

**The Impact of Total Quality Management (TQM) on Financial Performance:  
Evidence from Quality Award Winners**

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## **Abstract**

Total Quality Management (TQM) is periodically lambasted by management gurus and the business media for its supposedly lackluster impact on financial performance. This paper presents objective evidence on whether this criticism is indeed justified. The evidence is based on a study of nearly 600 quality award winners. Three critical issues are addressed in this paper. First, we discuss the ongoing debate on TQM's ability to significantly improve financial performance, the reasons for this debate, and the importance of resolving this debate one way or the other. Second, we present evidence on the financial results that publicly traded organizations have achieved from implementing TQM effectively. Financial results are measured using variables such as stock returns, operating income, sales, and costs. Third, we discuss how the financial results vary by organizational characteristics such as size, capital intensity, extent of diversification, and the maturity of the TQM implementation. This evidence helps set realistic expectations of what different organizations can expect to get from TQM. The paper also offers a methodology, including various performance measures and data sources that organizations can use to link their quality initiatives to financial results.

## 1.0 The controversy about the value of TQM

Total Quality Management (TQM) - the management paradigm based on the principles of total customer satisfaction, employee involvement, continuous improvement, and long-term partnerships with suppliers and customers - has recently been getting a bad rap in the popular business press regarding its ability to improve financial performance. "Is TQM Dead" was the question posed by *USA Today* (1995) when it featured an article announcing the 1995 Baldrige Award. A recent *Wall Street Journal* article raised the issue "Is Total Quality Management (TQM) yesterday's news or does it still shine?". *The Washington Post* (1993) wrote about "Totaled Quality Management", *The Economist* (1992, 1995) talked about "The Cracks in Quality" and the "Straining of Quality", and an article on management fads in *Business Week* (Byrne, 1997) proclaimed that "TQM is as dead as a pet rock". Among other things, TQM has been labeled as the biggest fad in corporate management that is now floundering; a fad with which many firms have become disillusioned and discouraged; or simply as a fad of the month whose time has come and gone.

As expected, proponents of TQM have responded to the negative publicity about TQM. Some can't help but find it ironic that the business writers and gurus that are thrashing TQM are the very same ones that in the 1980's were singing praises about TQM and promoting it as the paradigm that every organization must adopt. Others have pointed to the popularity of quality awards at the state and national levels as evidence that TQM is well and alive. For example, besides the Malcolm Baldrige National Quality Award, 44 out of the 50 States in USA now have their own quality award systems in place. In addition, about 50 new quality award systems have been initiated outside of USA, many of which are at the national level. They also point out that there is growing interest among organizations to use the Baldrige and other quality award criteria

for internal self-assessment. In addition, demand for TQM training seminars is still growing. To many, all this suggests that the popularity of TQM is growing not declining.

Others have argued that the very popularity of TQM was bound to create criticisms. They suggest that there is no need to react to the negative publicity as it will go away with time. Unfortunately, this can be dangerous as the reality is that the negative publicity has caused many firms to question the relationship between TQM and financial performance. A recent survey of 27 vice presidents of quality from Fortune 500 companies indicates that nearly 75% of them are under considerable pressure to show the payoff from TQM. An article in Fortune (Rigby, 1998) reported survey results about tools that were management's favorites in 1997. TQM was ranked 10th among all tools, with 16% of respondents indicating they were extremely satisfied with it and 14% indicating dissatisfaction.

## **2.0 Why is there a controversy about TQM?**

To resolve the controversy about the value of TQM, one must begin by looking at the sources that have generated the controversy. Much of the criticism is based on evidence from surveys conducted during the early 1990's. Let us examine some of this evidence:

- In a survey of 500 companies by Arthur D. Little, 36% indicated that TQM was having a significant impact on their ability to compete.
- A survey by A. T. Kearney of 100 British firms indicated that 20% believed that their quality programs had achieved tangible results.
- A study of 30 quality programs by McKinsey & Co. found that two-thirds of them had stalled or fallen short of yielding improvements.

Although these survey results have been used to make a case against TQM, it is worth noting that these results are nothing more than opinions, perceptions, and impressions about the value of TQM. They do not present any objective data on the financial benefits obtained by the responding organizations. Furthermore, around the same time that these surveys were released, some organizations that were considered role models of TQM implementation faced significant problems. Examples include Florida Power & Light, a winner of the Demming Prize, and Wallace Co., a winner of the Malcolm Baldrige National Quality Award. Such examples provided more ammunition for critics, who made unreasonable extrapolations and conclusions about the value of TQM from these failures.

Many organizations adopted TQM with inflated expectations and a quick-fix mentality. TQM was expected to have answers to all the problems and a sure bet to reverse poor performance. When TQM did not deliver the hoped for results, it was deemed a failure. Furthermore, contrary to TQM's philosophy, many firms adopted it seeking instant and swift gratification. Often implementation efforts were measured against short-term financial performance. When short-term improvements did not materialize, many firms got disillusioned with TQM. This disillusionment and disappointment is perhaps getting reflected in managers' response to the various surveys mentioned earlier.

Competition from other paradigms have also created problems for the TQM movement. New paradigms such as re-engineering, customer-centered organizations, process-oriented organizations, learning organizations, supply-chain management, six sigma etc., have recently surfaced. It is interesting to note that some of these paradigms are basically a spin-off of key TQM concepts packaged and labeled differently. For example, six sigma was the centerpiece of Motorola's TQM initiative, but it is now being sold as something unique and different from TQM. Selling these paradigms was easy given the controversy about TQM.

The controversy about the value of TQM has also been fueled by the inept defensive offered by its proponents. Instead of providing hard facts to show that TQM works, many have argued why TQM's theory of focusing on customer satisfaction, continuous improvement, and employee involvement should lead to success. Others have argued, again without any data, that if TQM does not improve corporate financial performance than what does (Paton 1994)? Brad Stratton's (1993) editorial in Quality Progress essentially stated that although you cannot link TQM to financial performance, organizations should still invest in it. This surely does not help resolve the controversy about TQM. In fact, it provides more reasons to lambaste TQM.

Nobody denies that there are organizations that have benefited immensely from successful implementations of TQM. Obvious examples that come to mind are Motorola, Federal Express, Xerox, and Sollectron. The benefits realized by these organizations have been mentioned in various seminars, conferences, and articles. While some of these achievements are definitely very impressive, the evidence is anecdotal. Furthermore, these anecdotes rarely account for the fact that performance improvements could also be influenced by factors such as industry, economy, and social factors, which may have nothing to do with TQM. We believe that this has raised the expectations and hype about the value of TQM, some of which has come back to haunt the TQM movement.

### **3.0 Resolving the Controversy about the value of TQM**

As one reflects on the controversy about TQM, two issues come to mind. First, the controversy is based more on anecdotes, impressions, and opinions, but less on what one would consider to be scientific and objective evidence. The arguments advanced by both the detractors and proponents of TQM do not stand up to the standards of scientific evidence. We find this somewhat ironic since TQM proponents always point out that making decisions based on the

analysis of carefully collected rigorous data is a key core value of TQM. Yet, they seem to have ignored this core value in defending TQM.

