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Brand Equity and Share Value

The Moderating Impact of Managerial Ability

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Abstract

This study investigates the value relevance of brand value estimates provided by Interbrand Ltd. in their Best Global Brands list over the years 2000 to 2016 and the moderating impact of managerial ability on this relationship. With a focus on listed firms in the United States and a quantitative approach, we find these estimates to be of great value relevance and provide value relevant information not reflected in the book value of equity or net income of a firm. This finding is in line with previous research in the area. Using a recently developed measure of managerial ability by Demerjian, Lev and McVay (2012), we are able to document initial evidence of a moderating impact on this relationship. This result is subject to statistical challenge, why we call for others to replicate our result.

Tutor: Mariya Ivanova

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1. INTRODUCTION 3
1.1 Problem Area 3
1.2 Purpose 4
1.3 Contribution 4
1.4 Disposition 5
2. LITERATURE REVIEW 5
2.1 Accounting for Intangible Assets 5
2.2 Brand Equity and Relation to Share Value 7
2.3 Managerial Ability 11
2.4 Hypotheses Development 12
3. METHODOLOGY 13
3.1 Research Method 13
3.2 Variables 13
3.3 Empirical Model 15
3.4 Sample 17
4. RESULTS 22
4.1 Univariate Analyses 22
4.2 Multivariate Analyses 23
4.3 Robustness checks 27
5. DISCUSSION 33
5.1 Value Relevance of Brand Value Estimates 33
5.2 The Moderating Impact of Managerial Ability 35
5.3 Timeliness and Reliability in Brand Value Changes 36
6. CONCLUSION 36
7. LIMITATIONS 37
8. DIRECTION FOR FUTURE RESEARCH 38
REFERENCES 39

1. INTRODUCTION

1.1 Problem Area

Although intangible assets play an important role for the competitive abilities and value creation of firms, they are often absent from the balance sheet. Under major regulations such as IFRS and US GAAP, accounting for intangible assets varies with how they are acquired (Robinson, Henry, Pirie, & Broihahn, 2015). These regulations impose restrictions on the number of intangibles that may be included as assets on the balance sheet. The main rule is of expensing rather than capitalizing. Reasons for this practice include uncertainty regarding payoffs and the incitements of managers, as well as a concern that increased flexibility would lead to accounting manipulation (Wyatt, 2005). However, some accuse current regulation of decreasing the quality of financial reporting, claiming that the recording of intangible assets reflects underlying economic conditions (Wyatt, 2005) and competitive ability (Cañibano, 2018).

One important intangible asset that is expensed rather than capitalized is brands as such. The accounting impact of a marketing campaign is direct, although the true financial impact may be much more durable. In order to capture this dimensional value of a brand, Aaker was first to define the concept of brand equity as "a set of brand assets and liabilities linked to a brand, its name and symbol that add to or subtract from the value provided by a product or service to a firm and/or a customer" (Aaker, 1991, p. 15). Since then many additional attempts have been made to define what brand equity is and how to measure it. Numerous consulting firms across the globe have made it their specialty.

Several authors have explored the relationship between brand equity and share value (see e.g. Simon & Sullivan, 1993; Barth, Clement, Foster, & Kaznik, 1998; Madden, Fehle, & Fournier, 2006; Kirk, Ray, & Wilson, 2013). A strong correlation is often found between brand equity and share value. Among these studies we find our benchmark study, Barth et al. (1998), which explores the relationship between brand equity estimates provided by Financial World and share prices, finding that such a relationship exists and is strong. However, the effect of managerial ability on the link between the two remains unexplored. This study builds on the definitions and measures of managerial ability developed by Demerjian, Lev, and McVay (2012). That is, a high managerial ability often equals a high efficiency in generating revenue with existing assets, compared to industry peers. Since many of the decisions driving brand

value lie at the managerial level (Kirk et al., 2013), a high managerial ability ought to have a positive impact on the link between brand equity and share value.

1.2 Purpose

The findings of Barth et al. (1998) are now two decades old. During this time, the association between brand equity and value measures has been explored further, while regulation has persisted with little change. The financial impact of strong brands has been investigated by authors such as Madden et al. (2006) and Fehle, Fournier, Madden, and Shrider (2008), finding that strong brands deliver higher returns while doing so at lower risk. At the same time, technological changes such as the internet have highlighted the importance of brands in marketing communications (Keller, 2009). From within the foundations of the Barth et al. (1998) study, we investigate the association between brand equity and share price focusing on a more prolonged period of time, seeking evidence of the correlation between brand value and value measures. Adding to this, the study seeks to explore the moderating effects of managerial ability on the relationship between brand equity and share value, using a newly developed measure of managerial ability by Demerjian et al. (2012). A high managerial ability ought to imply that managers are more efficient in generating revenue given a certain amount of assets, compared industry peers. This study aims to explore these subjects using quantitative methods.

1.2.1 Research Questions

The research questions in which we are interested are the following:

What is the association between brand equity and share value?

Does managerial ability moderate the relationship between brand equity and share value?

1.3 Contribution

We have designed our study in line with our benchmark study, “Brand Equity and Capital Market Valuation” (Barth et al., 1998). Our goal was to expand the original research firstly by focusing on a unique timeframe. Using recent data on US firms together with more recent brand value estimates we have explored the link between brand values and share prices for the years 2000-2016. Secondly, to the original specifications of Barth et al. (1998), we have also added managerial ability as developed by Demerjian et al. (2012) in order to explore the impact of managerial ability on the link between brand equity and share prices.

We predict that the abovementioned relationship is stronger today compared to when tested by Barth et al. (1998) due to the changing value relevance of different accounting measures (see e.g. Wyatt, 2005; Barth, Li, & McClure, 2017; Cañibano, 2018) and the fact that brands have become more important (Keller, 2009). Regarding managerial ability, we predict a positive moderating impact on the link between brand value and share value since managerial efficiency drives value creation (Demerjian et al., 2012), and many of the decisions driving brand value lie on the managerial level (Kirk et al., 2013).

1.4 Disposition

Our thesis consists of eight parts. In part 2 we present findings from previous research within the area. In part 3 our choice of method is presented including choice of variables, hypotheses, our sampling process and some descriptive statistics. In part 4 we present our results including robustness checks. In part 5 we discuss our results. In part 6 we conclude our findings and in part 7 we discuss the limitations of our study. Finally, in part 8 we provide some suggestions for future research.

2. LITERATURE REVIEW

This section reviews previous research in areas relevant to our study. We identify three main areas of literature. Firstly, we review research examining accounting for and value relevance of intangible assets. Secondly, we look at research on brand equity and how it relates to share price. Finally, we discuss research on managerial ability, how it can be measured and its relevance in value creating processes.

2.1 Accounting for Intangible Assets

2.1.1 Definition and Regulation

An intangible asset is a non-monetary, identifiable asset lacking physical substance (Robinson et al., 2015). Examples of such include patents and brands. Under current accounting regulations US GAAP and IFRS, internally created intangible assets are expensed rather than capitalized, meaning that they are largely absent from the balance sheet of a firm. This does not apply to purchased intangibles however, as these are recorded at cost. This entails a difference in total assets between firms that create their own intangibles compared to firms that purchase their intangibles. Why does regulation enforce expensing rather than capitalization of internally

generated intangibles? Wyatt (2005) suggests it is because payoffs are uncertain and that the incitements of managers are unknown. There are however concerns that this regulatory conservatism may impair the accuracy of accounting.

2.1.2 Value Relevance

One field in accounting studies is the value relevance provided by accounting numbers. That is, the ability of accounting measures to be relevant for the valuation of firms. In a working paper, Barth et al. (2017) review recent changes in value relevance of different accounting measures in the setting of a changing economy, viz. that it transforms from being largely based on industry to being based on intangible assets. This leads to a value change in different accounting measures. For instance, the value relevance of earnings and dividends is decreasing while it is increasing for measures such as operating cash flow, R&D expenses and recognized intangible assets (Barth et al., 2017). Regarding intangible assets, the strict accounting for intangibles imposed by major regulations is being criticized by many. Datta and Faud (2016) claim that even though intangible assets may be difficult to value, it is necessary to include them in financial reporting. Otherwise the quality and relevance of accounting suffers, and the relationship between book and market values is distorted. Cañibano (2018) reviews the accounting of intangible assets and describes how innovation and knowledge management are of increasing importance for business success. Failure in recognizing these factors may lead to accounting not reflecting all aspects relevant for value creation within firms. Dumay (2016) criticizes the reporting regulations of intangible assets on the ground that their inclusion would provide relevant information to markets and investors. However, it is important to note that firm type and size have been found to impact the importance of these factors. Zimmermann (2015) argues that value relevance of accounting measures is of different importance to different firms. For small firms with high growth and a large dependence on intangible assets, accounting earnings and other measures are of small importance in their valuation. Rather, according to Zimmermann (2015), the purpose of accounting in these firms is drifting towards a stewardship role, i.e. a more honest and prudent accounting focused on good capital housekeeping. However, valuation continues to play an important role for accounting in listed firms (Zimmermann, 2015). In conclusion, there is empirical support that intangible assets may play an important role in firm value creation, growing in importance with size, but that this relationship may be distorted by regulation.

