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QUALITY AND RELIABILITY CORNER

An empirical assessment of the financial performance of Malcolm Baldrige Award winners

Malcolm
Baldrige Award
winners

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Abstract *The Malcolm Baldrige Award was created in 1987 to curtail the US loss of market share to foreign producers and to encourage a focus on management of quality and customer satisfaction. However, since its inception there has been a long-running controversy on whether winning this award does enhance future financial performance and ultimately shareholders' wealth. Examines how Baldrige Award winners perform with respect to several accounting and financial metrics. Specifically, assesses Baldrige Award winners' financial performance relative to industry benchmarks and a control group of similar firms. The results suggest that award winners are superior financial performers and are valued higher by investors compared with similar sized firms and industry benchmarks. However, no evidence was found that winning the award causes changes in firm value in the award year and subsequent years. The results suggest that the Baldrige Award winners are examples of firms that stand out as performance leaders in their industries. Since one of the purposes of the award is to stimulate quality awareness among US firms, the Baldrige recipients may be construed as a conspicuous centerpiece of the US quality management movement.*

I. Introduction

The Malcolm Baldrige National Quality Award, which was established in 1987 by Public Law 100-107 and signed into effect by President Ronald Reagan, has been seen as a major catalyst for transforming US businesses. The Baldrige Award is given by the President of the USA to manufacturing and service businesses, small and large, and, since 1999, to education and healthcare organizations. Recipients of this award must be judged outstanding in seven areas: leadership, strategic planning, customer and market focus, information and analysis, human resource focus, process management and business results (NIST, 2002).

The award, which many see as the engine that fueled the nation's interest in quality and customer satisfaction, was invented to stop the US loss of market share to foreign producers in the 1980s. Many US producers during the 1980s had embarked on a campaign of cutting costs only to realize that this strategy had further weakened their ability to compete. For example, firms that lay off workers realized that not only morale and motivation among the remaining employees had decreased, but also lower levels of customer service and a reduction of innovative ideas and products had occurred. Skinner (1986) refers to this phenomenon as the productivity paradox. It did not take long for these firms to realize that a much more effective way to compete in a highly competitive economic environment was to improve the quality of their products.



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The Malcolm Baldrige Quality Award seeks to enhance management's awareness of quality and recognize stellar accomplishments in improving product quality among US businesses. Also, since Baldwin winners are required by law to share their experiences publicly, another objective of the award is to provide ideas and strategies to other US firms that are seeking ways to improve product quality. The award reflects not only a clear taxonomy of the principles of quality management, but also, according to Garvin (1991), provides companies with a "comprehensive framework for assessing their progress toward the new paradigm of management and such commonly acknowledged goals as customer satisfaction and increased employee involvement."

The Baldrige Award, however, is not without controversy. Indeed, it is somewhat surprising that an award with such commonsense and idealistic goals would come under such heavy fire and intense criticism. This increasingly intense debate, on several issues surrounding the benefits and costs of the award, has pillared industry leaders and academic professionals on both sides of the isle. On one side of the debate, critics of the Award cite three major problems. One, it requires enormous investments causing some to claim that the award can be bought. These critics generally cite Xerox, a 1989 winner, and Corning, a 1989 finalist, as spending, respectively, \$800,000 and 14,000 labor hours preparing applications and readying employees for site visits by Baldrige examiners. After reviewing a worldwide study conducted by Ernst & Young on quality, Sherman (1992) reports that many businesses waste millions of dollars a year on quality improvement strategies that do not improve their performance and may even hamper it. Second, critics note that the award may not be indicative of exceptional, or even very good product quality. Here, Cadillac, a 1990 winner is frequently cited as an automobile that has yet to achieve top ranking in most surveys such as Consumer Reports and J.D. Powers on automobile quality. Third, the poor financial performance of some past winners, including among others, General Motors' Cadillac Division, Motorola, Wallace Company, and Federal Express, have led critics to believe that the award is not an accurate measure of a company's competitiveness and profitability. For example, the Wallace Company of Houston, Texas, a pipe and valve distributor, won the Baldrige Award in the small business category in 1990 and was faced with bankruptcy one year later.

From the above discussion, it is clear that critics view the Baldrige Award as an enormously expensive use of financial and other resources with no concomitant return on investment. Indeed these critics conclude that trying to win the award or winning the award leads to a decrease in shareholders' wealth. On the other hand, proponents of the award see it as a *sine-qua-non* for enhancing Corporate America competitiveness and ultimate profitability. Garvin (1991) notes that Baldrige winners are as vulnerable as other companies to economic downturns, changes in fashion, and shifts in technology are far better positioned "to recover gracefully because they have superior management processes in place." Thus, Garvin (1991) concludes that the Baldrige Award is "a strong predictor of long-term survival and a leading indicator of future profitability."

As the above discussion reveals, linking the Baldrige Award to firm's financial performance is still an open question. Clearly, if the award does accurately recognize producers of stellar quality products, then a financial performance assessment of these firms should produce results consistent with that of prior research on the relationship

between quality and variables such as cost, profitability, market share (see Buzzell and Wiersema, 1981; Craig and Douglas, 1982; Garvin, 1983; Madu *et al.*, 1995).

