Should the smiling curve frown during an economic downturn to enhance firm performance?

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Abstract

This study examines the efficacy of the smiling curve, and clarifies the relationship between downsizing strategies (advertising, marketing, and research and development, respectively) and firm performance specifically in an economic downturn. This study tests hypotheses using 1996–2010 data from the *Taiwan Economic Journal* on 436 listed Taiwanese companies. The results indicate that the benefits for firms to follow the smiling curve may not occur in the short term and that downsizing strategies may not always be the appropriate strategy to improve firm performance. During an economic downturn, downsizing strategies do not appear to enhance firm performance, that is, the smiling curve should not frown during an economic downturn to enhance firm performance.

S hih's commitment to push his company to add value through the 'smiling curve' saved Acer from the fate of dozens of other Taiwanese electronics suppliers that became captive suppliers of OEM goods to major computer companies (Bartlett & Ghoshal, 2000: 136).

The smiling curve, shown in Figure 1, was coined by Stan Shih, co-founder of Acer. It highlights 'the declining importance of assembly and the increasing importance of technology and marketing' in Taiwan's personal computer (PC) industry from the late 1990s (Hung & Whittington, 2011: 534), that is, in the PC industry, the margins at both ends of the value chain are higher than the margin in the middle of the chain. Therefore, to improve performance, firms in the PC industry should follow the smiling curve and migrate from segments in the middle of the chain that add less value (i.e., assembly) to the ends of the curve, which add more value (i.e., brand and technology) (Hon, Tarng, & Chu, 2000). Acer has become one of the top PC brand names primarily because it follows the smiling curve (Lundquist, 2007). The smiling curve reflects the evolution and competition of the PC industry (Hon, Tarng, & Chu, 2000). This further suggests that 'in many industries profitability at various stages of value chain has come to follow a U-shaped curve high at the upstream and downstream processes and low at the midstream processes' (Chen, 2004: 346), as shown in Figure 2. In other words, as both Figures 1 and 2 show, the smiling curve represents 'the pattern of value added along the

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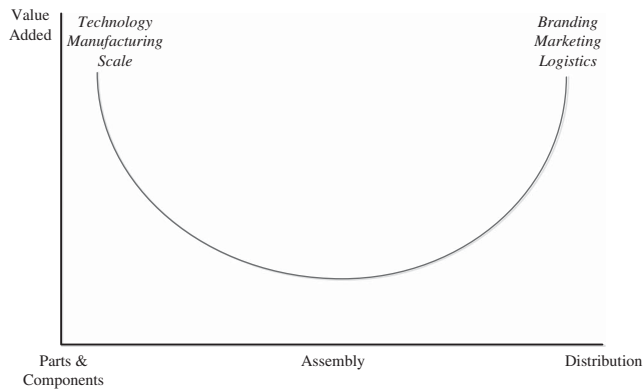   Corresponding author: cltien@ntnu.edu.tw

FIGURE 1. SMILING CURVE – THE VALUE-ADDED CURVE FOR THE PERSONAL COMPUTER INDUSTRY. BASED ON STAN SHIH'S 'REENGINEERING ACER' (1996, 2004B) (CHINESE VERSION)
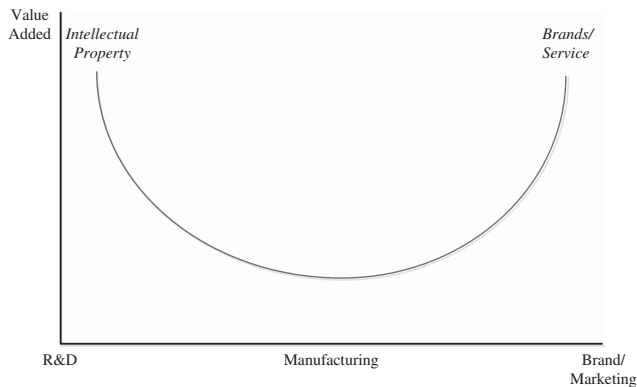

FIGURE 2. SMILING CURVE – THE VALUE-ADDED CURVE. BASED ON STAN SHIH'S 'MILLENNIUM TRANSFORMATION: CHANGE MANAGEMENT FOR NEW ACER' (2004A) (CHINESE VERSION), AND 'SMILE AND BEAT YOUR OWN PATH' (2012) (CHINESE VERSION)

value chain' and predicts the 'firms most likely to profit in global value chains' (Shin, Kraemer, & Dedrick, 2012: 90). Thus, it is important to navigate the value curve and find a more profitable point in the supply chain (Bartlett & Ghoshal, 2000).

Contractual arrangements such as original equipment manufacturing (OEM) link enterprises in emerging countries to firms in developed countries that own brands and technology (Luo & Tung, 2007). Taiwan-based Acer serves as an example of an emerging market enterprise's efforts to shift away from its less profitable OEM business in order to improve performance (Chen, 2005). Acer's strategy of following the smiling curve in the PC industry has moved the firm from the low-end point of contractual assembly to the high-end points of brand and technology. Similar trends can be seen in firms in other industries, such as China's television industry (Xie & Wu, 2003), mobile phone industry (Sun, Chen, & Pleggenkuhle-Miles, 2010), and textile industry (Yang, He, & Zhang, 2010). Thus, the smiling curve can be applied to explain the evolution of enterprises in emerging economies and to illustrate how firms can improve performance by embracing profitable segments in the value chain without relying solely on contractual arrangements, that is, investing in owning brands or building technological capabilities is important for bettering the performance of emerging countries' enterprises.