2.2 Brand Equity and Relation to Share Value

2.2.1 Definition of Brand Equity

Brand values are recognized as drivers of firm value. Much attention was paid to the subject during the 1990s. Due to the constraints placed by regulation, different attempts were made to unmask the role of these unquantified brands in creating share value. Aaker and Biel (1993) noted that the interest in brands on the financial market had been increasing, seeing them as intangible assets that grow rather than depreciate. In order to capture the value effect of brands compared to unbranded products, the concept of brand equity was introduced by Aaker. He saw it as "a set of brand assets and liabilities linked to a brand, its name and symbol that add to or subtract from the value provided by a product or service to a firm and/or a customer" (Aaker, 1991, p. 15). In order to maintain and develop brand equity, Aaker (1991) emphasized the need for sustained investments. This first definition was later developed and tailored from a financial perspective by Simon and Sullivan (1993) as "[…] the incremental cash flows which accrue to branded products over and above the cash flows that would result from the sale of unbranded products." (p. 29). In this definition, the financial impact appears somewhat clearer, as a price premium reflecting what customers are prepared to pay for the branded product, an amount that can be summed and counted as an asset. Keller (2009) describes several effects relating to a strong brand through higher awareness and positive associations.

2.2.2 Measuring Brand Equity

Transforming the previously defined asset and its positive effects into dollar amounts has been proven complicated and disputable. Many different approaches exist which may be categorized as the customer-based approach and the company-based approach. For customers, brand equity helps to " interpret, process and store huge quantities of information about products and brands" (Aaker, 1991, p.16) while also adding customer confidence in the decision-making process. Furthermore, it enhances customer satisfaction with the given product. For firms, Aaker (1991) suggests that the added value attributable to brand equity may be measured through the generation of marginal cash flows. While providing five different approaches to assessing the value of a brand, Aaker (1991) stresses the difficulty in providing a fully objective and verifiable estimate. This might provide some ground for the restrictions imposed on accounting for intangibles under major regulations.

Many attempts have been made to provide a reliable method for measuring brand equity despite the difficulties involved. Simon and Sullivan (1993) present a technique that originates in the market value of a firm, gaining support from the strong foundation provided in efficient market literature. Likewise, building on the view of the financial market would imply the application of forward looking measures as opposed to using historical accounting data. More specifically, Simon and Sullivan's (1993) approach is to extract the brand value from the market value of all the company assets. The authors show how this can be done in two ways. One is the macro way, in which the total assets of a firm are considered. They are separated into tangible and non-tangible assets, after which all company brands are derived from the intangibles. Thus, this approach cannot be used to estimate the value of individual brands within a company. The second way is the micro way, which allows measures at the individual brand level. This approach measures how brand equity responds to a major brand marketing decision.

In spite of being theoretically sound and well-founded, the methodology of Simon and Sullivan (1993) may be difficult to apply on individual brands since its practical use demands the presence of a large marketing event, such as the launch of a new product line. As an alternative, different market agents produce simple estimates on brand values. One of those is the consulting firm Interbrand. Their analysts perform an asset-based valuation approach where sales and margins are considered in order to ascertain the value derivable from a brand (Huang, 2015). For more details on Interbrand see section 3.2.2.

2.2.3 Brand Equity and Share Value

Many studies investigate the association between brand equity and share value. Among these we find our benchmark study: "Brand Equity and Capital Market Valuation" written by Barth, Clement, Foster, and Kaznik, and published in Review of Accounting Studies (1998). The study examines whether brand value estimates could reflect value relevant information and be reliable and timely enough to be reflected in share price and returns. The brand value estimates are borrowed from Financial World's annual survey of brand estimates which uses a methodology developed by the established brand valuation consulting firm Interbrand Ltd. Using a sample of five years they test their predictions using two specifications; one relating brand values to share prices, and one relating one-year changes in brand values to annual share returns. From estimating the first specification they find evidence that brand value estimates are value relevant

and sufficiently reliable to be reflected in share price. From estimating the second specification they find evidence that one-year changes in brand value estimates show positive sign in their association with contemporary returns. They also find evidence that simultaneous bias is not present in their regressions i.e. the brand value estimates used are not based on market value. The findings are inconsistent with the assumption from investors that brand value estimates are significantly less reliable than other components of book value of equity.

Kerin and Sethuraman (1998) try to document the relationship between brand value and shareholder value for publicly held consumer goods companies in the United States. Using brand values from Financial Worlds list of the world's most valuable brands in years 1995 and 1996 they find empirical support for a positive relationship between brand value and M/B ratios. However, the relationship is found to have decreasing returns to scale, i.e. the value added per dollar of brand equity decreases with increases in brand value.

Building on the findings and methodology of Barth et al. (1998), Kirk et al. (2013) set out to explore whether the relationship is different in consumer and industrial firms. Using partly the same specification as Barth et al. (1998), and partly a modified specification, they test the role of brand values in the two different segments. The authors also run tests to explore whether there is a time-lagged association between brand values and stock prices. They borrow their brand value estimates from Interbrand. Their findings are significant: the business area of the firm has an impact on the role of brand values in valuation, which is higher for consumer firms than for industrial firms. Another attempt to describe the link between brand value and shareholder value is made by Madden et al. (2006). They build their study on the realization that "... [shareholder value creation] occurs if and only if a company's stock returns are higher than any returns the company's shareholders might receive from alternative investments of similar risk" (Madden et al., 2006, p. 225). From this, the authors use the Fama French method for calculating returns and risk on three different portfolios. One of these portfolios is a World's Most Valued Brands-portfolio, which is constructed using brand values from Interbrand. By comparing the return and risk of this portfolio with a benchmark portfolio consisting of every other share in the CSRP database, they find that firms with strong brands deliver better returns and does so at a lower risk.

Fehle et al. (2008) examine whether strong brands create value for shareholders or not. In their study they try answering two questions; (1) "Does recognizable brand value increase shareholder wealth?" And (2) "If so, how can we use this information to explain better the way assets are priced" (p. 4). For data on brand values they use Interbrand's list of the world's most valuable brands for 1994-2001 (excluding 1998 as data was not available). Data on monthly returns and market capitalization collected from CRSP and Compustat data are used to compute annual book-to-market ratios. They compare one portfolio consisting of strong-brand-firms with a comparison portfolio (representing the overall market) using monthly return data after controlling for risk. Their findings show that the portfolio consisting of strong brands performs better than the overall market. This, they say, indicates that, during the sample period, the return of strong-brand-firms presented on Interbrand's list contains an element not captured by traditional asset pricing models. In order to capture this element and better explain how share value correlates with brand equity, they try to construct a Fama-French style brand factor, which however fails to explain this relationship across a broader group of equities.

Chu and Keh (2006), in their study “Brand value creation: Analysis of the Interbrand-Business Week brand value rankings” examine how lagged advertising, marketing promotions and R&D expenses influence brand value after controlling for net income and lagged brand value. Data of brand values are collected from Business Week's ranking of the world's top brands, which construct their brand value estimates in conjunction with Interbrand. Their sample contains 353 observations of brand values that pertain to 73 brands from the annual rankings between the years 1999-2005. To investigate the non-linear influence that advertising, marketing promotion and R&D expenses have on brand value creation they use a quadratic model. Furthermore, they control for simultaneity and endogeneity to clarify whether advertising, marketing promotion or R&D expenses are affected by brand value. They find that the return on R&D expenditure increases for expenses below $ 200 million and has a significant impact up until $ 1 billion, much in line with the flat maximum principle. The return on advertising is greatest in the spending range of $ 200 million and $ 4.6 billion which was the highest advertising expense in their dataset. For expenses beyond that level promotional spending shows higher returns than R&D expenses. Promotional spending is however not found to contribute to brand value creation for low amounts of spending.