The purpose of this study is to examine how Baldrige Award winners perform with respect to several accounting profitability and market metrics. We assess Baldrige Award winner's financial performance relative to industry benchmarks and a control group of similar firms. Our results suggest that award winners perform significantly better when compared with a group of similar sized firms and the industry benchmarks in terms of accounting and financial performance measures. In our multiple regression when we control for all other differences that also affect firm value, such as firm size, profitability, leverage and intangible assets, we find the award winners are valued 11 percent higher than the otherwise comparable firms in the control sample. This suggests the award winners are superior financial performers and are valued higher by investors.

An interesting question that follows is whether the award adds value to its winners or the winners are the more successful firms to begin with. Our investigation seems to support the later. The award could add value to its winners if it signals effective leadership and superior product quality in the winning firms that are previously unknown to investors. If this is true, we will expect to observe higher firm value in award years, and subsequent years following the award, than years before the award for the award winners. However, we did not find such evidence. We thus conclude that winning the award *per se* does not cause changes in firm value for award winners. These results suggest that firms who win the award are more successful firms in their respective industries both before and after the award.

The remainder of the paper proceeds as follows: section II presents a review of the literature. Section III discusses the construction of our test and matching sample, and methodology. The process of gathering the sample and the sample characteristics are discussed in section IV. Section V presents the empirical results on firm values, and the final section provides a summary and conclusions.

II. Research background

Although there are a number of theoretical and empirical studies examining the relationship between quality, cost and financial performance (e.g. Lawler *et al.*, 1995; Hendricks and Singhal, 1996), there is still a paucity of studies that have investigated the impact of winning a quality award on corporate financial performance using externally available financial data. However, since this study focuses on the financial performance of companies that won the Baldrige Award, we limit our review only to those studies that focus on the Baldrige firms. A good review of empirical studies that relate financial performance, using both market and accounting variables, to other quality awards can be found in Jarrell and Easton (1996).

Dr Joseph Juran, one of the pioneers in the quality movement, and the Associates for Improvement Management conducted a study where 1,000 hypothetical dollars were invested in firms that won the Baldrige Award. The results revealed that compared with a Standard & Poors (S&P) gain of 33.1 percent, the Baldrige companies rocked up a cumulative return of 89.2 percent. In similar vein to the Juran study, the Commerce Department (*US Department of Commerce News*, 1995) reported that if an individual had invested \$1,000 in each of the publicly traded Baldrige winners from the

announcement time of the award, through October 3, 1994, that individual would have earned a cumulative return of 188 percent, compared to a 28 percent on the S&P 500.

Both of these studies were clearly grappling with the issue of the financial performance of the Baldrige firms relative to other firms. However, since these studies fail to control for variables such as size, industry effects, risk, performance prior to winning the award, etc., it is difficult to ascribe the Baldrige companies' stellar market return performance over the S&P 500 companies to improvements in product quality and/or winning the award. Indeed, without adequate controls, it is also plausible that variables other than quality were responsible for the Baldrige Award winners' enhanced market returns.

Wisner and Eakins (1994) examine both accounting and stock market performance for four Baldrige Award winners that are publicly traded and are not subsidiaries nor divisions of other firms, and four privately held Baldrige Award winners. These authors argue that since product quality has been shown in the literature to be directly correlated with financial success, a financial analysis of these firms will help determine if the Baldrige Award is a meaningful indicator of product quality leadership. Wisner and Eakins (1994), using financial information from Value Line, Standards & Poors, and Disclosure, calculated the following profitability and stock market-based ratios to assess the financial performance for the four firms since 1987, one year prior to the first Baldrige Award: annual sales, the average five-year sales growth, the return on sales, return on assets, return on net worth, price earnings ratio, earnings per share, and the five year average earning per share growth. These authors conclude that the financial performance of the four publicly traded firms was mixed. Their analysis suggests that "during a period of economic recession all four firms experienced significant sales growth over the period of investigation." However, they also note that two of the four firms experienced declining profitability from 1989 to 1992.

According to Wisner and Eakins (1994), respondents to a questionnaire sent to the four privately held award winners cited improvements in competitive characteristics within their industries and attributed that success to their quality programs.

In a more recent study Ramasesh (1998), using an event study methodology, examines the short-term impact of the Baldrige Award announcement on shareholders' wealth. This author was concerned with the short selling of stock of Baldrige Award winners on the announcement date of the award. Ramasesh examines the following question: "Does the announcement of the Award signal possibilities for making abnormal gains by short selling the stocks as the critics claim?"

Using closing price data from the Dow Jones News Service and daily return data from the Center for Research in Security Prices (CRSP), Ramasesh (1998) calculated the abnormal security return for 13 Baldrige Award winners around the date of the announcement. Ramasesh concludes that no significant negative abnormal returns were observed on the date of the announcement, thus falsifying the critics claim that pursuing the Award is economically irrational given the huge investment required to achieve it. While for small cap firms, this author detects significant positive excess return on the day of the award announcement, he is unable to detect statistically significant positive or negative abnormal returns for the large cap firms in his sample. Ramasesh explains this anomaly by noting that since the investment community does not extensively follow small cap firms, the winning of the Baldrige Award is a signal to the capital markets of enhanced future performance and profitability. However, in the

case of large capitalization firms, which are well-managed companies that are closely monitored by the investment community, the incremental value of the information of the announcement of a quality award is not likely to be substantial to the capital markets.

