lower number signifies a higher or "better" score in terms of quality. We reverse coded the ratings so that higher numbers signified "better"

ratings. This makes the data more intuitive and more easily interpreted but does not have any statistical influence. For purposes of illustration, Figure 1 below provides a one page sample of a multiple page report from ADAC of the BMW 335i Coupe car model. On average each report, referring to a single car model, is about 5 to 8 pages long and provides an extensive amount of information.

ADAC Autotest

Stand: August 2006
Text und Test: P. Thywissen

ADAC

BMW 335i Coupé

Zweitüriges Coupe der Mittelklasse (226 kW / 306 PS)

ADAC Testergebnis — Note 2,0

Traditionell gibt's den 3er auch als Coupé. Der neue sieht dynamisch aus und fährt auch so. Besonders mit dem neuen 306 PS Sechszylinder, der sich durch innovative Techniken, wie zum Beispiel den zwei Turboladern auszeichnet. Das sorgt für viel Kraft bereits aus niedriger Drehzahl. Zusammen mit dem vorzüglich abgestuften Sechsgang-Getriebe kommen selbst leistungshungrige Fahrer voll auf ihre Kosten. Fazit: Ein wirklicher Sportwagen, perfekt bis ins Detail und mit der Aktivlenkung besonders handlich. Der Preis: Ab 44317 €. **Karosserievarianten:** Stufenheck und Kombi. **Konkurrenten:** Mercedes Sportcoupé.

+ sehr gute Verarbeitung
+ leichte, funktionelle Bedienung
+ körpergerechte Sportsitze
+ starker, laufruhiger Motor
+ sehr gute Straßenlage
+ mit Aktivlenkung sehr handlich
+ großes Händlernetz

– hinten schlechte Sicht
– kein Reserverad
– hohe Kosten

Karosserie/Kofferraum — Note 2,5

Verarbeitung — Note: 1,5

+ Die sehr gut verarbeitete Karosserie ist besonders verwindungssteif. Spaltmaßen an Türen und Klappen sind gleichmäßig und gering. Der geschlossene Unterboden ist glattflächig, das reduziert verbrauchserhöhende Luftwirbel. Im Innenraum gefallen hochwertige, haptisch angenehme Materialien und die besonders saubere Verarbeitung. Die Runflat-Reifen sind serienmäßig, bei Druckverlust kann mit ca. 80 km/h noch 100 bis 200 Kilometer weitergefahren werden.

– Die Karosserievarianten haben keinen Schutz vor Beschädigungen durch dagegenschlagende Autotüren. Ein vollwertiges Reserverad gibt es nicht.

Sicht — Note: 2,4

Optional gibt es eine akustische Einparkhilfe für hinten und auch für vorn und hinten.

+ Der Fahrer sieht nach vorn gut, dafür sorgt die abblendende Front. Helle Xenonscheinwerfer sind serienmäßig, dynamisches Kurvenlicht kosten extra. Selbsttätig abblendende, außen auch beheizbare Rückspiegel sind eine weitere Option.

– Die Pfosten der Frontscheibe sind etwas breit, der linke stört beim Abbiegen. Nach schräg hinten sieht der Fahrer wenig, leicht kann es passieren, dass er einen Fußgänger oder Fahrradfahrer übersieht.

Kurvenlicht

Die Scheinwerfer schwenken (abhängig von Lenkradeinstellung und Geschwindigkeit) gemäß dem Straßenverlauf (rechtes Bild) in Fahrtrichtung und folgen so der Fahrbahn in Kurvenrichtung.

Ein-/Ausstieg — Note: 3,8

+ Mit der Fernbedienung zum Ent- und Verriegeln der Türen lassen sich auch die Fenster öffnen und schließen. Nach dem Aussteigen bleiben die Scheinwerfer noch eine kurze Zeit eingeschaltet und

Mit * gekennzeichnete Kriterien und Noten beziehen sich auf die Fahrzeugklasse

Seite 1 / BMW 335i Coupé

Figure 1: Sample page of ADAC Report

For this study, we selected one homogenous car category which was the “sedan” category. It was selected because a larger number of reports were available in this category compared to any other car category. We selected manufacturers from the U.S., Germany and Japan. The three countries that were chosen represent three of the top five auto-producing nations and account for a combined of almost 50% of the global auto production (20). China, which currently is third in vehicle production (21; 22) has been omitted as information on specific manufacturers and models remains scarce and only a very limited number of cars have been assessed by ADAC so far. A total of 79 car

models representing 13 different car brands from the three countries are included in this study. For each model we have taken the most recent ADAC report which is in most cases, depending on the introduction date of that model in Germany, the year 2006 and 2007.