2.3 Managerial Ability

In this section, we review previous literature concerning managerial ability and introduce the measure used in our estimations.

2.3.1 Definition and Method of Measurement

The subject of a manager's ability attracts much attention since it is of high relevance for many research questions, for example how talented managers contribute to corporate success. However, separating managerial ability from the abilities of a firm is a complicated process. Often, different types of proxies are used, such as compensation, tenure or manager fixed effects. A recent attempt to quantify Managerial Ability by creating a managerial ability score (MA-score) has been made by Demerjian, Lev, and McVay (2012). This measure will be used for regression purposes in later sections. Demerjian et al. (2012) base the MA-Score on the manager's efficiency in generating revenues for the company. That is, how well managers use resources compared to industry peers in generating revenue. Their approach can be summarized as follows. First, they use Data Envelopment Analysis (DEA) to construct an efficient frontier for each industry. They achieve this by comparing sales generated by each firm in relation to several given inputs, cost of goods sold, net operating leases, net research and development, purchased goodwill, sales and administrative expenses, net PPE and other intangible assets. The efficient frontier is attributable to both the firm and the manager, and thus the effect derived from the firm must be removed. The authors do this through a second regression, where they clean the effect through a number of variables representing firm characteristics effecting efficiency. The regression produces a residual term, which according to Demerjian et al. (2012) is the managerial ability. The authors then perform several validity and robustness checks to verify their result. The tests conclude that MA-score is positively correlated with CEO pay, that positive reactions in the share price may be observed when a manager with low MA-score leaves (and vice versa), and that replacing a CEO with a higher ability CEO leads to subsequent improvements in firm performance. This has been used in other research, for instance in Demerjian, Lev, Lewis and McVay (2013). In this study, the authors check if the MA-score has any impact on earnings quality, and find that there is such an effect.

Also relying on the MA-score, Chen, Podolski and Veeraraghavan (2015) explore whether executive compensation is justified, a topic given much attention throughout the years. They

examine the role that managers play in the area of corporate innovation. Their findings are fourfold. Firstly, they find a robust positive association between managerial ability and the volume of patents and patent citation. Secondly, they find this relationship to diminish with CEO tenure and age. Thirdly, they show that patents generated by managers with a higher managerial ability are valued more positively by the financial market. Lastly, they also show managerial ability to be positively associated with more 'radical' innovations.

Managerial ability has been found to drive value. Building on previous literature criticizing how resource-based theory neglects the impact of managers, Holcomb, Holmes and Connelly (2009) focus on managerial ability as a source of resource value creation. Using data from professional sport teams they investigate whether managers differ in their ability to create value by looking at the effect of managerial ability, human resource stock and managers' action on resource value creation. Their findings are threefold. Firstly, they find managers to differ in managerial ability and that these differences help explain differences in organizational performance. Secondly, they find a high managerial ability to have the strongest impact on resource productivity when the quality of the firm's resources is low. Finally, managerial ability also has a positive impact on the synchronization of resources as a way to create advantages in performance, and this relationship becomes increasingly important with decreasing value on resources.

2.4 Hypotheses Development

To answer our research questions, to explore the association between brand equity and share value and the moderating impact of managerial ability on this relationship, we will test three hypotheses. The first regards the value relevance of brand value estimates. Literature research in the previous section suggests that such a relationship exists, and we expect to find it in our study as well.

Hypothesis 1: There is a positive relationship between brand value and market value

Our second hypothesis regards the moderating impact of managerial ability on the relationship between brand value estimates and share prices. Since previous studies show that high ability managers are able to utilize resources in a more efficient way, we expect that a high managerial ability will have a significant moderating impact.

Hypothesis 2: Managerial ability has a positive moderating impact on the relationship between brand value and market value

Our third and last hypothesis regards the brand value estimates themselves, and the yearly changes in brand values. We expect that they will be timely and reliable enough to be reflected in stock returns.

Hypothesis 3: Brand values are timely enough to be reflected in share prices and returns

3. METHODOLOGY

3.1 Research Method

The choice of method is not only the choice of approach to and dealing with the subject, but also the technique for retrieving data. The method should be chosen with great care, since systematic error sources could bias the whole study and greatly reduce its relevance (Ejvegård, 2009). When choosing a method for our study, we considered not only what is being used in previous studies, but also the general characteristics of each individual method. Earlier research reviewed in the literature review is exclusively quantitative (see e.g. Simon & Sullivan, 1993; Barth et al., 1998; Madden et al., 2006). Such a method allows statistical analysis of data, which facilitates an objective and precise analysis and obstructs conclusions not supported by the data (Ejvegård, 2009), while also focusing on testing and verifying (Ghauri & Grønhaug, 2010), which fits our research questions.

3.2 Variables

The majority of variables used in our study matches the definitions used by Barth et al. (1998) unless otherwise stated.

3.2.1 Dependent Variables

Market value, MV_{it} is the total market value of firm i at the end of year t, in million USD. For purposes of regression, MV_{it} is deflated by the number of shares outstanding at the end of year t. Data on this variable is retrieved from CRSP.

Stock return, $RETURN_{it}$ is firm i's stock return for the period beginning three months after year t-1 to three months after the end of year t, minus the CRSP value weighted return for the same period, as reported by CRSP.

3.2.2 Independent Variables

Brand value, $BRANDS_{it}$ is the sum of firm i's individual brand value estimates as reported by Interbrand in their Best Global Brands list in year t, in million USD. For the purpose of regression, this variable is deflated by the number of shares outstanding at the end of year t. Interbrand is a consulting firm that has a good reputation for valuing brands, as Madden et al. (2006) noted: "Interbrand brand valuation estimates are recognized by auditors and tax authorities in many countries around the world […]" (pp. 226-227). Additionally, their methodology has been widely used in academic research (see Barth et al., 1998; Madden et al., 2006; Fehle et al., 2008; Kirk et al., 2013). More details about the Interbrand valuation method are provided by Huang (2015). In short, the Interbrand valuation method estimates brand value as the future earnings of a brand multiplied with brand strength. This is achieved through firstly calculating residual earnings for a product or business excluding revenue from tangible assets, secondly minimizing the impact of industry by determining the proportion created by the brand through a market analysis, and finally collecting values from an analysis of ten areas to define brand strength (the ten areas are "[…] authenticity, clarity, brand commitment, brand protection, adaptability, consistency, diversity, visibility, relevance and understandability […]" (Huang, 2015, p. 72). A drawback of using Interbrand is that only the top 100 valued brands worldwide are available on a yearly basis from year 2000 to year 2017, limiting the selection of firms we can analyze. For further details on the Interbrand valuation methodology, see Interbrand (n.d.).

Yearly change in brand values, $\Delta BRANDS_{it}$ is the percentage change in the value of firm i's total brand values from time t-1 to time t, using the million-dollar amounts in $BRANDS_{it}$. This definition is somewhat different from the one used in Barth et al. (1998) where the authors use a percentage term provided by their brand value source, Financial World. Our method results in fewer observations since it requires two subsequent observations in $BRANDS_{it}$ to get one observation in $\Delta BRANDS_{it}$.

Managerial ability, MGR_{it} is firm i's managerial ability score in year t, as reported by Demerjian building on findings of Demerjian et al. (2012). The managerial ability measure is retrieved from Demerjians personal webpage (Peter Demerjian Data, n.d.). The Demerjian et al. (2012) method for estimating managerial ability builds on a data envelopment analysis,

where the authors estimate the relative efficiency of each firm in its respective industry. More specifically, they compare sales generated by each firm on condition of several inputs. The authors then perform a second regression analysis, in which they rinse for effects arising from the firm as such, claiming that the residual captures managerial ability. To verify that the measure captures what it is supposed to measure, a series of validity checks are performed. The measure has been used in academic research since its introduction (see e.g. Chen et al., 2015; Demerjian et al., 2015).

3.3 Empirical Model

Our study consists of three specifications designed to test our different hypotheses.