To clarify the small cap results further, Ramasesh did a longitudinal study of some profitability ratios on Solectron, which won the award in 1991. We interpret these results as mixed, although the author claims Solectron showed a consistent improvement in operating and profitability performance in the years subsequent to winning the award.

It is clear from the above studies that financial performance of the Baldrige companies is still an open issue. Moreover, since some of the studies lacked statistical rigor (and this may have been intentional on the part of the authors given the small sample size and a short time-series of financial performance variables) and failed to use a control sample, interpretation of the results is questionable.

III. Sample construction and empirical method

Test and matching sample

Our test sample includes all publicly traded business enterprises that received the Baldrige National Quality award during 1988-2002. The recipient's identity is obtained from Baldrige National Quality Program Web site at <http://www.quality.nist.gov/>. There are 51 award winners during this period. We excluded four not-for-profit organizations such as hospitals and schools and 18 private companies/divisions whose financial data are not available. We also excluded five recipients that were subsequently acquired or merged with other companies. There are five firms/divisions that received the award in several years. We excluded the multiple incidences and retained the firm only once. Our test sample includes a total of 18 award recipients. Among these 18 recipients, 11 are subdivisions. However, because division data are not available, we included the entire firm in our test sample. The sample selection procedure is described in panel A of Table I.

We form matching samples by including firms in the same three-digit SIC industry codes as the award recipients, according to the award winners' main SIC codes. We use three-digit instead of four-digit SIC codes because the later would form industries with too few member firms to identify matching firm by size. The matching firm must have the same three-digit industry code and similar in sales revenue to the award winners in the award years. A total of 18 firms were selected to form the matching sample.

The firms in the test sample (award winners) are substantially larger in size than the matching sample firms. The mean (median) sales value for award recipients is \$30,218 (\$15,873) million, while for the matching firms it is \$20,450 (\$7,413) million. Total assets exhibit similar pattern with \$51,026 (\$14,679) million for award recipients and \$45,719 (\$7,655) million for matching firms. In most of the cases, the award winners are the largest firms in the three-digit SIC industry codes, and thus we are forced to choose the second largest firm in the industry to include in our matching sample. This size difference could affect our univariate tests when we compare the performance indices directly between the two samples. We thus include size as a control variable in our multivariate tests to control for the size effect on our tests.

	<i>n</i>	
<i>Panel A: sample construction</i>		
Total number of recipients between 1988 and 2002	51	
Minus:		
Not-for-profit organizations	4	
Private companies, or a division of	18	
Division of foreign companies	1	
Being acquired or merged after receiving Award	5	
Multiple divisions for same firm	5	
Unique recipients in test sample	18	
Award for an entire firm	6	
Award for a division	12	
	Award winners	Match sample
<i>Panel B: industry distribution of test and match sample</i>		
Sample distribution by firm's main two-digit SIC codes		
Paper, Printing, Publishing and Allied Products (26-27)	1	1
Chemicals and Allied Products (28)	1	1
Rubber and Plastic Products (30)	1	1
Primary and Fabricated Metals and Machinery (33-34)	1	1
Industrial and Commercial Machinery (35)	3	3
Electric and Transportation Equipments (36-37)	3	3
Photo, Watch, Jewelry, Sporting Products (38-39)	3	3
Air Transportation (45)	1	1
Communications (48)	1	1
Security and Commodity Brokers (62)	2	2
Business Services (73)	1	1
Total	18	18
Diversification status		
Single industry firms	6	8
Multi-industry firms	12	10
Note: This Table demonstrates sample construction procedure and industry distribution. The test sample includes Baldrige National Quality Award winners during 1988-2002. The recipient's identity is obtained from Baldrige National Quality Program Web site at www.quality.nist.gov/ Matching sample firms are from the same primary industry with closest sales value as the Award winners. Several firms received awards at different years for different divisions. In such cases duplicated incidences are deleted. Data are from the COMPUSTAT Annual and Business Segment (CBS) file. Firms with multiple industry segments are those reporting more than one industry activity on CBS files		

Table I.
Sample selection and classification

Panel B in Table I shows a sample distribution by firm primary SIC codes. The sample covers a wide spectrum of manufacturing and services firms without clear concentration on any single industry.

Industry benchmarking

Panel B of Table I also shows that the majority of our sample firms, 12 out of 18, have activities in multiple industries. Similarly, ten out of 18 firms in our control sample also engage in activities in multiple industries. These multi-activity firms raise a compatibility issue. Although we construct matching samples by matching firms' primary SIC codes, the firms might not match in terms of their business activities in



other industries and in their industry compositions. To deal with this issue, we focus on the industry adjusted values in both the univariate and multivariate tests.

We construct industry benchmarks by computing several industry median accounting performance metrics and use these median values to compare with the firm's actual accounting performance metrics. For firms with activities in multiple industries, we compute the weighted average of industry medians of all industries in which the firm operates. The median value of each industry is computed using all single activity firms in that industry. We then compute the industry benchmark for a particular multi-activity firm by taking a weighted average of the median values from all industries in which the multi-activity firm has operations. The weight is the ratio of firm's segment sales to total sales. This approach is based on the industry adjustment procedure developed in Berger and Ofek (1995) and has been used in many other studies in accounting and finance (e.g. Bodnar *et al.*, 1997; Denis *et al.*, 2002). A numeric example is provided in [1]. All industry benchmark performance indices in column (b) of Table II are computed in this fashion.