Second, the controversy about TQM must be resolved one way or the other. Organizations that have already invested in TQM would like to know whether they have made the right decisions and whether they should continue investing. Many quality managers have indicated to us that even though their organizations have committed to TQM, they will need hard evidence to ensure that their senior managers continue to invest in it. Others have indicated to us that their organizations have backed away from investing in TQM because of the controversy about its value. The best way to resolve the controversy is to use objective and verifiable data to examine the strength of the relationship between TQM and financial performance.

For the last five years we have researched the financial impact of effective implementations TQM. This article reports key aspects of our methodology and some of our major findings. The bottom-line from our research is that effective TQM implementations significantly improve financial performance - it does payoff handsomely.

#### **4.0 Methodology used in the study**

There were four main steps in the methodology used in our research study:

1. Choosing the appropriate performance measures.
2. Gathering a sample of firms that have effectively implemented TQM.
3. Choosing a time period (when and over what time) for measuring performance.
4. Selecting appropriate benchmarks for comparing the performance of sample firms.

#### **Choice of Performance Measures**

To establish the value of TQM, it is important to link it to financial measures. The primary focus of our study was to examine the stock price performance of firms that have effectively implemented TQM. The reason is that stock price performance is widely reported and tracked, and easily understood. Stock price performance is of great interest to many stakeholders including senior management, employees, suppliers, mutual fund managers, institutional and other individual investors. Many believe that goal of a firm should be to maximize its share value. Clearly, it makes sense to use stock price performance as the primary performance measure for this study.

In the long-run stock prices are driven by profits (or net cash flows). Our study examined profit performance by estimating the changes in operating income, defined as net sales less cost of goods sold and selling and administrative expenses. This measures the profits generated from operations before interest and taxes. Operating income is influenced by changes in the growth rate and efficiency. Our study measured growth by estimating the percent change in sales, total assets, and employees. We measured improvement in efficiency by estimating the percent



change in return on sales and return on assets. Return on sales is the ratio of operating income to sales and measures the profit per dollar of sales. Return on assets is the ratio of operating income to assets and measures the profit per dollar of assets.

### **Gathering a sample of firms that have effectively implemented TQM.**

Any attempt to establish the link between TQM and financial performance must focus on firms that have implemented TQM effectively. This is important because while most firms will claim that they have implemented TQM, few are doing it effectively. Including non-effective implementers will obscure the impact of TQM. Effectively implementation means that the key principles of TQM such as focus on customer satisfaction, employee involvement, and continuous improvement are well accepted, practiced, and deployed within the firm.

We used the winning of quality awards as a proxy for effective implementation of TQM. A review of various quality award criteria confirmed that the core concepts and values emphasized are those that are widely considered to be the building blocks of effective TQM implementations. Awards are given after the applicant goes through a multi-level evaluation process where internal or external experts judge the applicant. A stringent process seems to be in place to ensure that winners are effectively implementing and practicing TQM.

Our sample represents award winners from about 140 different award givers, some of which are listed in Table 1. Many award givers are customers who have developed quality award systems for their suppliers. These include most major automobile manufacturing firms in the United States, and many other large manufacturing firms. Award givers also include independent organizations such as the National Institute of Standards and Technology (which administers the Baldrige award) and various states in the United States.

Overall the sample consists of 3000 different firms that have won quality awards. To avoid biases associated with asking winners to self-judge the impact of TQM, the sample of winners is further restricted to include only publicly traded firms. This provides the flexibility to use objective and historical financial data as far back as necessary, and to uniformly define performance measures. Furthermore, the financial information can be easily gathered from commercially available databases. The final sample consists of about 600 winners representing nearly 50 distinct two-digit Standard Industrial Classification (SIC) Codes, with 75% of the sample winners coming from the manufacturing sector.

### **Choosing a time period for examining the performance.**

Choosing when to begin measuring the performance and over what time period should the performance be measured are critical issues in linking TQM to financial performance. Ideally, one should begin to measure performance from the point in time when the firm first started implementing TQM. The measurement period should also include the time after the firm has effectively implemented its TQM program. Furthermore, as many experts have emphasized, TQM takes a long time to be fully absorbed and integrated in the normal operating mode of doing things at a firm. Hence, any attempt to establish the relationship between TQM and financial performance must examine performance over a long-time period.

We examined performance over two five-year periods. The first period -the post-implementation period- starts one year before and ends four years after the date the winners won their first quality award. Clearly, winners have a reasonably effective TQM implementation by the time they win their first quality award. Since, it takes award givers about 6 to 9 months to evaluate and certify the effectiveness of the implementation, we assumed that the winner's TQM

implementation was effective about a year before the date of winning the first award. Examining performance from this point provides an estimate of the financial impact of TQM implementations once they are effective.

The second period -the implementation period- starts six years before and ends one year before the date the winners won their first quality award. It is during this time periods that winners are implementing TQM and incurring the associated implementation costs. To provide a balanced perspective on the net benefits of TQM, it is important to estimate the magnitude of these costs.

Figure 1 depicts the determination of the two periods for a winner that won its first award in 1990. In this case the implementation period would cover the years from 1984 to 1989, and the post-implementation period would cover the years from 1989 to 1994. Similarly, for a winner that won its first award in 1988, the implementation and post-implementation periods would covers the years from 1982 to 1987 and 1987 to 1992, respectively. It is important to emphasize that the performance of all quality award winners is not examined over the same calendar time period. The time period is unique to each award winner and depends on when each won its first quality award.

### **Selecting appropriate benchmarks**

The performance of all firms is influenced by industry and economic conditions which may have nothing to do with whether firms have an effective TQM implementation. Benchmarks serve the purpose of adjusting a firm's performance for the relevant industry and economic influences. Stock market portfolios such as the S&P 500 were used to benchmark the stock price performance of award winners. For the other performance variables a sample of

benchmarks firms was generated by matching each award winner to a benchmark firm of similar size from the same industry.

## **5.0 Results**

### **Results for the implementation period**

No significant differences in performance are observed during the implementation period. Basically, there was no difference in the performance of the winners and the benchmarks. This is good news since one would have expected worsening performance during this period because of the direct and indirect costs in implementing TQM. It is plausible that during the implementation period winners find easy improvement opportunities. Capitalizing on these opportunities pays for the implementation costs. On the other hand, the results could also suggest that the implementation costs may not be as high as widely believed.

### **Stock price performance of award winners during the post-implementation period**

Results for the post-implementation period indicate that quality award winners outperformed the benchmarks on almost every performance measure. Figure 2 compares the stock price performance of award winners against the various benchmark portfolios using the following process. For each award winner, a hypothetical \$100 is invested in the winner's stock one year prior to the date of winning their first quality award. At the same time an equal amount is also invested in a benchmark portfolio. Both investments strategies are tracked for the next five year. At the end of five years the average stock price return from holding the stocks of the award winners is compared against the average returns from investing in the benchmark portfolio.

The results indicate that award winners significantly outperformed the benchmark portfolios. The stock prices of award winners increased by an average of 114% over the five-year period. Over this same time period an alternative strategy of investing a similar amount in S&P 500 Index and holding it over the same time period would have resulted in a 80% return. The difference of 34% is a statistically and economically significant level of outperformance - it translates to an average market value creation of an extra \$669 million. The chances of observing the difference of 34% purely by luck is about 1 out of 150.