3.3.1 Brand Values and Share Prices

The first specification is designated to measure the association between brand value estimates and share prices in accordance with Barth et al. (1998). The original specifications of Barth et al. (1998) only incorporates year fixed effects. However recent evidence by Kirk et al. (2013) suggests that firm type has moderating impact on this relationship, why we also include industry fixed effects.

$$MV_{it} = \alpha_1 BRANDS_{it} + \alpha_2 BV_{it} + \alpha_3 NI_{it} + fixed\ effects + \varepsilon_{1it}$$

Where MV_{it} equals market value of the firm at fiscal year-end, deflated by the number of shares outstanding, $BRANDS_{it}$ is the firm's total brand value estimates as reported by Interbrand deflated by the number of shares outstanding, BV_{it} is the book value of equity at fiscal year-end deflated by the number of shares outstanding, NI_{it} is net income per share from the firm's continuing operations, fixed effects refer to year and industry fixed effects. Year fixed effects is a dummy variable that takes the value one if the observation is from fiscal year t and zero otherwise. Industry fixed effects is a dummy variable computed on two-digit SIC- codes, that takes the value one if the observation is in that industry and zero otherwise. ε_{1it} is an error term. This equation is regressed both with fixed effects and in a pooled estimation. In accordance with the findings of Barth et al. (1998), we interpret a positive association between brand value and share prices, that is a significant and positive coefficient on α_1, as evidence that brand values are important for equity valuation of companies owning strong brands.

3.3.2 The Moderating Impact of Managerial Ability

To test our hypothesis regarding managerial ability and its impact on the relationship between brand values and share prices, we modify the first specification to incorporate managerial ability. The modification is made following changes done to the same equation by Kirk et al. (2013). The managerial ability measure developed by Demerjian et al. (2012) is included by adding it as an independent variable and by multiplying it with the brand value estimate per share.

$$MV_{it} = \beta_1 BRANDS_{it} + \beta_2 BRANDS_{it} * MGR_{it} + \beta_3 MGR_{it} + \beta_4 BV_{it} + \beta_5 NI_{it} + fixed\ effects + \varepsilon_{2it}$$

Where MV_{it} equals market value of firm i at fiscal year-end, deflated by the number of shares outstanding, $BRANDS_{it}$ is the firm's total brand value estimates as reported by Interbrand deflated by the number of shares outstanding, MGR_{it} is firm i's managerial ability score as reported by Demerjian building on the findings of Demerjian et al. (2012), BV_{it} is the book value of equity at fiscal year-end deflated by the number of shares outstanding, NI_{it} is net income per share from the firm's continuing operations, fixed effects refer to year and industry fixed effects. Year fixed effects is a dummy variable that takes the value one if the observation is from fiscal year t and zero otherwise. Industry fixed effects is a dummy variable that takes the value one if the observation is in that industry and zero otherwise, based on two-digit SIC-code. ε_{2it} is an error term. The observation of a significant positive coefficient on the interacting variable, which is what we predict since marketing is in many ways a managerial issue (Kirk et al., 2013), would be evidence that managerial ability has a moderating impact on the relationship between brand values and share prices. This will also entail that a high ability manager creates more value given a level of brands compared to a lower ability manager. Failure to detect such a relationship will be interpreted as managerial ability not being relevant for the value creation applicable to the ownership of strong brands, or that the measure is biased.

3.3.3 Returns and Changes in Brand Values

The third and last specification tests whether year-to-year changes in brand estimates and net income affect stock returns. The specification is intended to measure the timeliness and reliability of changes in brand value estimates.

$$RETURN_{it} = \gamma_1 \Delta BRANDS_{it} + \gamma_2 NI_{it} + \gamma_3 \Delta NI_{it} + fixed\ effects + \varepsilon_{3it}$$

Where $RETURN_{it}$ is year t stock return three months after the end of year t-1 to three months after the end of year t minus the CRSP value rated return for the same period, $\Delta BRANDS_{it}$ is the percentage change in firm i's total brand value estimates from year t-1 to year t, NI_{it} is the net income or loss of firm i in the end of year t divided by beginning of period market value, ΔNI_{it} is NI_{it} minus NI_{t-1} divided by beginning of period market value, fixed effects refer to year and industry fixed effects. Year fixed effects is a dummy variable that takes the value one if the observation is from fiscal year t and zero otherwise. Industry fixed effects is a dummy variable that takes the value one if the observation is in that industry and zero otherwise, based on two-digit SIC-code. ε_{3it} is an error term. Observing a significant and positive coefficient on $\Delta BRANDS_{it}$ would constitute evidence that changes in brand value estimates are indeed timely and reliable enough. Failure to detect such a relationship would provide evidence that brand value estimates are biased to some extent.

3.4 Sample

3.4.1 Sampling Process

The ideal statistical way of thinking is to begin with considering what information is required, what the relevant population is, how sample members should be selected, and how information should be obtained from the sample members (Newbold, Carlson, & Thorne, 2013). Ideally, since what we are interested in is evaluating the effect of brand values on share prices in the United States, we would select our sample from all listed firms in the United States. However, such a sampling process is impossible due to data unavailability. Therefore, we define our sample using a set of criteria. 1. The company must own a brand that is represented on the yearly Interbrand Best Global Brands list. The list covers 100 brands per year and extends from the years 2000 to 2017. This gives 1775 brand years to begin with (the number covered was 75 in the year 2000). 2. The time period is limited to 2000-2016 due to that Demerjian's data stretches to 2016 (excluding 100 brand years in 2017). 3. The firm must be headquartered in the United States and be publicly traded (excluding 825 brand years). 4. Financial data for the owning company must be available through the databases Compustat and CRSP (excluding 47 brand years). This gives a total of 803 brand years. Since some firms own more than one brand, the 803 brand years are attributable to 766 firm years. This process is illustrated in the table below.

Table 1 Sampling

Sampling process	**N**
Interbrand Best Global Brands 2000-2017	1775
Minus "brand-years" covered in 2017 due to data availability in Demerjian	-100
Minus "brand-years" whose owner firm is not publically traded in the US	-825
Lack of data availability	-47
Number of brands to be included in sample	803
Number of firm-years	766

As stated above, some firms own multiple brands at different points in time. The distribution of brand years per firm year is illustrated in the table below.

Table 2 Firms owning multiple brands

Number of brand-years per firm-year	Firm-years	% of total	Total brand-years
1	731	95.43	731
2	33	4.31	66
3	2	0.26	6
Total	766		803

The sample brands vary in stickiness, meaning that some are observed more times than others. This could potentially be a problem, and we discuss it further in section 4.3.3.

3.4.2 Descriptive Statistics

In this section, we present some descriptive statistics regarding our sample. At first, we consider the distribution of our observations over time. Table 3 displays the distribution of brand years through the period covered in our study, from year 2000 to year 2016. As illustrated by the right-hand column, the percentage of firm year observations per year of the total firm years lies almost constant at 5 to 6 %. Since the period includes some dramatic events such as the financial crisis of 2008-2009, it is of utmost importance to include year fixed effects in our regressions.

Table 3 Distribution of sample observations over time

	Firm Year	
Year	Number	% of total
2000	35	5
2001	48	6
2002	49	6
2003	48	6
2004	45	6
2005	42	5
2006	43	6
2007	45	6
2008	45	6
2009	44	6
2010	45	6
2011	44	6
2012	46	6
2013	47	6
2014	47	6
2015	46	6
2016	47	6
N	766	

Thereafter, we present some basic statistical measures for our sample, providing some characteristics of our sample firms. The table below displays means, medians, minimum, maximum, number and standard deviation of our variables and the firms' assets. The latter is included to illustrate total size of the balance sheets of the sample firms. The size of the sample firms is striking as far as all variables are concerned. Since the brands included in the sample rank as the most valuable in the world, this implicates that firms owning such brands must be of considerable size. Worthy of note is also the large variances of the variables, as indicated by the large observed standard deviations. Some adjustment is highly required in order to scale for size. This is achieved in our estimations through deflating by the number of shares outstanding. The statistics illustrate some limitations to our study. The results derived from the regression

analyses will be valid only for very large firms in the American setting. The total number of observations differ between different variables, due to lack of data availability regarding the $\Delta BRANDS_{it}$ and MGR_{it} variables. Since our definition of $\Delta BRANDS_{it}$ require two subsequent observations of $BRANDS_{it}$ in order to calculate the year-to-year change, the number of observations is slightly lower than that of $BRANDS_{it}$ (679 compared to 766 for $BRANDS_{it}$). The groups have therefore been reduced to the least common denominator for the purpose of estimating equation three. Hence the total number of ΔNI_{it} observations is as many, 679. Regarding the number of observations for our MGR_{it} variable, data for some of our sample firms are unavailable, resulting in a smaller number of observations on MGR_{it} compared to our $BRANDS_{it}$ variable, 651 compared to 766.