3.2 Variable Definition

Manufacturers suggested retail price (MSRP) serves as the dependent variable and as a proxy for the transaction price of each car. Prior studies have also used the MSRP (4). This is especially suitable because each manufacturer lists its products, including MSRP and product attributes according to the ADAC rating. All data was gathered for the base model for each car in order to make the most appropriate comparisons.

Product-Specific Attributes. We model MSRP as a function of various product attributes, dummy brand variable and market share. For the product related attributes, we use the eight broad product categories (i.e., chassis/trunk, interior, comfort, engine, driving characteristics, safety, environment, and economics) from the official ADAC rating. The following table summarizes the eight product categories and underlying 33 measurement items.

Table 1: Categories of Product Attribute

Chassis/Trunk (CHA) [6]	**Driving Characteristics (DRI) [4]**
Assembly	Stability
Overlook ability	Corner Handling
Getting in and out of car	Handling
Trunk - Volume	Steering
Trunk - Accessibility	**Safety (SAF) [4]**
Trunk - Variability	Braking
Interior (INT) [4]	Composure
Way you use it	Restraint Systems
Spacious - Front	Kids
Spacious - Back	**Environment (ENV) [2]**
Interior - Variability	MPG
Comfort (COM) [4]	Pollutants
Suspension	**Economics (ECO) [5]**
Seats	Upkeep Costs
Interior Noise	Garage/Tire Costs
Climate Control	How it keeps value
Engine/Drive Train (ENG) [4]	Costs of Add-ons
Performance	Fixed Costs

How smooth it runs
Transmission/Shifting
Gearing

Market Share (MKS): This variable is the natural logarithm of the most recent available market share of each brand in 2006 in Germany. We included the market share (LnMKS) as a variable for several reasons. Since the ADAC ratings are from the German automobile Club, they include the market share from Germany. The Federal Motor Transport Authority (Kraftfahrt-Bundesamt) provides official data on the number of cars per brand registered. While we are focusing on the sedan category, the market share data is reported for all type of cars per brand. The results of our market share analysis should therefore be interpreted with caution.

Number of Models (MOD): As mentioned above, customers might pay more in order to have a greater choice of products. We use the number of models provided by each brand in the sedan category as a measure of product variety.

3.3 Hedonic Regression Model

Our basic approach is to test the relationship between price and the various product attributes, market share, product variety, and brand equity. Hedonic regression assumes that prices are a function of the imputed prices customers assign to the attributes of a product (23-26). Consistent with hedonic pricing literature (24) and other studies estimating brand equity using hedonic regression (4), we regress the price of each car against the ADAC ratings of the eight tangible product attribute categories, official market share data, and a dummy variable for each brand. We use a semi-log model for two reasons. First, a logarithmic transformation provides the best functional form, and second price differences associated with product- and brand-level variables are believed to be best represented as percentage differences rather than constant differences. After the logarithmic transformation of MSRP and market share, the estimated model takes the following form:

$$LnMSRP_i = \beta_0 + \beta_1 CHA_i + \beta_2 INT_i + \beta_3 COM_i + \beta_4 ENG_i + \beta_5 DRI_i + \beta_6 SAF_i + \beta_7 ENV_i + \beta_8 ECO_i - \beta_9 LnMKS + \beta_{10} MOD + \beta_{11} brand_i + \varepsilon_1$$

where $LnMSRP_i$ is the natural logarithm of MSRP of the i-th car; β_0 is a constant; β_i the various regression coefficients.

Weighting Observations. It is important to note that the brands in our data set differ with regard to the number of car models represented. Of the 79 car models in the study, the majority are from BMW, Toyota, VW, followed by Ford, Mazda, and Chevrolet as shown in Table 2. In an unweighted analysis, companies with a larger number of car models would exert a disproportionate influence on the estimate of the coefficients on brand-level variables. Therefore, consistent with other studies (4), we believe that each brand should be weighted accordingly. To account for this factor and to assess the "robustness" of our model, we perform our analysis first using an unweighted least squares regression and then repeat the analysis using a weighted least squares regression.

4 Results

4.1 Descriptive Statistics

Table 2 below summarizes the descriptive statistics for each car brand, the total number of car models of each brand in the sedan category, the average selling price in EUR, the average rating in each of the eight product categories, and the overall average rating.