Figure 2 also show that award winners outperformed a benchmark consisting of all stocks traded on the New York, American, and NASDAQ stock exchanges. This portfolio experienced a 76% gain as compared to the 114% gain from investing in award winners. Award winners also beat a benchmark consisting of firms in the same industry by 26% and a benchmark consisting of firms of similar size by 34%.

A more detailed analysis of the pattern of stock price outperformance reveals some additional and interesting insights. Figure 3 compares the stock price performance of the award winners against the S&P 500 Index on an annual basis for each of the five years in the post-implementation period. The award winners beat the S&P 500 Index in four out of the five years, with most of outperformance occurring from the third year onwards. Award winners beat the S&P 500 in the third year by 5%, fourth year by 7%, and in the fifth year by 12%.

Since award winners are likely to have an effective TQM implementation a year before they win their first quality award, the pattern of annual stock price performance of Figure 3 suggests that it might take a couple of years after effective implementation before the benefits of TQM begin to show up in the form of higher stock returns. Organizations should view TQM as a long-term investment and must allow time for its benefits to show up in financial performance.

To summarize, the overall evidence indicates that firms that have an effective TQM program do better in terms of stock price performance when compared to appropriate benchmarks.

### **Profit, growth, and efficiency performance of award winners during the post-implementation period**

Figure 4 depicts the performance of award winners and benchmark firms on accounting based performance measures. The differences are striking. Operating income for award winners increased by an average of 91% over the post-implementation period. This is in contrast to an average 43% increase over the same time period for the benchmark firms. The difference of 48% is a statistically and economically significant level of outperformance. The chances of observing this difference in operating profit purely by luck is about 1 out of 200.

Award winners also experienced higher growth as compared to the benchmark firms. Winners increased sales by 69% sales (compared to 32% for the benchmarks), increased total assets by 79% (compared to 37% for the benchmarks), and increased the number of employees by 23% (compared to 7% for the benchmarks). Winners also showed higher improvement in efficiency measures. The return on sales improved by 8% compared to no improvement for the benchmarks, and the return on assets improved by 9% compared to 6% for the benchmarks. These results clearly indicate that TQM does improve profitability, leads to higher growth, and improves efficiency. Furthermore, they provide additional validity to the winners' stock price performance shown in Figure 2. The improvement in profitability is the reason for the rise in stock prices of the award winners.

### **How the benefits of TQM vary by firm characteristics?**

Many firms are also interested to learn how the gains from TQM vary by firm characteristics so that they can set realistic expectations of what to expect from successful implementations of TQM. To provide insights into this issues, we segmented the sample of award winners by type of quality award won, capital intensity of the firm, size of the firm, and the extent of diversification. Results are examined separately for the various segments. Some interesting insights are obtained about how the extent of benefits from TQM vary by firm characteristics.

### **Independent versus customer award winners**

There are some very dramatic differences among firms that won independent awards such as the national and state quality awards, and those winning customer awards such as those given by Chrysler, Ford, and Texas Instruments, among others. The national and state awards have more comprehensive and stringent evaluation criteria, and use a multi-stage evaluation process conducted by independent third-party examiners. Thus, winning independent awards could indicate more mature TQM implementations when compared to the maturity of implementations at firms that have only won awards from their customers.

Consistent with this conjecture independent award winners significantly outperformed customer award winners (see Figure 5). For example, in terms of improvement in operating income independent award winners outperformed their benchmarks by an average of 73% whereas customer award winners outperformed their benchmarks by 33%. Independent award winners do better than customer award winners on sales (39% vs. 23% increase), on return on sales (19% vs. 9% increase), and return of assets (10% vs. 6% increase). Independent award

winners also do better on stock price performance. They outperformed the S&P 500 by 51% compared to the 26% outperformance of S&P 500 by customer award winners.

Although independent award winners do better than customer award winners, it is important to emphasize that winning customer awards also pays off since these winners do better than their corresponding benchmarks on all performance measures. Note that Figure 5 gives the performance numbers after adjusting for the performance of the benchmarks. However, in the long run a firm should benchmark their TQM implementations against the criteria and evaluation process used by independent award winners.

### **Low capital-intensive versus high capital-intensive award winners**

An important component of TQM is adopting practices such as employee training, involvement and empowerment, and information sharing. Employees are the driving force for improvements originating from activities such as suggestion programs, quality circles, cross-functional teams, and process improvement teams. Clearly, the opportunities for gains from these activities are likely to be higher in a less capital-intensive environment than in a more capital-intensive environment.

To test this conjecture, we segmented the sample of quality award winners into low and high capital-intensive winners. Capital intensity is measured as the ratio of net property, plant, and equipment to the number of employees. The median value of this ratio, \$25,000 of assets per employee, is used to segment the sample into low and high capital intensive winners. Winners with assets per employee less than \$25,000 are considered to be low capital-intensive and winners with assets per employee greater than \$25,000 as high capital-intensive.



Figure 6 shows that low capital-intensive award winners do better than high capital-intensive award winners on all performance variables except growth in employees. For example, in terms of improvement in operating income low capital-intensive winners outperformed their benchmarks by an average of 65% and high capital-intensive winners outperformed their benchmarks by 21%. Low capital-intensive award winners do better than high capital intensive winners on sales (33% vs. 25% increase), on return on sales (17% vs. 7% increase), and return of assets (10% vs. 4% increase). Also note that Figure 6 indicates that both low and high capital-intensive winners gain from effective TQM implementations as both these segments outperform their respective benchmarks.

### **Smaller versus larger award winners**

Figure 7 compares the performance of smaller and larger award winners. The median total asset value of the sample, \$600 million, is used to segment the sample. Winners with total assets below the median are considered small, and winners with assets greater than the median are considered large. The performance numbers in Figure 7 show that both the smaller and larger award winners gain from effective TQM implementations - both these segments outperform their respective benchmarks. Figure 7 also shows that smaller winners generally fared better than larger winners. Smaller winners experienced a 63% improvement in operating income (compared to 22% for larger winners), a 39% increase in sales (compared to 20% for larger winners), and a 17% improvement in return on sales (compared to 7% for larger winners).

The observation that smaller winners did better than larger winners is not that surprising considering the fact that many key elements of TQM such as teamwork, worker empowerment, and spirit of co-operation across functional departments are already present to some extent in

smaller firms. Additionally bringing change can be more difficult in larger firms. Clearly, the results do not support the conventional wisdom that TQM is less beneficial to smaller firms.

### **Focused versus diversified award winners**

Focused firms are likely to benefit more from TQM than diversified firms because the different operating units in a more focused firm are likely to be very similar in terms of organizational culture, technology, operating procedures, and competitive priorities. Therefore, the lessons learned from a successful TQM implementation in one operating unit can easily be implemented in other operating units. As operating units gain experience with TQM, the knowledge created in the process can be transferred at low cost to other units. Such economies of scale and learning synergies may not be present to the same extent in more diversified firms.

Figure 8 supports the conjecture regarding how the benefits of TQM will differ for focused and diversified firms. Focused award winners do better than diversified award winners on all performance variables except efficiency measures such as return on sales and return on assets. Focused winners experienced a 56% improvement in operating income (compared to 30% for diversified winners), a 39% increase in sales (compared to 20% for diversified winners), and a 7% improvement in return on sales (compared to 17% for diversified winners). Figure 8 also shows that both the focused and diversified award winners gain from effective TQM implementations as both these segments outperform their respective benchmarks.