Table 4 Descriptive statistics

	Mean	Median	Min	Max	N	Std. Dev.
$BRANDS_{it}$	17 394.15	9 392.50	1 235	178 110	766	20 768.49
$\Delta BRANDS_{it}$	0.03	0.03	-0.55	1.29	679	0.14
$RETURN_{it}$	0.05	0.02	-0.69	4.29	766	0.33
MV_{it}	86 041.97	52 967.82	685.80	643 120.13	766	92 749.27
$ASSETS_{it}$	166 031.28	34 664.50	1 493.13	2 573 126	766	391 100.98
BV_{it}	26 615.63	12 279.00	-17 311	228 122	766	36 806.28
NI_{it}	4 518.15	2 665	-99 289	53 394	766	7 319.73
ΔNI_{it}	0.01	0.01	-1.02	3.28	679	0.18
MGR_{it}	0.13	0.10	-0.27	0.68	651	0.19

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand in million USD.
$\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values $BRANDS_{it}$, from year t-1 to year 1.
$RETURN_{it}$ is measured as the stock's return minus the CRSP value-weighted return, from time t-1 plus three months to time t plus three months.
MV_{it} is the total market value of firm i at the end of year t, in million USD.
$ASSETS_{it}$ is the total assets of firm i at the end of year t, in million USD.
BV_{it} is the book value of firm i's equity at the end of year t, in million USD.
NI_{it} is the net income or loss of firm i for year t, in million USD.
ΔNI_{it} is expressed as NI year t minus NI year t-1 deflated by market value at the beginning of the year.
MGR_{it} is company i's managerial ability score as reported by Demerjian, building on the findings of Demerjian et al. (2012).

In order to illustrate how the dependent and explanatory variables correlate with each other and to investigate interdependencies, we include a correlation matrix below. A correlation matrix has multiple advantages as it helps to detect statistical faults caused by correlation between independent variables. As displayed below, the correlations between our main explanatory variable $BRANDS_{it}$ and the other explanatory variables BV_{it} and NI_{it}, is fairly strong (0.62 and 0.70 respectively). Furthermore, the correlations between the dependent variable MV_{it} and the three explanatory variables are strong (0.73 with $BRANDS_{it}$, 0.84 with NI_{it} and 0.84 with BV_{it}). This raises concern that later results from estimating this equation could be driven by correlation between variables, a topic that is further addressed in section 4.3 Robustness Checks. They are also addressed through the univariate analysis of our main explanatory variables in section 4.1. The MGR_{it} variable has no strong correlation with any other explanatory variable.

Table 5 Correlation matrix

	$BRANDS_{it}$	$\Delta BRANDS_{it}$	MGR_{it}	$RETURN_{it}$	MV_{it}	NI_{it}	ΔNI_{it}	BV_{it}
$BRANDS_{it}$	1							
$\Delta BRANDS_{it}$	0.15	1						
MGR_{it}	0.15	0.08	1					
$RETURN_{it}$	-0.04	-0.02	-0.05	1				
MV_{it}	0.73	0.31	0.31	0.01	1			
NI_{it}	0.70	0.29	0.25	-0.02	0.84	1		
ΔNI_{it}	-0.02	-0.02	0.03	0.54	-0.01	0.07	1	
BV_{it}	0.62	0.21	0.27	-0.05	0.84	0.80	-0.02	1

$BRANDS_{it}$ is the firm's total brand value estimates of brand names as reported by Interbrand in million USD.
$\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values $BRANDS_{it}$, from year t-1 to year t.
MGR_{it} is company i's managerial ability score as reported by Demerjian, building on the findings of Demerjian et al. (2012).
$RETURN_{it}$ is measured as the stocks return minus the CRSP value-weighted return, from time t-1 plus three months to time t plus three months.
MV_{it} is the total market value of firm i at the end of year t, in million USD.
NI_{it} is the net income or loss of firm i for year t, in million USD.
ΔNI_{it} is expressed as NI year t minus NI year t-1 deflated by market value at the beginning of the year.
BV_{it} is the book value of firm i's equity at the end of year t, in million USD.

4. RESULTS

To estimate our regressions, we rely on Ordinary Least Squares (OLS) estimation using the statistical program Stata SE. The layout for this section is as follows. Firstly, we present results from univariate analyses of the main dependent and explanatory variables. After that, we present results from our multivariate analyses. Lastly, we perform a series of robustness checks, focusing on detecting potential violations of the underlying assumptions of OLS estimation.

4.1 Univariate Analyses

In this section, we explore whether univariate analyses of the dependent variables on the main explanatory variables provide initial evidence of links between each respective dependent variable. This initial analysis examines if any results from the following multivariate analyses are attributable to correlations with the control variables, as could potentially be the case given the correlation matrix presented in section 3.4.2. Table 6 displays regression outputs of the univariate analyses of MV_{it} being regressed on $BRANDS_{it}$.

Table 6

Dependent variable: MV_{it}

		Pooled estimation			**Fixed effects**		
Variable	Prediction	Coefficient	Std. Err.	t	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	2.28***	0.07	31.68	2.21***	0.07	31.54
Constant		28.40	2.77	10.27	-9.77	13.47	-0.73
	Number:	766			766		
	Adjusted R^2*:*	0.57			0.63		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
Fixed effects refer to estimation with industry and year fixed effects.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

In the estimation of the univariate relationship between $BRANDS_{it}$ and MV_{it} we find a positive statistically significant relationship, both in the pooled estimation and when controlling for year- and industry fixed effects. This constitutes initial evidence of our theory that brand value estimates provided by Interbrand capture value relevant information. One dollar of brand value per share produces 2.28 dollars of share value in the pooled estimation and 2.21 dollars per share when controlling for fixed effects. These coefficients are statistically significant and

positive, providing evidence that any positive relationship found between the variables in a later analysis would not be solely attributable to correlation with our control variables.

We also performed a univariate analysis on $RETURN_{it}$ regressed on $\Delta BRANDS_{it}$. The result of that estimation is displayed in the table below.

Table 7

Dependent variable: $RETURN_{it}$							
		Pooled estimation			**Fixed effects**		
Variable	Prediction	Coefficient	Std. Err.	t	Coefficient	Std. Err.	t
$\Delta BRANDS_{it}$	+	-0.12	0.09	-1.34	-0.09	0.10	-0.85
Constant		0.04	0.01	3.42	0.01	0.07	0.01
	Number:	679			679		
	Adjusted R^2*:*	0.01			0.03		

$\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values *BRANDS*, from year t-1 to year 1.
Fixed effects refer to estimation with industry and year fixed effects.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

As indicated by the negative coefficient on $\Delta BRANDS_{it}$ although not statistically significant, a relationship between yearly changes in total brand value estimates and the return of a firm's stock is unsupported, both in the pooled estimation and when controlling for fixed year and industry effects. If any significant positive coefficient is found for this variable at a later stage, this result would likely be due to a correlation with the control variables.

4.2 Multivariate Analyses

Here we will display the results of estimating our main specifications presented and developed in section 3.3.

4.2.1 Value Relevance of Brand Value Estimates

In this equation, we estimate the relationship between share prices and brand values, book value of equity and net income, all deflated by shares outstanding. The purpose is to explore if the measure of brand value provided by Interbrand captures value relevant information not reflected in the book value of equity or the net income from the continuing operations of a company.

$$MV_{it} = \alpha_1 BRANDS_{it} + \alpha_2 BV_{it} + \alpha_3 NI_{it} + fixed\ effects + \varepsilon_{1it}$$

Table 8

Dependent variable: MV_{it}

		Pooled estimation			**Fixed effects**		
Variable	Prediction	Coefficient	Std. Err.	t	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	1.10***	0.11	9.56	1.02***	0.14	7.27
BV_{it}	+	0.13	0.12	1.07	-0.05	0.16	-0.31
NI_{it}	+	9.13***	0.67	13.63	8.64***	0.71	12.10
Constant					3.72	12.14	0.31
	Number	766			766		
	Adjusted R^2	0.76			0.71		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding
BV_{it} is the book value of firm i's equity at the end of year t, in millions USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i for year t, in millions USD deflated by the number of shares outstanding.
Fixed effects refer to estimation with industry and year fixed effects.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

The coefficients represent what one dollar of brand value per share, book value per share and net income per share do to the share price. The results show that, on average, one dollar of brand value per share raises the share price by 1.10 dollars in the pooled estimation and 1.02 when fixed effects are taken into account. This finding is in line with our predictions and holds strong statistical significance. Our findings suggest that Interbrand's brand value estimates capture value relevant information not reflected in the book value of equity or net income of a firm. However, the relationship between book value of equity and market value is more uncertain. We observe no statistical significance. The link between net income per share and share price is however the most supported relationship. Our findings suggest that one dollar of net income per share contributes 9.13 dollars to the share price in the pooled estimation and 8.64 dollars when fixed year effects are taken into account. This finding has strong statistical significance.