Conventional and industry-adjusted value measures

To measure whether investors value award winners higher than other firms, we compute three conventional value measures. Our first measure is a market-to-book ratio, denoted as MTB and measured as the total market value of assets to the book value of assets for the firm. The market value of assets is defined as the sum of the market value of equity plus the book value of liabilities and preferred stock. This measure is a close proxy for Tobin's q , which is the value measure used in the studies by Morck and Yeung (1991) and Lang and Stulz (1994)[2]. The second measure is the standard price to earnings per share ratio and is denoted as PE. The third measure is an excess value ratio, denoted as EV and measured as the market value of common equity minus the book value of common equity divided by total sales. This is the value measure used in the studies of Errunza and Senbet (1981, 1984) and Kim and Lyn (1986). All these three measures have drawbacks since they are not adjusted for industry effects, thus making comparison difficult between firms with different industry compositions. These measures are also affected by fluctuations in firms' assets value and earnings.

To establish a compatible value measure across firms, we create an industry adjusted-value measure, whereby the market value of each firm is compared to an imputed market value of firm's industrial segments. This industry-adjusted value is developed by Berger and Ofek (1995) and used in several other papers (e.g. Bodnar *et al.*, 1997; Denis *et al.*, 2002). We denote this fourth value measure as VM. To allow for benchmarking against single-activity firms, the imputed value for each industrial segment of diversified firms is based upon the industry median market-to-sales ratios of single-activity firms (for full details on this measure see the Appendix). Thus, the firm imputed value is the estimated market value of the firm based on industry median value multiples in which the firm has business operation. We use this value measure in our multivariate tests.

To calculate this adjusted-value measure, we require each firm-year observation to have data on total market value (defined as the sum of the market value of common equity plus the book value of liabilities) and industrial segment sales data that reconcile with total sales (the sum of segment sales must be within ± 1 percent of

Table II.
Descriptive statistics

	t-score/Z-score (a)-(b)	Industry median benchmark (b)	Award winners (a)	Match sample (c)	t-score/Z-score (a)-(c)
Total firm-year observations	157	157	157	157	-
Profit margin (EBIT on sales)	-5.630***	0.0534	0.1133	0.1260	0.960
Median	-3.147***	0.0659	0.0904	0.1035	0.740
Return on assets	-2.160**	0.0793	0.0898	0.0908	0.150
Median	-2.380***	0.0782	0.0908	0.0866	-0.114
Sales per employee	-3.790***	191	231	239	0.590
Median	-4.520***	180	215	204	0.352
Income per employee	-3.540***	16	33	41	1.030
Median	-4.044***	12	19	21	1.256
Assets turnover (sales on assets)	3.320***	1.1192	0.9691	0.8816	-2.120**
Median	3.945***	1.1196	0.9081	0.9219	0.056
Inventory turnover (CGS over inventory)	0.580	11.9868	11.0261	8.5745	-1.800*
Median	-2.321**	5.3848	6.3835	5.2778	-3.028***
Receivable turnover (sales over receivables)	5.380***	7.2995	5.4203	5.8454	1.180
Median	2.580***	6.3783	5.7745	5.3630	-2.009**
Debt to assets ratio	-4.660***	0.2134	0.2881	0.3081	1.040
Median	-2.885***	0.2011	0.2834	0.2767	-0.402
Capital expenditure over sales	-2.750***	0.0693	0.0895	0.0812	-1.200
Median	-4.977***	0.0451	0.0805	0.0599	-2.680***
Research and development expense over sales	0.540	0.0499	0.0466	0.0423	-0.930
Median	-1.781**	0.0245	0.0462	0.0406	-1.084
Advertising expense over sales	-7.870***	0.0016	0.0089	0.0081	-0.570
Median	-4.193***	0.0000	0.0014	0.0000	-0.403

Notes: This Table provides descriptive statistics and sample difference tests for Award Winners (a) and firms in match sample (c). The table also provides descriptive statistics and sample difference tests between Award winners and industrial benchmark (b). The matching sample includes firms that are closest in sales value in the award year and in the same industry as identified by Award winners' main three-digit SIC code. The industry means/medians that we use as industry benchmark are the weighted average of industry medians, using test firm segment sales as weights. The mean and median of an industry are computed using single-segment firms in the same industry. We keep all data from award year to year 2002 for all firms wherever the data are available. Difference test for mean is based on two-sample *t*-test and medians the signed-rank tests. All data are from COMPUSTAT Annual Industrial and Full Coverage files and the Business Information File (BIF). The significant level: *** significant at 1 percent level, ** 5 percent, and * 10 percent

consolidated sales). The imputed value of a firm's activity in a particular industry is determined from the median market value-to-sales ratio for all single-activity firms in that particular industry for that particular year. In obtaining the multiplier for a particular industry, we use the narrowest SIC code grouping that includes at least five single activity firms in that industry for that year. We restrict the sample to firms that report at least \$20 million in sales in order to avoid distortion of industry medians by small firms.