Table 2: Descriptive Statistics

Brand	#	MSRP	CHA	INT	COM	ENG	DRI	SAF	ENV	ECO	Aver.
Audi	5	47,100	3.0	3.2	3.7	4.0	4.0	3.4	3.0	2.1	**3.32**
BMW	11	55,300	2.8	3.1	3.8	4.1	4.2	3.5	3.0	1.9	**3.31**
Chevrolet	6	19,100	2.6	2.9	2.8	2.9	2.1	1.8	3.0	2.6	**2.57**
Chrysler	5	32,500	2.4	2.8	2.9	3.5	2.8	2.3	2.2	2.5	**2.69**
Ford	8	21,900	3.2	3.4	3.0	3.5	3.5	3.3	3.3	2.3	**3.19**
Honda	5	30,600	2.8	2.9	3.1	3.4	3.2	3.0	3.3	2.2	**3.02**
Mazda	7	22,300	2.8	3.0	3.1	3.6	3.5	2.9	3.2	2.5	**3.08**
Nissan	2	16,300	2.8	2.9	2.6	3.0	3.2	3.3	2.9	0.8	**2.71**
Seat	3	22,300	2.8	3.4	3.3	3.9	3.7	3.4	2.8	1.9	**3.18**
Skoda	3	18,700	3.2	3.1	3.1	3.2	3.6	3.1	3.3	3.6	**3.25**
Suzuki	4	17,300	2.7	2.9	2.7	2.7	2.6	2.5	2.6	2.8	**2.67**
Toyota	11	19,800	2.9	3.1	2.9	3.3	3.3	3.0	3.2	2.4	**3.02**
VW	9	24,300	3.0	3.5	3.3	3.6	3.8	3.5	3.0	2.2	**3.26**
Total/ Average	**79**	**28,700**	**2.9**	**3.1**	**3.2**	**3.5**	**3.4**	**3.0**	**3.0**	**2.3**	

Table 2 clearly demonstrates that there is substantial variation among brands in terms of average price set as well as the average level of quality in the various product attribute categories. We further investigate this by conducting multiple hedonic regressions.

The first two regression models excluded the dummy brand variables whereas the next two included them in order to assess whether adding the brand dummy variables would add value to the explanation of the variance of the price. Regression [1] used unweighted least squares regression while regression [2] used weighted least squares regression. Regressions [3] and [4] both included the dummy brand variables where regression [3] used unweighted least squares and regression [4] used weighted least squares regression. Conducting four regressions enables us to evaluate different scenarios and assess how "robust" the proposed model is under different circumstances. The results are summarized in Table 3 below.

Table 3: Regression Results

	[1]	**U**	**[2]**	**W**	**[3]**	**U**	**[4]**	**W**
	Beta	**Sig.**	**Beta**	**Sig.**	**Beta**	**Sig.**	**Beta**	**Sig.**
Chassi	0.18	*	0.18		0.28	*	0.30	*
Interior	-0.23	*	-0.18		-0.29	*	-0.26	*
Comfort	0.63	*	0.57	*	0.40	*	0.33	*
Engine	0.36	*	0.39	*	0.27	*	0.28	*
Drive	-0.18		-0.17		-0.15		-0.14	
Safety	0.38	*	0.42	*	0.71	*	0.74	*
Environment	-0.06		-0.06		-0.06		-0.04	
Economy	-0.04		-0.01		-0.08		-0.04	
BMW					0.11		0.15	
VW					-0.15		-0.12	
Skoda					-0.08		-0.08	
Seat					-0.11		-0.09	
Audi					0.07		0.10	
Honda					0.11		0.17	*
Toyota					- 0.04		-0.01	
Suzuki					0.14		0.19	*
Nissan					-0.08		-0.10	
Mazda					0.02		0.05	
Chevrolet					0.42	*	0.45	*
Chrysler					0.41	*	0.48	*
Ford					-0.09		-0.09	
Market Share	-0.47	*	-0.51	*				
# Models	0.19	*	0.18					
Adjusted	**0.67**		**0.61**		**0.69**		**0.64**	

R-square

U = Unweighted least square regression
W = Weighted least square regression

Prior to an interpretation of the results, we assess the validity of the regression models by determining whether the residual errors are normally distributed and whether the regression models suffer from multicollinearity. The z-resid histogram provides a visual way of assessing if the assumption of normally distributed residual error is met. The regression models are robust as we observed a normal curve shape in the histogram (not shown). In terms of multicollinearity, we assessed the tolerance or variance-inflation factors (VIF) which shows the relationship between the independent variables. A VIF above 10 indicates significant multicollinearity (27). Although some of the variables in the regression models have a relatively high VIF, the highest with a value of 7.33, none approach the cutoff point of 10. Therefore, we have sufficient evidence that multicollinearity is not an issue in our regression models. Overall, the regression models explain a significant amount of the variance of the price. The models' adjusted r-squares range from 0.61 to 0.69, indicating that the regression models represent relatively strong and accurate predictors of actual prices set by the manufacturers and paid by consumers. With regard to the hypothesis tests, hypothesis one is partially supported. Five of the eight product categories (chassis, interior, comfort, engine and safety) have significant beta coefficients. With the exception of one (interior), all have positive beta coefficients, lending to support H1. In addition, the coefficients vary substantially in values. And while previous studies have found negative beta coefficients for product attributes (4) further research is needed to understand why there is a negative relationship between interior quality and the final price.