4.2.2 The Moderating Impact of Managerial Ability

In this section, we present the results from estimating equation 2, including firm i's managerial ability score as reported by Demerjian et al. (2012) as an independent variable and multiplying it with the firm's brand value estimate per share in order to explore the moderating impact.

$$MV_{it} = \beta_1 BRANDS_{it} + \beta_2 BRANDS_{it} * MGR_{it} + \beta_3 MGR_{it} + \beta_4 BV_{it} + \beta_5 NI_{it} + fixed\ effects + \varepsilon_{2it}$$

Table 9

Dependent variable*: MV*

		Pooled estimation			**Fixed effects**		
Variable	Prediction	Coefficient	Std. Err.	t	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	0.91***	0.17	6.40	0.73***	0.19	3.77
$BRANDS_{it} * MGR_{it}$	+	2.85***	0.59	4.85	4.59***	0.60	7.69
MGR_{it}	+	23.91**	11.36	2.10	-68.88***	15.63	-4.41
BV_{it}	+	0.08	0.19	0.40	0.06	0.22	0.28
NI_{it}		8.63***	0.81	10.59	7.03***	0.88	8.02
Constant					11.58	12.04	0.96
	Number	651			651		
	Adjusted R^2	0.79			0.75		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
MGR_{it} is company i's managerial ability score as reported by Demerjian, building on the findings of Demerjian et al. (2012).
BV_{it} is the book value of firm i's equity at the end of year t, in millions USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i for year t, in millions USD deflated by the number of shares outstanding.
Fixed effects refer to estimation with industry and year fixed effects.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

The results show that including managerial ability in the equation has a moderating impact on brand value, since the coefficient is positive and the t-statistic is strong at 4.85 in the pooled estimation and 7.69 when fixed year effects are considered. This finding is in line with our hypothesis that managers with high ability are able to allocate resources more efficiently and also, given a certain input create more value. The coefficient on the MGR_{it} variable differs widely when fixed effects are taken into account, 23.91 in the pooled estimation compared to -68.88 in the estimation with fixed effects. This finding is unexpected and is subject to further investigation in section 4.3 Robustness Checks. By running the same equation and adding firm-

specific effects, evidence is found that the significant negative sign on MGR_{it} is attributable to firm-specific effects. The total number of observations included in this estimation differs from that in the previous estimation, the number here is 651 while in earlier estimations it was 766. This difference is due to lack of data availability in the Demerjian database of managerial ability.

4.2.3 Timeliness and Reliability in Brand Value Changes

Here, we present the results from estimating the equation including $RETURN_{it}$ and $\Delta BRANDS_{it}$. The purpose of this equation is to test the timeliness of changes of brand value estimates, a test performed in our benchmark article (Barth et al., 1998). A significant positive coefficient on $\Delta BRANDS_{it}$ would indicate that yearly changes in brand value estimates are timely and sufficiently reliable to be reflected in returns.

$$RETURN_{it} = \gamma_1 \Delta BRANDS_{it} + \gamma_2 NI_{it} + \gamma_3 \Delta NI_{it} + fixed\ effects + \varepsilon_{3it}$$

Table 10

Dependent variable: $RETURN_{it}$							
		Pooled estimation			**Fixed effects**		
Variable	Prediction	Coefficient	Std. Err.	t	Coefficient	Std. Err.	t
$\Delta BRANDS_{it}$	+	-0.03	0.08	-0.36	-0.08	0.09	-0.94
NI_{it}	+	0.02	0.12	0.16	-0.23	0.16	-1.50
ΔNI_{it}	+	0.93***	0.07	14.27	0.95***	0.07	13.77
Constant					0.02	0.06	0.42
	Number	679			679		
	Adjusted R^2	0.28			0.29		

$\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values $BRANDS_{it}$, from year t-1 to year 1.
NI_{it} is the net income or loss of firm i in year t, deflated by market value at the beginning of the year.
ΔNI_{it} is expressed as NI year t minus NI year t-1 deflated by market value at the beginning of the year.
Fixed effects refer to estimation with industry and year fixed effects.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

Following Barth et al. (1998), this equation is not deflated by number of shares outstanding. $\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values $BRANDS_{it}$, from year t-1 to year t. NI_{it} and ΔNI_{it} (*NI* year t minus *NI* year t-1) are deflated by market value at the

beginning of the year, following Barth et al. (1998). Returns are measured as the return of the stock minus the CRSP value-weighted return, from time t-1 plus three months to time t plus three months.

Our finding does not support that changes in brand value estimates over time are reliable, indicated by the weak coefficient on $\Delta BRANDS_{it}$ which takes a negative sign, contrary to our predictions. A one percentage change in a firm's total brand value estimates has no effect on stock return, neither in the pooled estimation nor when industry- and year fixed effects are taken into account. Neither is the NI_{it} variable statistically significant, indicating that year-end net income expressed as a fraction of beginning market value has no effect on returns in our sample. This result also contradicts what is revealed regarding the relationship in the correlation matrix (Table 5). Unstipulated estimations excluding ΔNI_{it} shows that the NI_{it} variable does have significant positive effect on $RETURN_{it}$. We suspect this relationship to be disturbed by the strong effects of ΔNI_{it}. ΔNI_{it} is not a real percentage change, as the denominator is the beginning of year market value, but it still reflects that a "percentage increase" in net income effects the stock's return with 0.93 percent in the pooled estimation and 0.95 percent when fixed year and industry effects are considered. This finding has strong statistical significance. The number of observations included in this estimation is lower than the one used in the first estimation, 679 compared to 766. This is a result of $\Delta BRANDS_{it}$ requiring two subsequent brand value estimates for the same firm, in year t-1 and in year t.

4.3 Robustness checks

Our results in the previous section could be challenged. Points of concern include the violation of the underlying assumptions of our estimation technique, Ordinary Least Squares (OLS). To address these potential problems, we performed robustness checks including tests for multicollinearity, heteroscedasticity and different control variables.

4.3.1 Multicollinearity

Multicollinearity refers to when two or more explanatory variables in a multivariate regression are highly correlated. When multicollinearity is present the interpretation of the correlating variables becomes difficult since it is hard to distinguish each variable's individual contribution. To specify the degree of multicollinearity in our regressions we calculate the variance inflation

factor, often referred to as VIF. A common level for which the VIF-factor is considered high is ten (Woolridge, 2012). The results are presented in the table below.

Table 11
Panel 1 VIF-test Equation 1

Dependent variable: MV_{it}		
Variable	**VIF**	**Tolerance**
$BRANDS_{it}$	4.47	0.22
BV_{it}	3.74	0.27
NI_{it}	3.17	0.32
Mean VIF	3.79	

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
BV_{it} is the book value of firm i's equity at the end of year t, in million USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i in year t, deflated by number of shares outstanding.

Panel 2 VIF-test Equation 2

Dependent variable: MV_{it}		
Variable	**VIF**	**Tolerance**
$BRANDS_{it}$	8.66	0.12
$BRANDS_{it} * MGR_{it}$	2.35	0.43
MGR_{it}	1.53	0.65
BV_{it}	10.65	0.09
NI_{it}	5.32	0.19
Mean VIF	5.7	

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
MGR_{it} is firm i's managerial ability score as reported by Demerjian, building on the findings of Demerjian et al. (2012).
BV_{it} is the book value of firm i's equity at the end of year t, in million USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i in year t, in million USD deflated by number of shares outstanding.

Panel 3 VIF-test Equation 3

Dependent variable: $RETURN_{it}$		
Variable	**VIF**	**Tolerance**
$\Delta BRANDS_{it}$	1.02	0.98
NI_{it}	1.35	0.74
ΔNI_{it}	1.34	0.75
Mean VIF	1.24	

$\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values $BRANDS_{it}$, from year t-1 to year 1.
NI_{it} is the net income or loss of firm i for year t, in million USD.
ΔNI_{it} is expressed as NI year t minus NI year t-1 deflated by market value at the beginning of the year.

The VIF-tests does not reveal any multicollinearity problems since almost all mean VIF-factors are well below 10. The only variable with a VIF-level above 10 is BV_{it} in equation 2. We re-estimated this model excluding BV_{it} which significantly reduced the VIF-levels, concluding that multicollinearity is not biasing our results.