The representative industry multiplier for each year is applied to each firm's annual reported sales in that industry for that year to create the imputed market value for that activity. For single activity firms, this result becomes the imputed value of the firm. For multi-activity firms, the imputed value of each industrial segment is summed to generate a total imputed value of the firm. By definition, this imputed value represents an estimate of the value of the firm if all of its activities were valued as stand-alone firms. The natural logarithm of the ratio of the firm's total market value to this imputed value, denoted VM, is our adjusted-value measure. When this ratio is positive, it indicates the firm, if single activity, is more valuable than the median firm in that industry adjusted for the level of sales. If the firm is designated as a multi-activity firm, a positive ratio indicates that the firm is more valuable than the portfolio of representative single activity firms in the same industries with comparable sales levels. When this ratio is less than zero, the firm is less valuable than its comparable single-activity benchmark(s).

IV. Descriptive statistics

Data source

We begin by identifying all firms in the industries in which our sample firms operate on COMPUSTAT's Annual Industrial and Full-Coverage files, incorporated in the USA, and covered by COMPUSTAT's Business Information (CBI) file over the period 1984-2002[3]. We identify the status of a firm's industry activity from the CBI Industrial Segment databases. The segmental data are generated as part of the disclosure requirements under the *Statement of Financial Accounting Standards No. 14* (FASB, 1976) and No. 131 (FASB, 1998), which supersedes No. 14 and is effective for fiscal year 1998. Firms are required to report data for any activity segment making up more than 10 percent of the firm's consolidated revenues, operating income, or identifiable assets. The basis of segmentation is left to the discretion of the firm, but is generally differentiated at the four-digit SIC code level. We identify any firm reporting information in more than one industrial segment on the CIS tape as being industrially diversified (multi-activity) for that year. Firms that report only one industrial segment are considered as single activity firms. These firms are used to compute industry medians, which act as a benchmark for multi-activity firms.

Sample characteristics

Table II provides descriptive statistics on industry benchmark, award winners and the matching firm sample. Columns (a) and (c) present data for award winners and matching samples, respectively. Column (b) presents data for industry medians, which are benchmarks used to compare with the test samples. We compute several statistics for each of the three groups of performance metrics: profitability, assets utility ratios, and factors that potentially affect the value of the firm. Profitability measures include

profit margin, return on assets, sales per employee, and income per employee. Assets utility ratios include assets turnover, inventory turnover, and accounts receivable turnover ratios. Factors affecting firm value include debt to assets ratio, capital expenditure to sales, research and development (R&D) expense to sales, and advertising expense to sales ratios. We compute two sample *t*-tests of differences between sample means, and a signed rank test for test of differences between sample medians. The statistics show that there are basically no significant differences between the award winners and matching sample firms across profitability indices. There are significant differences on inventory and account receivable turnover ratios. However, the difference is not significant on the total assets turnover ratio. There are significant differences on the capital expenditure over sales ratios, suggesting award winners spend more on capital expenditure. Since these differences can affect firm value, we need to control for these differences when studying the value differences between the award winners and matching samples.

Comparing the award winners to industry median benchmark reveals that the award recipients are more profitable, have lower assets utilization ratios and higher debt to assets ratios, and spends more on capital expenditure, R&D, and advertising per every dollar of sales. However, the aforementioned characteristics are mostly attributable to the size differences between the test sample and the industry median firms. As alluded to earlier, the award winners are the largest firms in their industries and we expect them to show higher profitability, lower assets utilization, and higher debt usage. We also expect these firms to spend more aggressively on capital expenditure, R&D, and advertising. These characteristics, however, are not necessarily indicative of whether investors value them higher than the other firms in the industry.

V. Empirical investigation of firm values

Univariate tests

Panel A of Table III displays the summary statistics for all value measures for both award winners and matching sample firms. We first report the three conventional value measures that are not adjusted for industry effects. Industry adjusted value measures VM are provided as comparison. In this univariate comparison, we emphasize the median rather than the mean due to extreme values on both ends, which might affect the mean. The M2B and PE ratios are not significant at the conventional level. With respect to EV, there are no significant differences between the two groups. However, due to the diversity of the firms, the different industry structure and composition, further testing is required.

To eliminate the industry effect on firm value, we emphasize the industry adjusted value measure VM. We show that both mean and median VM for award winners are positive (0.0791 and 0.0568), indicating their actual values are greater than the imputed industry benchmarks. The mean and median VM for matching sample are much smaller with the median less than zero (0.0103 and -0.0078), indicating the median matching sample firm is valued close to or below the imputed industry benchmarks. The between sample *t*-test and signed-rank test reveal the VM for award winners is significantly greater than that for the matching sample firms at 5 percent significance level. These results indicate award winners are much more valuable than the comparable firms in the matching sample.