Hypothesis two is supported. Not only did the overall adjusted r-squares increase with the introduction of the dummy brand variables, but more importantly, some of the brand equity coefficients are significant and positive. Unfortunately only 4 out of the 13 brands had a significant brand equity coefficient. Nevertheless, this provides some initial insights that brand equity can be modeled and measured empirically and that it influences positively and directly the price of the brand. It should also be noted that brand equity has different values depending on the various car manufacturers. Interestingly, we also find some evidence of a possible country of origin effect. By taking the significant brand

equity coefficient and calculating the average of the two regressions with the brand dummy coefficients, we get a value of 0.14 for Honda, 0.17 for Suzuki, 0.44 for Chevrolet, and 0.45 for Chrysler. These results show that there is very little difference between car manufacturers from the same country (i.e., Honda and Suzuki; Chevrolet and Chrysler) but a large difference between car manufacturers from different countries (i.e., Japanese car vs. American car). Future research should investigate that further.
Hypothesis three is supported. In both the weighted and unweighted regression models the market share beta coefficient is both negative and significant. These results are consistent with the findings from Randall, Ulrich and Reibstein (4) among others.
Hypothesis four is partially supported. The beta coefficient for product variety is positive and significant, but only in the unweighted least squares regression. This results still indicates that the greater the number of models provided by a brand, the higher the price. This result is also consistent with previous research (19; 28).

5 Discussion

The purpose of this paper was to develop a generalized model for measuring and valuating product related attributes and specifically brand equity. The proposed model explains a large percentage of the variance of the price set by manufacturers and paid by consumers of sedan car models of various brands in Germany. In addition, we demonstrate that the different independent variables used in this analysis appear to have significant effects on the prices. The regression models suggest not only which variables influence the price, but the relative extent to which each variable exerts influence. We also show that brand equity itself can be modeled as an independent variable and is significantly influencing the price of cars for certain brands. Hence, this paper provides an important contribution to existing literature on measuring and modeling brand equity (2; 6; 12; 29), as it uses actually prices for valuating brand equity rather than perceived price or perceived value. Moreover, it shows that the quality of the various product attributes, product variety and market share also influence the price set by the manufacturers.
This research has both theoretical and practical implications. From a practical standpoint,

our results suggest that specific tactics can be identified and utilized to enhance the price or brand equity of a product, in this case a sedan automobile. Based upon the results of our hypothesis tests, those product attributes that are the most strongly related to price can be modified and/or enhanced to increase the value of the brand and allow manufacturers to command higher prices in order to maximize profit. Similarly, understanding the relationship between market share, product variety and price, may give decision makers new opportunities and avenues to increase the perception of the value of their brands and thereby influence consumers' willingness to pay for the brand. In addition our results suggest that the more models a car brand has, the higher the car manufacturer can price its products. And with regard to market share, there is a negative and significant relationship between market share and price.

The generalized model proposed in this article is prescriptive in nature and can be used to identify which product attributes as well as other variables contribute the most and the least to the price, thereby suggesting where product, pricing or promotion adjustments can be used to enhance strengths and address weaknesses of a car brand. Although beyond the scope of this paper, we offer some possible evidence of a country of origin effect. Different brands that originate from the same country had very similar beta coefficients. However the average beta coefficients varied substantially across car manufacturing countries. Also widely discussed in the literature, further research should be conducted to better understand this important issue.

As with all research, there are limitations of this study that must be noted. First, our analysis is of a single industry with a single product category (sedan car category). An important question is the degree to which our results apply to other car categories such as compact, SUV, luxury, van or coupe as well as to other industries. Second, we relied on data from one source in one country. Future research should examine data from other automotive associations such as the American Automobile Association (AAA) to consider country differences in valuating product attributes, brand equity, market share and the relationship to price. Third, some car brands might have offered cars with product attributes that are both valuable to consumers and not captured by the German Automobile Association ratings, and hence not captured by our hedonic regression model. Identifying and including these attributes may further enhance the explanatory

and predictive power of our model. Fourth, we did not consider admittedly important issues such as the competitive strategy and the tactical pricing strategies, both of which influence the price set by car manufacturers. Moreover, it might be that there is a systematic manufacturing cost bias that lowers production volume (and hence market share), leading to higher costs that are reflected in higher prices. However, true cost data are not available for the brands in our data set and we are therefore unable to consider cost-driven pricing decisions in the regression models.

6 References

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