4.3.2 Heteroscedasticity

One of the assumptions of ordinary least square regression is that of homoscedasticity, that the conditional variance of the error term is constant. This means that we assume the standard errors of the unobserved errors to be constant for different values of the explanatory variables (Woolridge, 2012). However, in many cases there is reason to question this assumption. When the assumption of homoscedasticity is not met, the test suffers from heteroscedasticity which causes the ordinary least square method to be less efficient and leads to invalid inferences caused by biases in the estimated standard errors (Breusch & Pagan, 1979). To control for heteroscedasticity in ordinary least square estimations, econometricians have come up with methods referred to as heteroscedasticity-robust, meaning that in large samples they are valid also without homoscedasticity. Implementing these heteroscedasticity-robust tests does not require knowledge of whether heteroscedasticity is present or not. However, since the t-statistic in the usual ordinary least square have exact t-distribution, there is reason to test for it before abandoning the classical ordinary least square method. One way to do this is through a Breusch-Pagan test which is based on the Lagrangian multiplier. (Woolridge, 2012). We carried out this test for each of our three main equations, and the results are presented in the table below.

Table 12 Breusch-Pagan test

Panel 1 Heteroscedasticity in Equation 1

H_0= Constant variance Dependent Variable	N	Variable (tested)	χ^2	Prob.> χ^2
MV_{it}	766	Fitted value for MV_{it}	1612.03	0.00

Note: We can reject the null hypothesis and hence it can be concluded that heteroscedasticity is present in the regression.

Panel 2 Heteroscedasticity in Equation 2

H_0= Constant variance Dependent Variable	N	Variable (tested)	χ^2	Prob.> χ^2
MV_{it}	766	Fitted value for MV_{it}	3854.47	0.00

Note: We can reject the null hypothesis and hence it can be concluded that heteroscedasticity is present in the regression.

Panel 3 Heteroscedasticity in Equation 3

H_0= Constant variance Dependent Variable	N	Variable (tested)	χ^2	Prob.> χ^2
$RETURN_{it}$	679	Fitted value for $RETURN_{it}$	170.29	0.00

Note: We can reject the null hypothesis and hence it can be concluded that heteroscedasticity is present in the regression.

All three tests show signs that heteroscedasticity is present in our estimations. To mitigate the problem of heteroscedasticity, we adjust the standard errors using the robust option in Stata SE. Through this we arrive at the following results:

Table 13
Panel 1 Equation 1

Dependent variable: MV_{it} Variable	Prediction	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	1.01***	0.32	3.13
BV_{it}	+	0.13	0.23	0.55
NI_{it}	+	8.19***	2.16	3.79
Constant		19.36	3.99	4.84
	Number	651		
	Adjusted R^2	0.68		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
BV_{it} is the book value of firm i's equity at the end of year t, in million USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i for year t, in million USD deflated by number of shares outstanding.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

Panel 2 Equation 2

Dependent variable: MV_{it}				
Variable	Prediction	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	0.41	0.40	1.04
$BRANDS_{it} * MGR_{it}$	+	4.51	3.18	1.42
MGR_{it}	+	-43.64	34.70	-1.26
BV_{it}	+	0.52	0.47	1.13
NI_{it}	+	6.80***	1.85	3.67
Constant		25.73	5.57	4.62
	Number	651		
	Adjusted R^2	0.73		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
MGR_{it} is company i's managerial ability score as reported by Demerjian, building on the findings of Demerjian et al. (2012).
BV_{it} is the book value of firm i's equity at the end of year t, in million USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i for year t, deflated by number of shares outstanding.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

Panel 3 Equation 3

Dependent variable: $RETURN_{it}$				
Variable	Prediction	Coefficient	Std. Err.	t
$\Delta BRANDS_{it}$	+	-0.06	0.11	-0.58
NI_{it}	+	-0.24	0.25	-0.96
ΔNI_{it}	+	0.98***	0.23	4.17
Constant		0.04	0.02	2.55
	Number	679		
	Adjusted R^2	0.28		

$\Delta BRANDS_{it}$ is expressed as a percentage change in firm i's total brand values $BRANDS_{it}$, from year t-1 to year 1.
NI_{it} is the net income or loss of firm i for year t, deflated by market value at the beginning of the year.
ΔNI_{it} is expressed as NI year t minus NI year t-1 deflated by market value at the beginning of the year.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

As far as equations one and three are concerned, no large differences to our earlier results are noted. While the significance levels are lower, they are still statistically significant at the 1 % level. However, regarding equation two, the significance levels of our main explanatory variables have declined resulting in that a relationship is no longer supported. When the

standard errors are treated as robust, the only significant variable is the NI_{it} variable, neither the MGR_{it} the $BRANDS_{it}$ nor the interacting variable are statistically significant. We interpret this as a contradiction to our earlier results, and will discuss it further in our discussion section.

4.3.3 Additional Fixed Effects

To address the issue of the unexpected sign of the MGR_{it} variable in section 4.2.2. and the stickiness of individual brand estimates indicated in section 3.4.1, we re-estimated the main equations adding firm specific effects to the existing fixed effects. In the estimation of equations 1 and 3, no significant difference was observed. However, the results from estimating equation 2 did change and is displayed in the table below.

Table 14 Additional fixed effects

Dependent variable: MV_{it}				
Variable	Prediction	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	1.29***	0.25	5.07
$BRANDS_{it}$ * MGR_{it}	+	3.12***	0.55	5.68
MGR_{it}	+	7.37	17.47	0.42
BV_{it}	+	-1.21***	0.30	-4.08
NI_{it}	+	6.65***	0.84	7.89
Constant		33.20	13.02	2.55
	Number	651		
	Adjusted R^2	0.83		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
MGR_{it} is firm i's managerial ability score as reported by Demerjian, building on the findings of Demerjian et al. (2012).
BV_{it} is the book value of firm i's equity at the end of year t, in million USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i for year t, in million USD deflated by number of shares outstanding.

In this estimation, the sign of the managerial ability variable takes a positive sign, which is in line with our predictions for this variable.

4.3.4 Acquired Brands

In our previous estimations, we have implicitly assumed that the sample firms own brands that are not present on the balance sheet. However, this assumption is not necessarily true since accounting regulations in the United States allow the recording of acquired brand assets. To conduct a check of the accuracy of this assumption, we estimated equation 1 including a dummy

variable $BRANDACQ_{it}$, taking the value one if firm i had acquired any of the brands on the Interbrand Best Global Brands list, and zero otherwise. The results are shown below.

Table 15

Dependent variable: MV_{it}

		Pooled estimation			**Fixed effects**		
Variable	Prediction	Coefficient	Std. Err.	t	Coefficient	Std. Err.	t
$BRANDS_{it}$	+	1.10***	0.11	9.58	1.01***	0.14	7.22
$BRANDACQ_{it}$	+	11.09	11.55	0.96	-8.56	11.97	-0.72
BV_{it}	+	0.13	0.12	1.02	-0.03	0.16	-0.22
NI_{it}	+	9.12***	0.67	13.63	8.58***	0.72	11.90
Constant					3.59	12.15	0.30
	Number	766			766		
	Adjusted R^2	0.76			0.71		

$BRANDS_{it}$ is firm i's total brand value estimates of brand names as reported by Interbrand deflated by the number of shares outstanding.
$BRANDACQ_{it}$ is a dummy variable that takes the value one the year and following years when one company acquires another brand on the Interbrand's Best Global Brands list.
BV_{it} is the book value of firm i's equity at the end of year t, in million USD deflated by the number of shares outstanding.
NI_{it} is the net income or loss of firm i for year t, in million USD deflated by number of shares outstanding.
***, **, * indicate significance at 0.01, 0.05, 0.1 levels respectively.

The coefficient on $BRANDACQ_{it}$ is insignificant in the estimation. We consider this to entail that our result in the first estimation is not attributable to acquired brands being present on the companies' balance sheets.

5. DISCUSSION

5.1 Value Relevance of Brand Value Estimates

As displayed in Table 8, our multivariate analysis regarding the value relevance of brand value estimates provided evidence for a positive and statistically significant relationship over time and across industries. Through an additional estimation of the univariate relationship between brand value estimates and share prices illustrated in Table 6, we ensured that the observed relationship is not biased by the presence of control variables. The relationship could be challenged due to our choice of statistical method. We countered these potential allegations by

performing a series of robustness checks in section 4.3, concluding that the relationship was statistically robust.