Panel A: between-sample tests on firm values

		Award winners	Match sample	t-score/ Z-score
<i>Common value measures</i>				
Total firm-year observations		157	157	—
Market-to-book value equity (MTB)	Mean	3.3709	3.1349	-0.300
	Median	2.8584	2.4639	-1.495*
Price-to-earnings ratio (PE)	Mean	-2.0948	-0.1162	0.080
	Median	16.5689	14.4791	-1.615*
Excess value to sales (EV)	Mean	0.9015	0.9159	0.100
	Median	0.5332	0.5450	0.115
<i>Industry-adjusted value measures</i>				
Market value of firm to sales (VM)	Mean	0.0791	0.0103	-1.030
	Median	0.0568	-0.0078	-1.889**
		Post-Award years	Before-Award years	t-score/ Z-score

Panel B: value differences for award winners in different years relative to Award years

<i>Post-Award vs before-Award years</i>				
Number of observations		139	138	—
Market-to-book value equity	Mean	3.4500	2.0039	-4.700***
	Median	2.8299	1.7733	3.745***
Price-to-earnings ratio	Mean	16.8908	11.9226	-1.230
	Median	16.7928	12.0914	1.731*
Excess value to sales	Mean	0.9391	0.4519	1.260
	Median	0.5429	0.2838	-1.234
Market value of firm to sales (VM) – industry-adjusted	Mean	0.0785	0.0942	0.320
	Median	0.0603	0.0717	-0.646
<i>Award year vs before-Award years</i>				
		Award year	Before-award years	t-score/ Z-score
Number of observations		18	138	—
Market-to-book value equity (MTB)	Mean	2.7193	2.0039	-2.230**
	Median	3.0837	1.7733	1.987**
Price-to-earnings ratio (PE)	Mean	8.2182	11.9226	0.910
	Median	14.2268	12.0914	0.280
Excess value to sales (EV)	Mean	0.5920	0.4519	-1.200
	Median	0.5211	0.2838	1.516*
Market value of firm to sales (VM) – industry-adjusted	Mean	0.0839	0.0942	0.200
	Median	0.0383	0.0717	-0.967

Notes: The Table shows the differences for common value measures between Award winners and matching firms, and between years before, on, and after Awards for award winners. Test of differences for mean is based on two-sample *t*-test and medians the signed-rank tests. Panel A displays market to book ratio, PE ratio, excess value to sales ratio, and industry-adjusted value measure for Award winners and matching firms. The industry-adjusted value measures are adjusted for industry effects and calculated in a fashion similar to that used by Berger and Ofek (1995). Panel B provides the same value measures for Award winners between years before, on, and after award years. All data are obtained from COMPUSTAT Annual files and the COMPUSTAT Business Information File. The significant level: *** significant at 1 percent level, ** 5 percent, and * 10 percent

Table III.
Univariate comparisons
of value measures
between Award winners
and matching firms

This result is consistent with the theory that the Baldrige Award is awarded to the right companies – companies that are perceived to be better performers by investors. However, we must be cautious on the inference based on univariate test. A firm's value is affected by many factors such as size, leverage, intangible assets, management, etc. We need to control for the factors that also affect the value in order to draw conclusion on whether award recipients are indeed more valuable than other firms in the market. We thus turn to multivariate analysis.

Multivariate test

In this section we seek to isolate further the value differences between award winners and matching firms. To do this, we use a multivariate regression to control for other value-relevant firm characteristics. We use a series of control variables derived from previous research on firm value. Morck and Yeung (1991) provide a theoretical justification for controlling for R&D and advertising expenditures as proxies for firm specific assets that may lead to economic rents. They also control for leverage as a proxy for any financing benefits. Berger and Ofek (1995) demonstrate the importance of controlling for measures of profitability, growth opportunities (capital expenditure), and firm size as factors that could affect excess value.

The dependent variable, our adjusted-value measure from the previous section, VM, is a relative measure. We therefore also measure the corporate control variables in a relative form[4]. Thus, for each firm, the corporate control variables are measured as the values for the firm relative to the value of its benchmark firm each year. Thus our multivariate regression is:

$$VM = \alpha_0 + \alpha_1 \text{Dummy} + \alpha_3 \text{Size} + \alpha_4 \text{Leverage} + \alpha_5 \frac{\text{EBIT}}{\text{Sales}} + \alpha_6 \frac{\text{Capex}}{\text{Sales}} + \alpha_7 \frac{\text{R\&D}}{\text{Sales}} + \alpha_8 \frac{\text{Advert}}{\text{Sales}} + \varepsilon_t$$

where:

- | | |
|------------|---|
| VM | is the adjusted-value measure derived in the previous section. |
| Dummy | is dummy variables. We use several different dummy variables in several different models, including:
FDummy – Firm dummy, which takes value 1 if the firm is award winner and zero otherwise;
ADummy – Time dummy, which takes value 1 if it is award year and zero otherwise; and
PDummy – Period dummy, which takes value 1 if it is a year after the firm receive award and zero otherwise. |
| Size | is the log of the difference between the firm's total sales and that of its benchmark firm(s). |
| Leverage | is the difference between the firm's debt/total asset ratio and that of its benchmark firm(s). |
| EBIT/Sales | is the difference between the ratio of the firm's earnings before interest and taxes to its total sales and that of its benchmark firm(s). |

Capex/Sales is the difference between the firm's capital expenditures to sales ratio and that of its benchmark firm(s).

R&D/Sales is the difference between the firm's R&D expenditures to sales ratio and that of its benchmark firm(s).

Advert/Sales is the difference between the firm's advertising expenditures to sales ratio and that of its benchmark firm(s).