## **6.0 Is TQM valuable?**

In contrast to the anecdotal and perceptual evidence that have been used by many experts to pass judgment on whether TQM is valuable or not, the evidence presented in this paper

provides a more factual, objective, and statistically valid assessment on the impact of TQM on financial performance. The message from the analysis of the financial performance of 600 quality award winners is clear and simple. When TQM is implemented effectively, financial performance improves dramatically. The criticism that TQM has produced lackluster economic gains is unwarranted. The proclamation that TQM is dead is premature. TQM is well and alive.

Our results should be reassuring to those firms that have made heavy investments in TQM and had to defend themselves against both internal and external critics of TQM. For those firms that were considering disbanding their TQM for some other management paradigms, these results should cause them to rethink their decision. It should also provide encouragement to those firms that have contemplated about adopting TQM but have been discouraged by the controversy about its potential payoff. One would hope that managers responsible for implementing TQM would use these results to debate, and perhaps put to rest, many questions that others might have about the legitimacy of TQM as a viable and effective management system.

Our results also support what many quality gurus have said repeatedly. Firms that want to implement TQM effectively must have patience. It is widely accepted that TQM takes a long time to implement as it requires major organizational changes in culture and employee mindset. Hence, the benefits will be realized in the long-run. The evidence reveals that even after effective implementation, it still takes a couple of years before financial performance starts to improve. This is in contrast to the expectations of many firms who sent employees for education and training on TQM methods and implemented a few other things, and then expected to see instant results. Managers that embrace TQM for quick gains will be surely disappointed. To get the benefits from TQM, one must be patient. It improves performance in the long-haul.

Firms should be realistic about what to expect from TQM. They should not be carried away by the hype associated with TQM. Keep in mind that TQM is a philosophy or foundation to develop a management system. A management system based on TQM can only improve the probability of making the right decisions. It cannot guarantee that all decisions will be right. For example, even the best performing Baldrige award winners have had periods of poor financial performance after winning the Baldrige award. Furthermore, as we have shown, organizational characteristics such as size, capital intensity, extent of diversification, and the maturity of implementations, all influence the gains from TQM. These and other factors should be considered in setting expectations. Finally, the gains from TQM are likely to be tempered by the behavior of competitors. As more and more firms in a particular market segment adopt TQM, the extent of gains from TQM will diminish.

Finally, we believe that TQM has still a long way to go. Recent surveys show that about 30 percent of manufacturing plants in United States have widely embraced TQM (Tanincez, 1997). The numbers are likely to be even lower for service establishments.

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<b>Table 1:</b> Names of some quality award givers whose award recipients <u>Customers that give awards to their suppliers</u>	are included in the sample <u>Independent Award Givers</u>
Auto Alliance International Inc. (Part of Mazda Motor Manufacturing)	Alabama Senate Productivity & Quality Award
Chrysler Corp.	Arizona's Pioneer and Governor's Award for Quality
Consolidated Rail	California Governor's Golden State Quality Awards
Eastman Kodak Co.	Connecticut Quality Improvement Award
Ford Motor Co.	Delaware Quality Award
General Motors Corp.	Florida Governor's Sterling Award
General Electric	Massachusetts Quality Award
Goodyear Tires	Maryland Senate Productivity Award
GTE Corp.	Maine State Quality Award
Honda of America Manufacturing Inc.	Michigan Quality Award
International Business Machines	Minnesota Quality Award
J. C. Penny & CO	Missouri Quality Award
Lockheed Corp.	National Association of Manufacturers ( The Shingo Prize)
Minnesota Mining and Manufacturing	National Institute of Standards and Technology (Baldrige Award)
National Aeronautical and Space Authority	North Carolina Quality Leadership Award
New United Motor Manufacturing Inc. (NUMMI)	New Mexico Quality Award
Toyota Motor Manufacturing U.S.A Inc.	New York Governor's Excelsior Award
Nissan Motor Manufacturing Corp. U.S.A	Nebraska Edgerton Quality Award
Pacific Bell	Oklahoma Quality Award
Sears Roebuck & Co.	Oregon Quality Award
Texas Instrument Co.	Pennsylvania Quality Award
TRW Inc.	Rhode Island Award for Competitiveness and Excellence
Xerox Corp.	Texas Quality Award
Union Carbide	Tennessee Quality Award
Westinghouse	Virginia Senate Productivity & Quality Award
Whirlpool	Washington State Quality Award

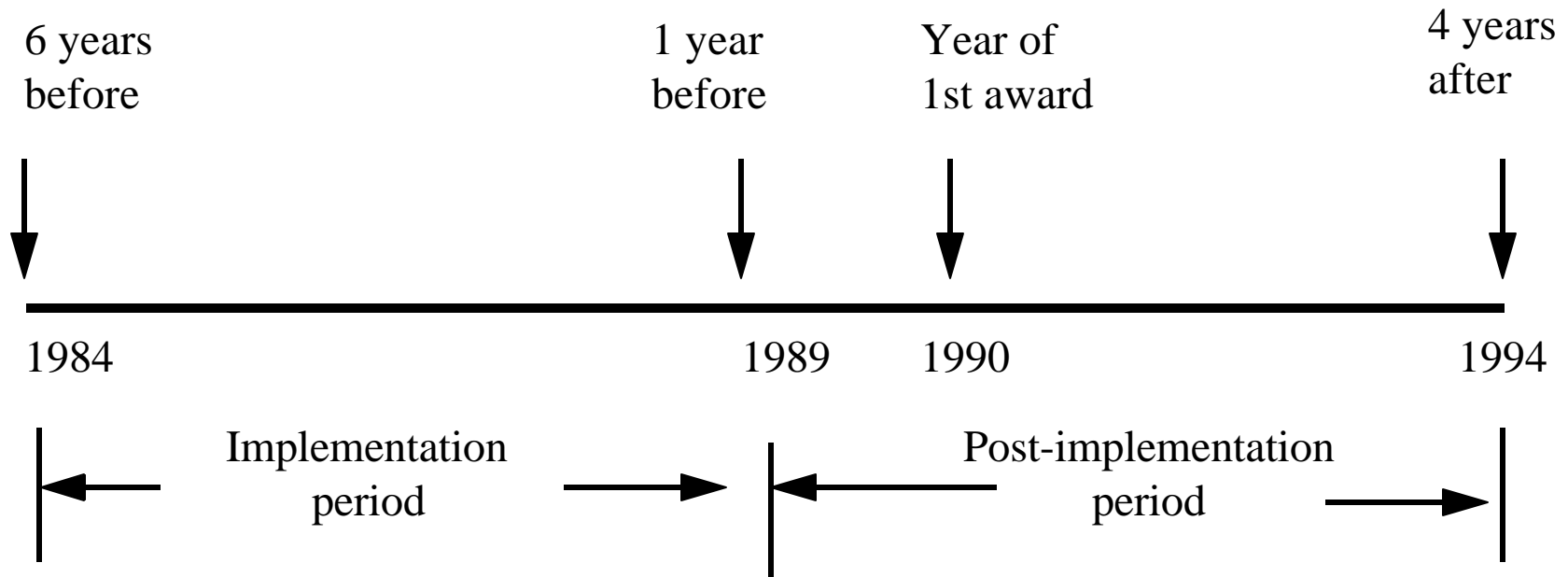


Figure 1: Determining the implementation and the post-implementation periods for a firm that won its first quality award in 1990.