This finding was in line with previous research regarding the value relevance of brands. Compared to our benchmark study Barth et al. (1998), our estimation resulted in an even stronger correlation, as the relationship between brand value estimates and share value was stronger and more statistically significant. The coefficient in our estimation was 1.10 with a t-statistic of 9.56 (Table 8), compared to a coefficient of 0.29 with a t-statistic of 5.57 in Barth et al. (1998, p. 55), although a direct comparison is not possible due to different samples. We interpret that our results provide evidence of the importance of brands for firm value creation. Worthy of note is the difference in sign and statistical significance of the book value variable. A relationship was unsupported in our estimations, while in Barth et al. (1998), a positive and statistically significant relationship was documented.

Our results support the findings of previous research investigating the value relevance of brand estimates in other settings (Simon & Sullivan, 1993; Kerin & Sethuraman, 1998; Madden et al., 2006; Fehle et al., 2008; Kirk et al., 2013).

Our finding can also be viewed in light of the importance of intangible assets for competitive abilities of a firm. As we find brand values to be value relevant across industries and over time, we support the claims that intangible assets matter for firm value creation and are valued by investors (Zimmermann, 2015; Datta & Faud, 2016; Dumay, 2016; Cañibano, 2018). Our estimates relied on the implicit assumption that sample firms own brands not present on the balance sheet, due to conservative regulation reviewed in section 2.1.1. To test the accuracy of this assumption, we performed an additional check of acquired brands presented in Table 15. As indicated by the statistically insignificant coefficient on the dummy variable representing acquired brands, this assumption was not unrealistic.

Additionally, our results provided some evidence that brand values as provided by Interbrand in their Best Global Brands list continue to provide value relevant information not reflected in the book value of equity or the net income of the company, and that this relationship persists over time and across industries. These findings provide some support that their valuation methodology is useful and accurate.

5.2 The Moderating Impact of Managerial Ability

In order to investigate the moderating impact of managerial ability on the relationship between brand values and share prices, we included managerial ability as a moderating variable. We predicted that it would have a positive impact on the relationship between brand value and share value. The results from estimating this relationship are displayed in Table 9. As indicated by the positive and statistically significant coefficient on the moderating variable, initial evidence of our hypothesis was provided. However, as noted by Aguinis, Petersen and Pierce (1999), the coefficient of moderating variables is often subject to statistical challenge. This is often due to the assumption of homoscedasticity, i.e. constant variation of the error term. Aguinis et al. (1999) found violation of this assumption in 40 % to 60 % of articles in a sample consisting of 87 articles in social science including moderating variables in their estimations. This was considered a common source of incorrect conclusions regarding the moderating effects. In order to assure the robustness of our result, we conducted a Breusch-Pagan test which indicated violation of the homoscedasticity assumption. When counterbalanced, the moderating impact of managerial ability was no longer supported. We interpret this result in line with Aguinis et al. (1999), viz. that further validation is required in order to confirm the relationship.

The results of our initial estimation in Table 9 were however in line with our hypothesis and provided some evidence of the moderating impact, that high performance managers produce more value given a certain level of brand value. This finding was in line with earlier research regarding the impact of managerial ability on value creating processes (Holcomb et al., 2009; Chen et al., 2015). However, no final conclusion can be drawn from our results given the statistical problem discussed above. We believe that the moderating impact of managerial ability will be statistically significant if the test is replicated using other data. Worthy of note is the unexpected coefficient on the managerial ability variable in the fixed effects estimation in Table 9. It was found to be negative with high statistical significance. To address this unexpected result, we re-estimated the same regression controlling for firm specific effects, presented in Table 14. As predicted this adjustment mitigated the statistically significant negative coefficient of the managerial ability variable, providing evidence that the unexpected finding was attributable to firm specific effects. This finding supports the Demerjian et al. (2012) method for estimating managerial ability, since the measure could otherwise be criticized since it is highly unlikely that a high managerial ability destroys value.

5.3 Timeliness and Reliability in Brand Value Changes

Our third equation tested Interbrand's Best Global Brands list for timeliness and reliability through a test of yearly stock returns and brand value changes. The results from the estimation are displayed in table 10. As opposed to the findings of Barth et al. (1998), we did not find changes in brand value estimates to be timely and sufficiently reliable to be reflected in share returns. This result raised concerns about the Interbrand brand valuation method while also supporting the view that intangible assets are unreliable and hard to value. In contrast to our first equation which supported the value relevance of Interbrand's brand value estimates, this finding failed to support their reliability. However, the sample was far from the total number of brand valuations performed by Interbrand, which means we cannot conclude that Interbrand's valuation method is flawed. This result does however have one welcome interpretation, as it counters one suspicion against the Interbrand valuation methodology held by Barth et al. (1998), viz. that brand values could in fact be based on share prices to some extent. If that was the case, the yearly changes in brand values would closely match the returns of the stock. In this regression, we also found NI_{it} not to be associated with share returns in a statistically significant way, as opposed to Barth et al. (1998). This finding was at first sight illogical but is in line with recent research that documents that the relationship between net income and share returns manifest differently depending on overall economic conditions (Zolotoy, Frederickson, & Lyon, 2017). This could explain the lack of statistical significance.

One possible concern regarding our results in this estimation aroused from our variable definition, which somewhat differs from that of Barth et al. (1998). Due to lack of data, we slightly altered the $\Delta BRANDS_{it}$ definition, which could possibly cause some bias. However, we do not think that this alteration affects the validity of the variable in a way that would impair the relevance of this study.

6. CONCLUSION

This study has examined the relationship between share value and brand value estimates as provided by Interbrand Ltd. It has also explored the moderating impact of managerial ability on this relationship. Brands classify as intangible assets and are thus subject to strict and conservative accounting regulation. Brands are often absent from accounting assets, although they have repeatedly been found to provide value relevant information. To test whether the

brand value estimates provide value relevant information across time and industry, we construct a sample of 803 unique brand value estimates attributable to 766 different firm years in the United States between the years 2000 to 2016. Through statistical analysis we were able to provide evidence that brand value estimates provided value relevant information and that this result was continuous over time and across industries. The result was verified through different robustness checks including tests concerning our statistical method as well as searching for acquired brands. However, in another test we found no evidence that yearly changes in brand value estimates were timely and sufficiently reliable to be reflected in share returns. This finding was somewhat unexpected as it supported allegations against the recording of intangible assets for being hard to value. It did however counter one suspicion against Interbrand brand value estimates for being based on stock prices. This study was the first to investigate the moderating impact of managerial ability on this relationship, which was done through the combining of our sample with a measure of managerial ability recently developed by Demerjian et al. (2012). The measure has been tested and verified through use in academic research since its introduction. By including this measure as an independent and moderating variable, we were able to provide initial evidence of the positive moderating impact of managerial ability on the relationship between brand value and share price. However, this proved subject to statistical challenge why further replication is required in order to establish the relationship.

7. LIMITATIONS

The results and conclusions of our study are limited. The first and foremost limitation is due to data availability, which in turn limited our sampling procedure. Since publicly available Interbrand brand value estimates are limited to highly valued brands across the globe, our sample was limited to very large firms. This implies that our findings are not applicable to smaller brands or firms in other countries than the United States. Furthermore, this means that our sample consists of firms that have been successful in building a strong brand. Thus, we exclude firms that might be investing heavily into building their brands without success. Additionally, despite the frequent usage of Interbrand's brand value estimates in previous research, their method is not undisputed. The measure of managerial ability is borrowed from Demerjian et al. (2012), but its validity is hard to determine.

8. DIRECTION FOR FUTURE RESEARCH

Our findings have provided further evidence for previous research as well as revealed new findings. Our initial finding that managerial ability moderates the relationship between brand value and share value in a positive way is in need of further investigation in order to ascertain that the moderating impact truly exists, as we are unable to provide complete statistical evidence of the effect. It would also be interesting to look into the relationship more in detail, investigating *how* managers help in generating value from strong brands. It might also be interesting to look at the impact of managerial ability in other value creating processes.

Little research has been made to determine the relationship between brand equity and share value for smaller brands. This is likely due to lack of data availability. If possible, it would be interesting to perform such research and compare the results to those regarding large brands.

One possible bias to our results is the uncertainty regarding the brand value estimates provided by Interbrand Ltd. This bias is present in most studies using some kind of brand value estimates. One possible topic of future research might be to try to determine the reliability of Interbrand's brand value estimates, looking deeper into their methodology.

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