Table IV presents the result of the multivariate regression. Focusing first on the corporate control variables, the coefficients are generally consistent with economic

Independent variables	Parameter estimates			
	Model 1	Model 2	Model 3	Model 4
Intercept	0.05502 (0.405)	0.2986 (0.022)	0.1861 (0.082)	0.0521 (0.435)
FDummy	0.11424 (0.009)			0.1246 (0.021)
ADummy		-0.1047 (0.156)		
PDummy			0.0128 (0.823)	
FDummy × PDummy				-0.0192 (0.743)
Log of size	-0.0590 (<0.001)	-0.0738 (0.002)	-0.0598 (0.005)	-0.0585 (<0.001)
EBIT to sales	2.4829 (<0.001)	2.3542 (<0.001)	2.3735 (<0.001)	2.4848 (<0.001)
Debt to assets	0.7050 (<0.001)	0.7171 (<0.001)	0.7653 (<0.001)	0.7044 (<0.001)
Capital exp. to sales	2.1414 (<0.001)	2.7383 (<0.001)	2.5807 (<0.001)	2.1475 (<0.001)
R&D exp. to sales	6.2087 (<0.001)	6.6494 (<0.001)	6.9499 (<0.001)	6.1824 (<0.001)
Adv. exp. to sales	-2.1854 (0.250)	-6.7818 (0.015)	-6.3154 (0.026)	-2.1112 (0.270)
Number obs. adj.	205	112	185	358
R-squared	0.6503	0.671	0.666	0.649

Notes: OLS estimates of industry-adjusted value measure on Award winner indicator and relative corporate control variables. This value measure is adjusted for industry effects and measured as the natural logarithm of the ratio of a firm's total market capitalization to its imputed capitalization. The firm's imputed capitalization is equal to the firm's sales multiplied by the median ratio of capitalization to sales among all single-activity firms in that industry with sales greater than \$20 million. Extreme values of this measure above 1.386 or below Number - 1.386, implying actual market values either more than four times or less than one-fourth of the imputed value, are deleted. Indicator variables FDummy, takes a value of 1 if the firm is an Award winner and zero otherwise. The period dummy, ADummy takes value 1 if the year is an Award year for the firm and zero otherwise. PDummy takes a value 1 if it is the year a post-Award year and 0 otherwise. The other control variables are all measured relative to the industry median measures. The numbers in the first line are the OLS estimators and the second the significance level or *p*-value for a one-tailed *t*-test. Models 2 and 3 run on test sample only and other models run on both test and match samples

Table IV.
Regression analysis
dependent variable –
industry-adjusted value
measures

intuition and the results of previous studies (e.g. Morck and Yeung, 1991; Berger and Ofek, 1995). For all models, high relative profitability (EBIT/Sales), Leverage (Debt/Sales), R&D intensity (R&D/Sales), and investment opportunities (Capex/Sales) are all significantly associated with greater value. Firm size is negatively related to value, indicating large firms are valued less than smaller firms. Advertising intensity (Advert/Sales) is unexpectedly negative, however, not significantly so.

The foremost important evidence in this study is that, after controlling for all other influences on firm value, in model 1, the FDummy remains positive 0.11424 and highly significant at 0.01 level. This suggests that the award winners are valued 11.4 percent higher than the firms in the matching samples. This indicates that the award winners are valued higher than the otherwise comparable firms (i.e. same industrial structure, corporate characteristics and time).

Source of value

Model 1 shows the award winners are about 11.4 percent higher in value than the non-recipients, after all differences such as industry structure and corporate characteristics are controlled for. We can conclude from these facts that award winners are more valuable firms. However, it is still unknown whether winning the award adds value to the firm or the award recipients are to begin with the more successful firms. The award could add value to its recipients because it signals effective leadership and a superior management quality, characteristics that are not previously known to the market. To investigate this possibility, we run univariate and multivariate analysis on the test sample for periods before and after award, and between the award year and all subsequent years following the award. The results are reported in panel B of Table III and models 2-4 in Table IV.

Panel B of Table III presents the four firm value measures for award winners in periods before, on, and after the awards years. We first divide firm-year observations for award winners into a post-award period and a pre-award period, depending on whether a particular data year is before or after the year when the firm received the award. We use a two sample *t*-tests for differences in means, and signed-rank test for medians, between different periods. If the award creates value either because of publicity or significant improvement in quality, we should be able to observe the value difference between these two different periods. We should also expect the after-award period to have higher firm value. However, the data do not support this hypothesis. While MTB shows significant, and PE marginally significant differences, differences in the EV measure are not significant. After adjusting for industry effect, the VM measure shows that the value of firms is not significantly different after receiving the award.

We further test the value differences between award-years, in which the firms win their awards, and before-award periods. Results are also inclusive with almost no significant differences across all of the value measures except for MTB. This indicates the award winners do not become more valuable in the period when they receive the award. However, as discussed previously, many factors affect firm value. We need to control for other factors that also affect value in order to examine the true differences between these periods.

Models 2-4 in Table IV report multivariate tests on value differences between different periods relative to award years. We create two dummy variables: ADummy

and PDummy. ADummy takes value 1 if the data year is an award year and zero otherwise, and PDummy takes value 1 if the data year is a year after receiving the award and zero otherwise. We run two multivariate regressions. Model 2 includes ADummy and model 3 includes the PDummy and both models are run only on the test sample. Both of these two dummies are insignificant, suggesting there is no significant value difference when comparing award year and years subsequent to receiving the awards to years prior to receiving the awards.