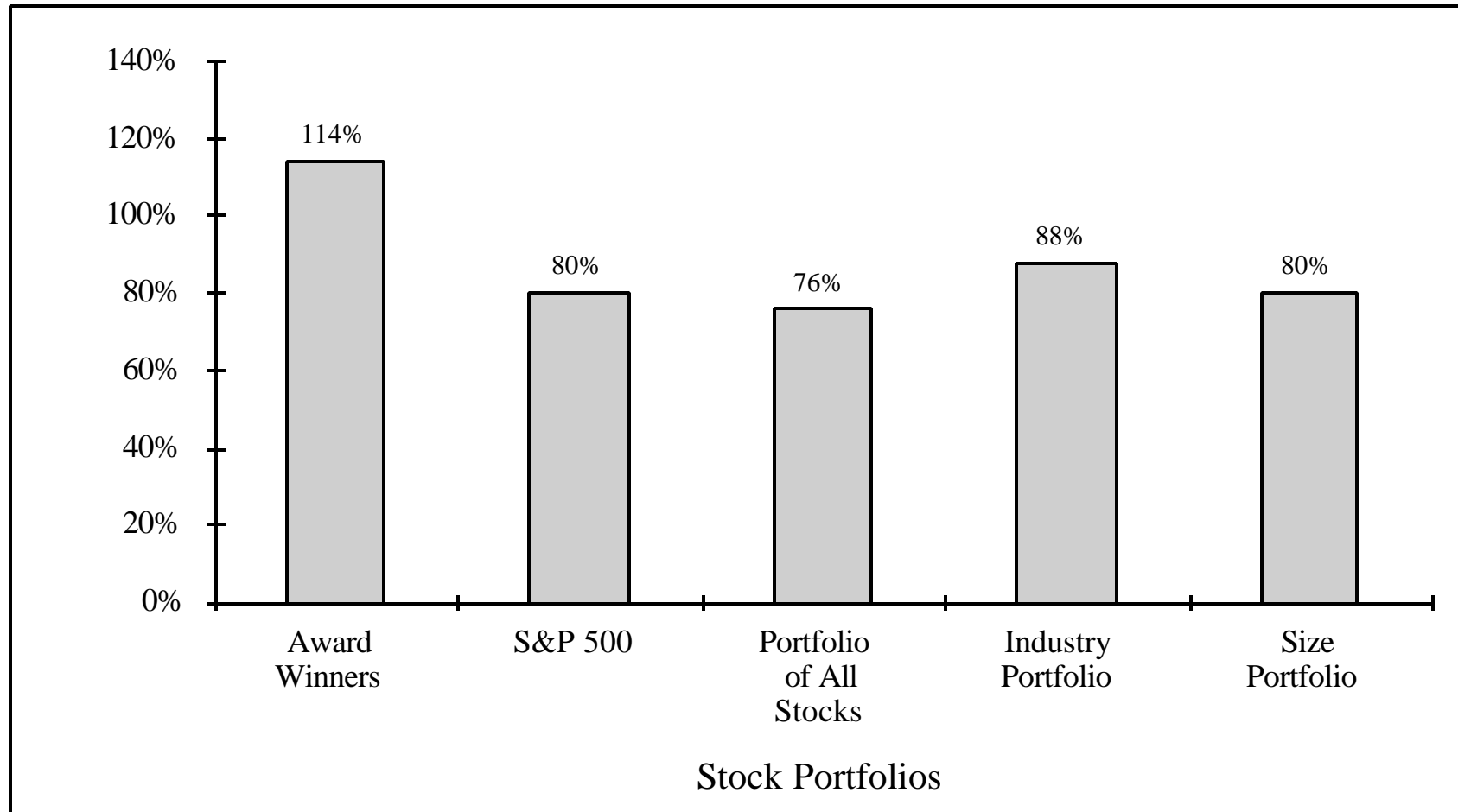


Figure 2: Comparison of the stock price performance of award winners and various benchmark portfolios. The results depict the changes in performance over the five-year post-implementation period that starts one year prior and ends four years after the date of winners winning their first quality award.



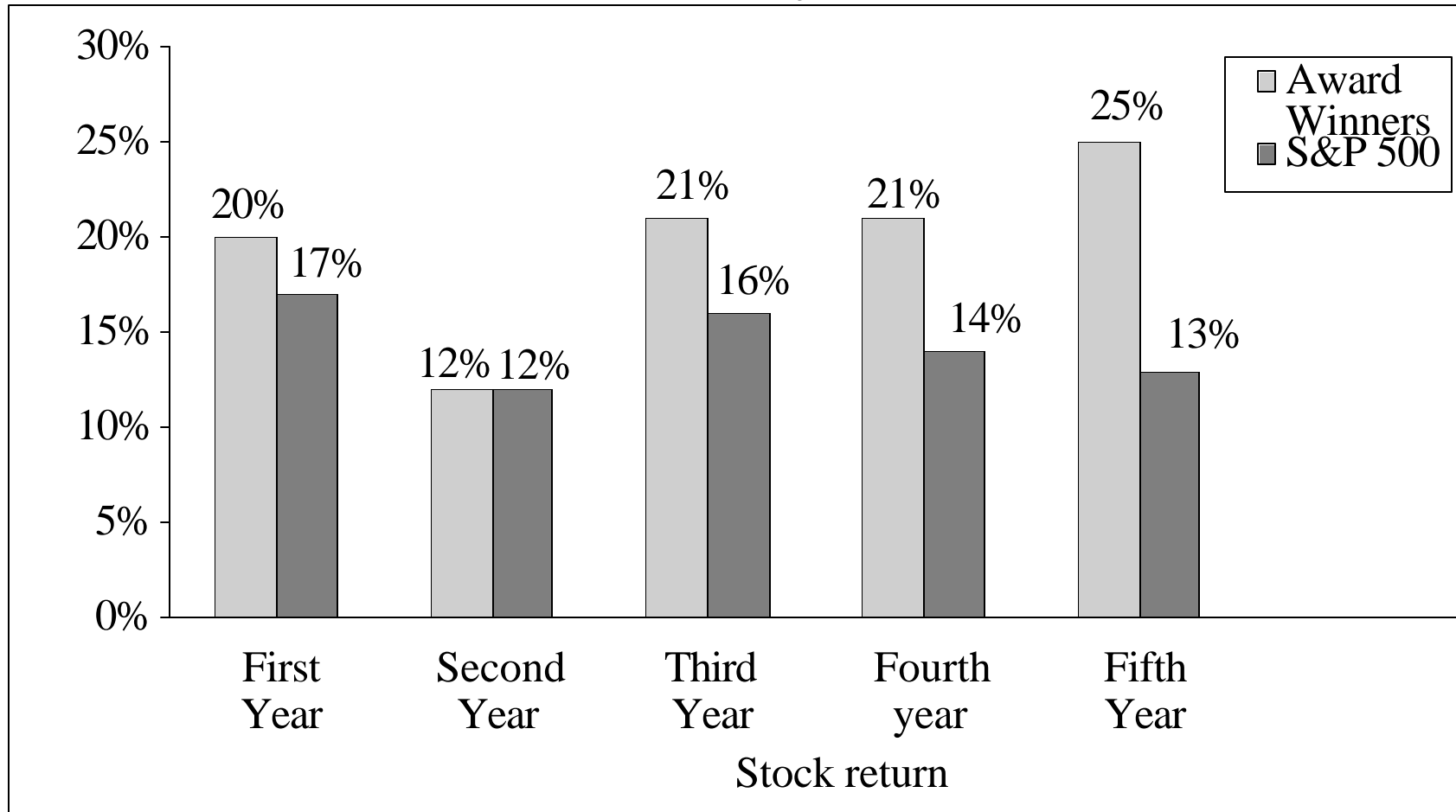


Figure 3: Comparison of the stock price performance of award winners and the S&P 500 on an annual basis. The results depict the annual changes in performance over the five-year post-implementation period that starts one year prior and ends four years after the date of winners winning their first quality award.

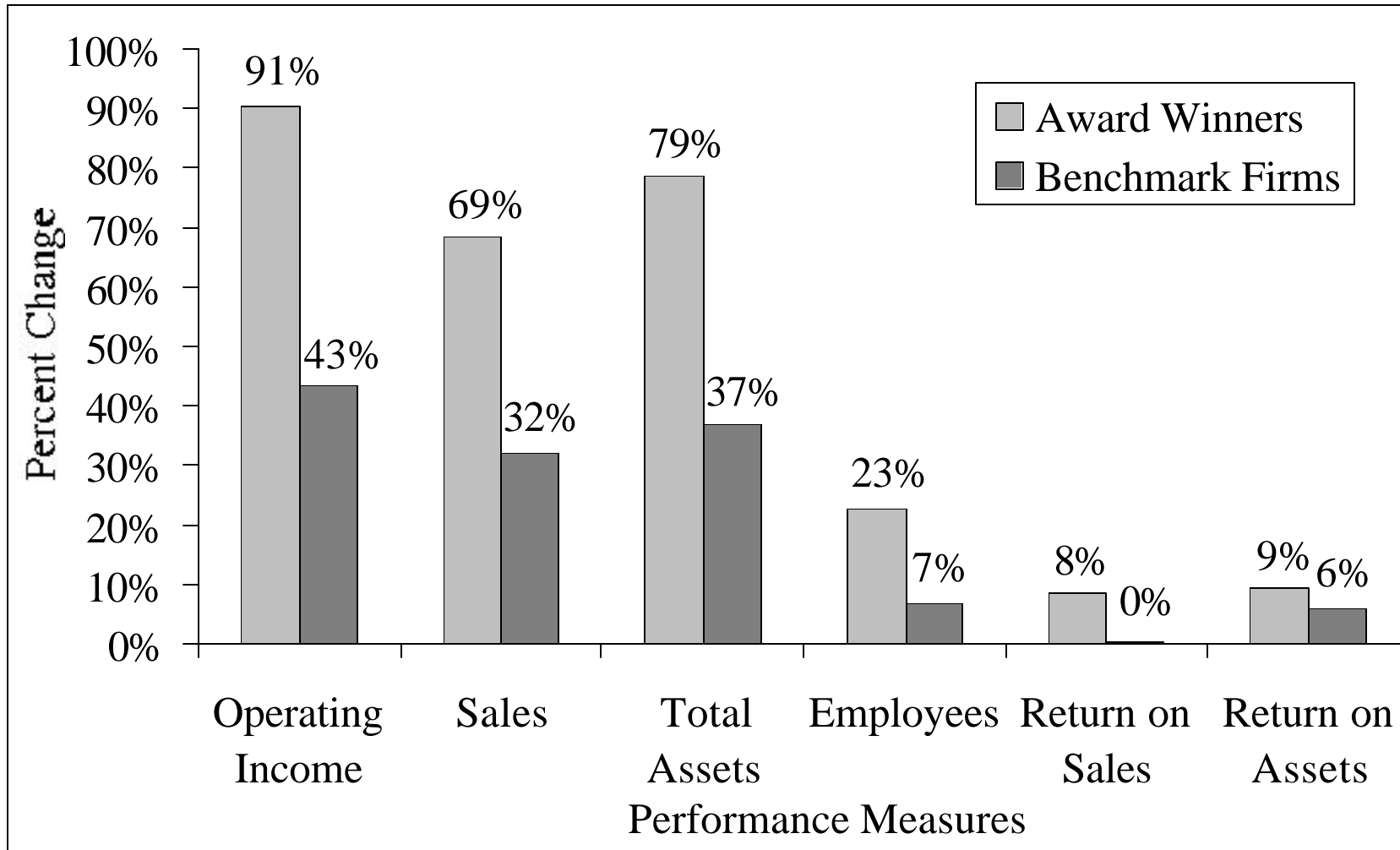


Figure 4: Comparison of the average percent change in performance of award winners and benchmark firms for the post-implementation period. The results depict the changes in performance over the five-year post-implementation period that starts one year prior and ends four years after the date of winners winning their first quality award.