Model 4 is run on all observations including the matching sample. We include the interaction effect between FDummy and PDummy. The FDummy should capture the value differences between the award winners and matching sample firms. The interactive dummy variables ($F_{dummy} \times PDummy$) should capture additional value differences of the award winners in the after-award period when compared with the matching samples. Only the FDummy remains significant. The interactive dummy is not significant indicating that there are no value differences for award winners at the different periods relative to the award year. We thus conclude that award winners are more successful firms, but the award itself is not the source for differences in firm values.

VI. Conclusion

We investigate several accounting performance metrics and firm value of 18 Baldrige Award winners using both raw and industry adjusted measures. We compare these indices with industry benchmarks based on the median indices for industries in which the firm operates. We also compare performance metrics with a group of similar sized firms that are selected from the same industries as the award winners in the award years. We find award winners perform significantly better than the industry medians in terms of profitability and assets utilization. They are also more leveraged with debt and spend more on capital expenditure, R&D and advertising, which, *ceteris paribus*, could potentially result in greater future growth.

In our tests on firm value, we construct various firm value measures such as market-to-book ratio, PE ratio, excess-value to sales ratio, and an industry adjusted value measure. We further use an industry adjustment procedure developed in the finance literature to ensure the comparability of these measures across firms. In our univariate tests, we find award winners are more valuable than the control group of firms, particularly on the industry adjusted value measures. Our multivariate regression test further confirms that the award winners are more valuable than the match sample firms, after controlling for several firm characteristics that also affect firm value. Additionally, we investigate the source of the value premium for award winners. We find there are basically no differences in value for award winners between the different periods relative to the award years.

These results suggest that the award winners are more successful firms and are valued higher by investors. However, the award itself has not created value since it did not create any value differences subsequent to the firms receiving the awards.

Notes

1. For example, assume a firm has business segments in industry A, B, and C, and its segment sales to total sales ratio is 1/2, 1/4 and 1/4 in each of its business segments, respectively; also the industry median profit margin in the three industries are 25 percent, 30 percent, and 50

percent, respectively. The industry benchmark profit margin which we use to compare the actual performance of the firm is: Adjusted Profit Margin = $1/2 \times 25$ percent + $1/4 \times 30$ percent + $1/4 \times 50$ percent = 32.5 percent.

2. This measure differs from a true measure of Tobin's q in that it uses book values for liabilities and normalizes by the book value of tangible assets. Tobin's q generally involves estimating both the market value of a firm's liabilities as well as the market value (replacement cost) of the tangible assets. Morck and Yeung (1991) report that they obtain very similar results to those reported in their study when they use a simple market-to-book ratio instead of their measure of Tobin's q .
3. We require data on earnings, sales, assets, share price, number of shares outstanding at the end of the year, book value of common equity, total liabilities, and assets. Incorporation in the USA is determined by a zero value for the FINC variable.
4. The use of a relative measure for accounting variables in the model is not part of the Berger and Ofek (1995) study, but is a modification included by Bodnar *et al.* (1997) and Denis *et al.* (2002).

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Further reading

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Appendix. Industry-adjusted value measure

The majority, 12 out of 18 (ten out of 18), of firms in test (matching) samples are firms with activities in multiple industries. Firm performance and value measures are not comparable between samples without adjusting the effect of industry effect and composition. We use the industry adjusting procedure developed by Berger and Ofek (1995) and used in many other studies to compute industry adjusted value measures. We compute the value measure in the following fashion:

$$\text{Adjusted value-measure}_{i,t} = \ln \left(\frac{\text{Market value of assets}_{i,t}}{\text{Imputed value of assets}_{i,t}} \right) \quad (A1)$$

$$\text{Imputed value of assets}_{i,t} = \sum_{k=1}^n (SS_{i,t,k} \cdot \gamma_k) \quad (A2)$$

where:

Market value of assets _{i,t} = firm's total asset value (market value of common equity plus book value of liabilities and preferred stocks) for firm i at year t .

Inputed value of assets _{<i>i,t</i>}	= sum of imputed value of assets of firm's segments as stand-alone activities.
SS _{<i>i,t,k</i>}	= sales revenue in industry segment <i>k</i> reported by firm <i>i</i> at year <i>t</i> .
γ_k	= median total market value of assets-to-sales ratio for the single activity firms in industry <i>k</i> .
<i>n</i>	= number of industrial segments reported by firm <i>i</i> at year <i>t</i> .
ln	= the natural logarithm function.

Equation (A1) shows the adjusted-value measure as the natural logarithm of the ratio of the firm's actual value to its imputed value. The firm's imputed value is expressed in equation (A2) as the sum of the imputed asset value of each segment. To compute the segment imputed asset value, we multiply an industry median market value of assets -to-sales multiplier for single-activity firms by the segment sales in the same industry reported by the firm. Thus the imputed value of each segment represents the imputed market value of assets of firm's industry segment as if it is a stand-alone single-activity firm. We repeated this process for each of the firm's segments and then sum them to obtain the firm's imputed market value of assets.

We find the firm's adjusted-value measure by taking the natural logarithm of the ratio of actual to imputed value. The measure will have a value of less than zero if the actual value of firm is less than the imputed market capitalization of its segments based upon the median market capital-to-sales ratio of single-activity firms in each industry. This suggests that a firm is less valuable than the sum of its components on a standalone basis. Similarly, the measure will have a positive value if the actual value of the firm is more than the imputed market value. This suggests that a firm is more valuable than the sum of its components on a stand-alone basis.