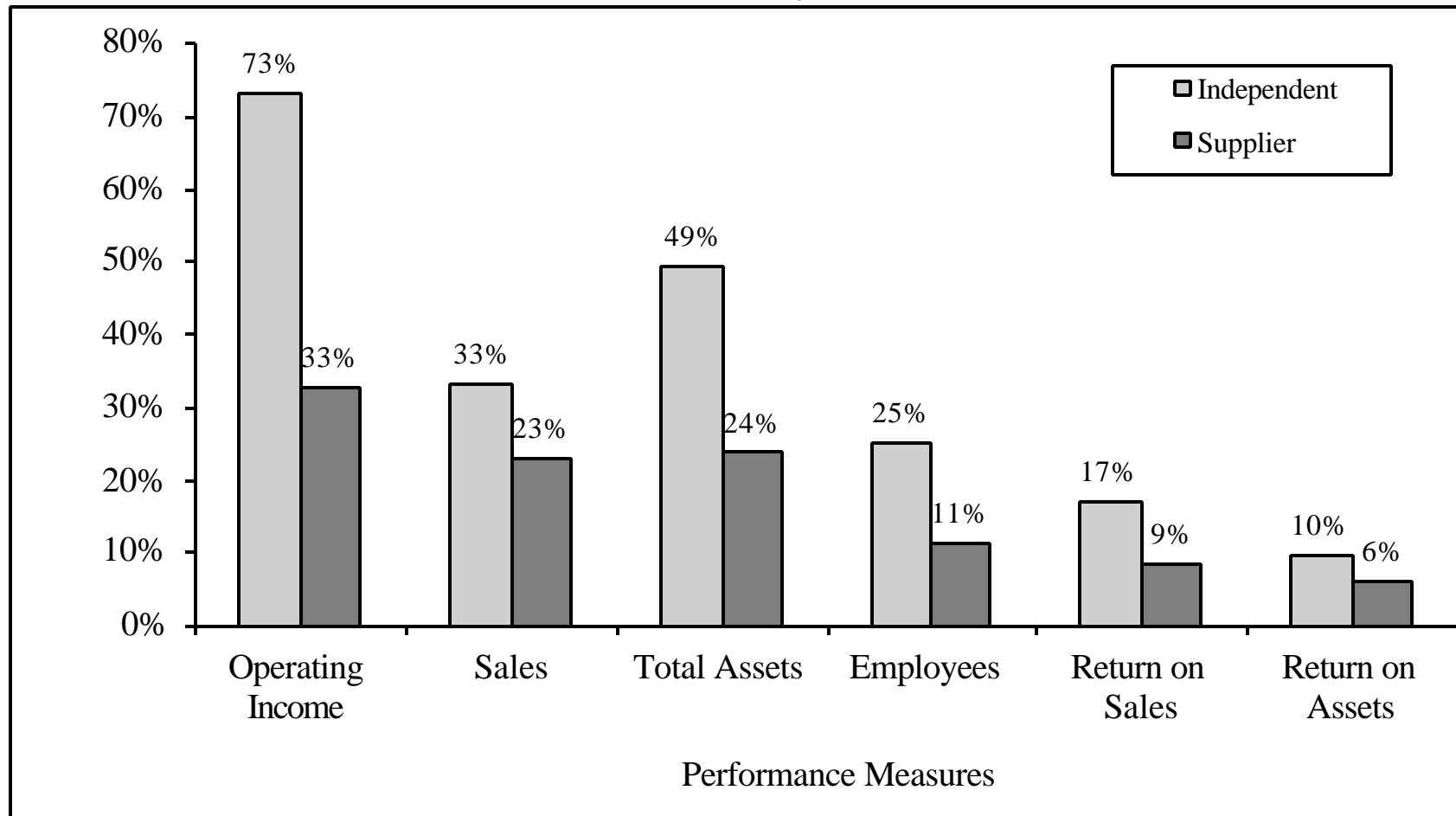


Figure 5: Comparison of the average percent change in performance of independent award winners and supplier award winners. All performance numbers are the average of the differences between the performance of the winners and their respective benchmarks. The results depict the changes in performance over the five-year post-implementation period that starts one year prior and ends four years after the date of winners winning their first quality award.

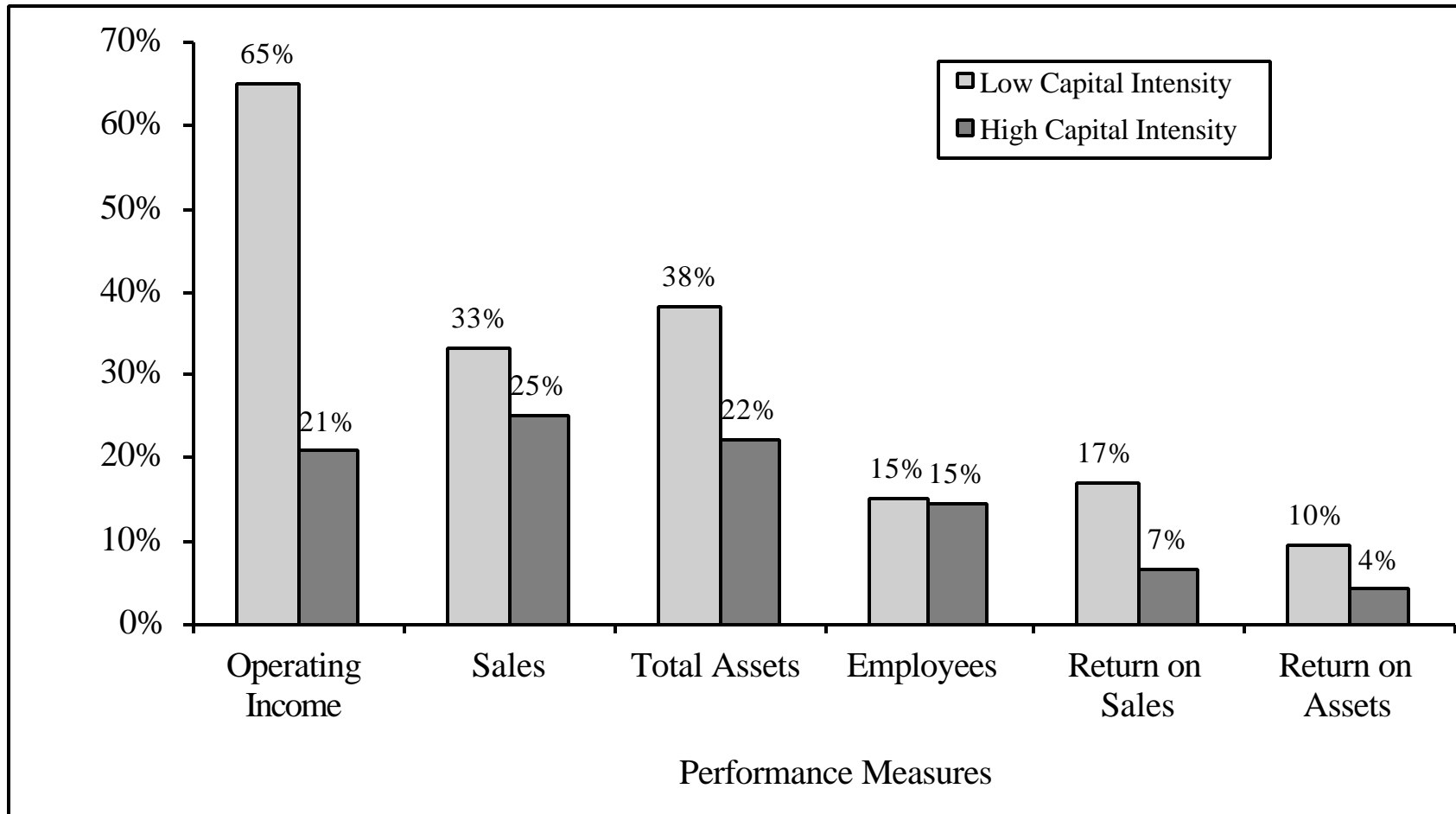


Figure 6: Comparison of the average percent change in performance of lower capital and higher capital intensity award winners. All performance numbers are the average of the differences between the performance of the winners and their respective benchmarks. The results depict the changes in performance over the five-year post-implementation period that starts one year prior and ends four years after the date of winners winning their first quality award.

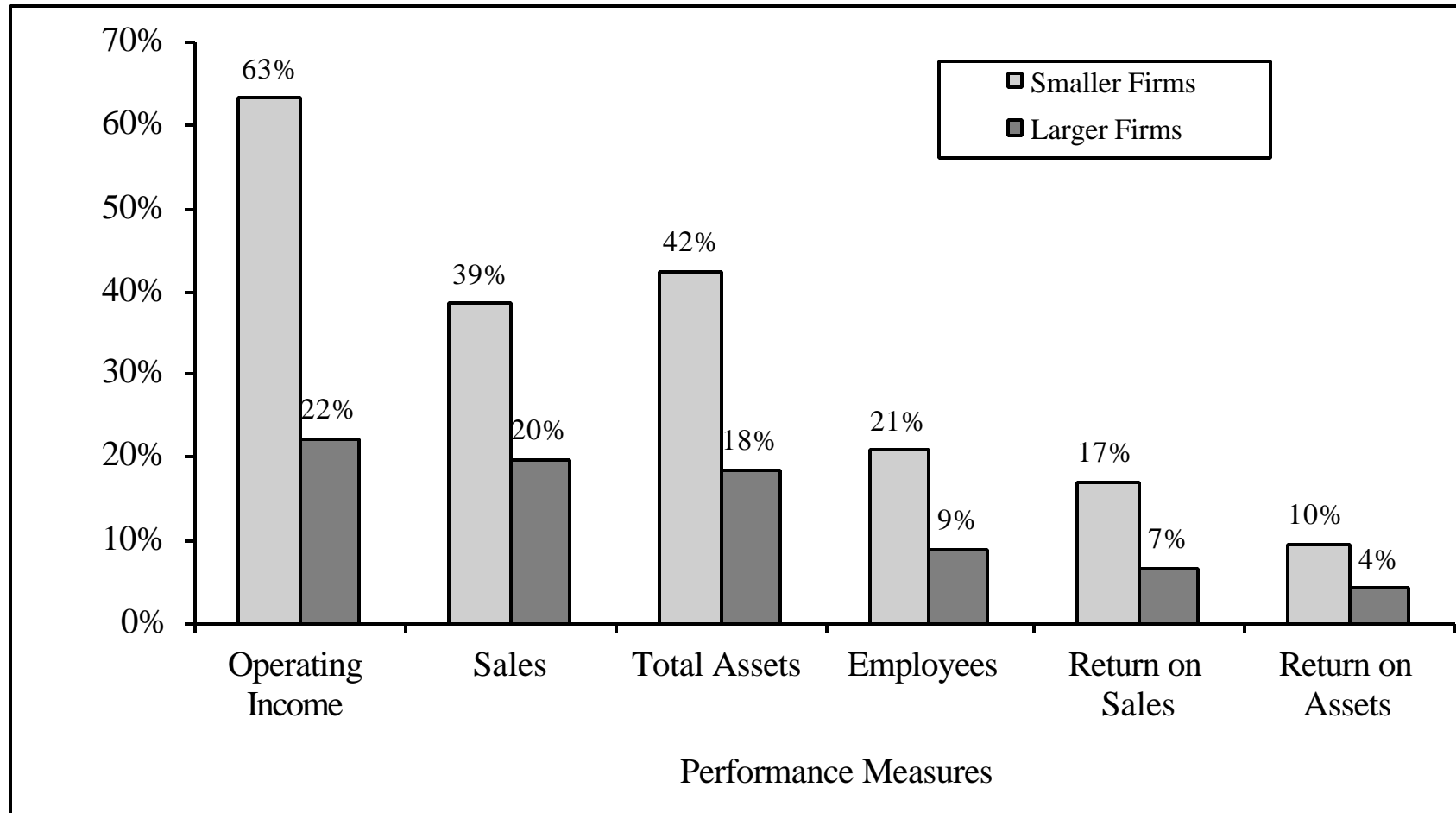


Figure 7: Comparison of the average percent change in performance of smaller and larger award winners. All performance numbers are the average of the differences between the performance of the winners and their respective benchmarks. The results depict the changes in performance over the five-year post-implementation period that starts one year prior and ends four years after the date of winners winning their first quality award.

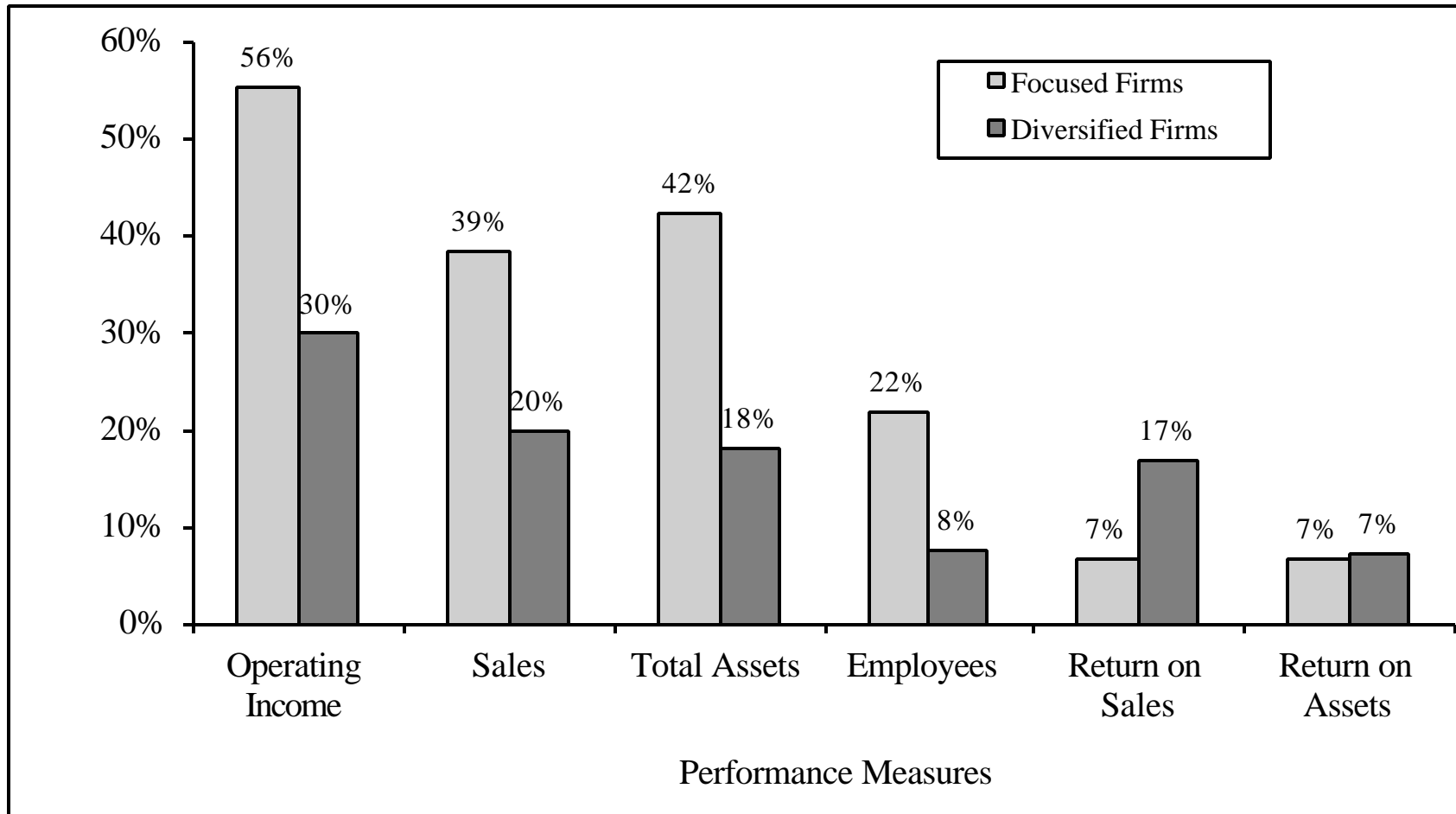


Figure 8: Comparison of the average percent change in performance of focused and diversified award winners. All performance numbers are the average of the differences between the performance of the winners and their respective benchmarks. The results depict the changes in performance over the five-year post-implementation period, which starts one year prior and ends four years after the date the winners won their first quality award.