Thus, following a smiling curve should contribute to the success of emerging countries' enterprises, and downsizing on such efforts could negatively affect their performance.

In recent decades, the macroeconomic environment has been uncertain, and significant events (e.g., the 1997 Asian financial crisis, the 2007 financial tsunami) have made firms aware of excessive investments and given them a tendency to be risk averse. In the face of an economic downturn, a firm may opt for organizational downsizing to keep costs down. Firms have widely used this downsizing strategy in practice and regard it as a useful tool to survive difficult times (Muñoz-Bullón & Sánchez-Bueno, 2011), and downsizing is believed to improve firm performance (Leung & Chang, 2002), that is, firms should downsize their operations and investments to reduce costs to make it through an economic downturn. However, a downsizing strategy may actually decrease a firm's competitiveness by reducing its resources, which can result in inflexibility and an inability to expand through mergers and acquisitions during a recession when firms are often undervalued in general. Furthermore, evidence shows that repeated layoffs tend to negatively affect firm profitability, casting doubt on the efficacy of downsizing strategies (Andrews, 2001).

Therefore, downsizing strategies can be a double-edged sword. During an economic downturn, managers can implement a variety of strategies to secure and sustain growth, and organizational downsizing is one of the most important strategies for managers to adopt among these various strategies (Fisher & White, 2000; Cascio, 2002). However, a firm's efforts to lower costs through reducing its resources or investments may cause it to miss opportunities to merge with or acquire undervalued firms or assets (i.e., brands or technologies) or may lead to failure to regain momentum when the economy recovers. Thus, a firm that adopts downsizing strategies may actually harm its future development.

Take for example management practices implemented in response to the 2007 financial crisis. Certain Taiwanese companies proactively undertook mergers and acquisitions and increased open-source capital expenditures to take advantage of the opportunities offered by the economic downturn. During such a period, the market value of many companies is undervalued, enabling firms to purchase others at far lower prices than normal. For example, Taiwanese notebook manufacturer Compal increased its investment in a spare parts factory and acquired several excellent small companies, internalizing and strengthening its value chain. While some firms saw growth opportunities, other firms adopted a passive approach during the 2007 financial crisis, applying downsizing strategies to be cost-effective. These firms chose to reduce unnecessary investments through various activities (including layoffs, pay reductions, and lower capital expenditures) to remain competitive or simply survive the economic downturn. For example, United Microelectronics Corporation, a global Top 5 semiconductor foundry based in Taiwan, announced a capital reduction, encouraging a rise in its stock price and increasing the owners' equity.

The aforementioned practices represent the opposite ends of the spectrum and serve as a basis for investigating the relationship between downsizing and firm performance to maintain corporate profits (Tsai & Shih, 2007). Facing an economic downturn, certain companies in Taiwan's electronics industry opted for open resources (continuous investment), while others did not. When the macro environment is full of uncertainties, how firms respond to environmental uncertainties raises the question of the puzzles and paradoxes of investments or divestments on firm performance. Therefore, this article attempts to answer the following two main questions: (1) does a firm following the smiling curve perform better? and (2) should the smiling curve frown to enhance firm performance during an economic downturn? That is, this study will further examine whether downsizing is an appropriate strategy to improve firm performance and how downsizing can affect firm performance differently during an economic downturn.

This study makes four contributions. First, it provides evidence as to whether the concept of the smiling curve can be realized in reality. Second, it assists firms in assessing whether downsizing is an effective strategy to improve their performance and whether it can lead to rightsizing. Third, this study

provides firms with evidence about whether they can increase their core competence by investing in assets for future development amid a relatively unstable market environment. Fourth, this study examines how evidence-based findings support or challenge the conventional wisdom on the merits of investments and divestments. It also provides academics, businesses, and the government with a new research avenue for how firms should strategize the smiling curve or downsize in order to avoid wrong-sizing for better performance.

LITERATURE AND HYPOTHESES

The smiling curve encourages firms to improve their performance by constantly finding more profitable segments in the value chain. Especially for firms in emerging countries, these firms should seek more profits by internalizing their marketing efforts or by enhancing their research and development (R&D) efforts than by OEM arrangements in the global value chain to strengthen their competitiveness (Sun, Chen, & Pleggenkuhle-Miles, 2010). Therefore, following the smiling curve should benefit firms in emerging markets through improved profitability, and downsizing on these efforts should negatively affect firm performance. However, during an economic downturn, firms generally use downsizing strategies to survive and appease stakeholders. Thus, it is imperative to determine whether firms should follow the smiling curve by internalizing and enhancing brand and technological developments to improve firm performance. It is also important to analyze whether the smiling curve should frown through downsizing activities for better performance, as well as whether downsizing activities have different effects on firm performance during an economic downturn.

Smiling curve and firm performance

The smiling curve, based on the practical concept and practices in the PC industry, was introduced in the 1990s by Stan Shih, who used this concept to motivate his team to move toward segments with more added value in the global value chain (Chen, 2008). Specifically, the smiling curve emerges from an X-axis that represents the three segments of the value chain structure – components, assembly, and distribution – and a Y-axis that displays the profit margins of business activities (Hon, Tarng, & Chu, 2000). The top-left curve represents segments such as technology, and the top-right curve represents segments such as brand operation (Zhang, 2010). The added value at the two ends of the curve is noticeably higher than the added value in the middle of the curve, which represents segments that characterize the OEM operations commonly adopted by enterprises in emerging economies, such as assembly (Zhang, 2010; OECD, 2014). The shape of this curve looks like a smiling face, and therefore it is named the smiling curve. Firms should carefully navigate the curve and move toward the points at both ends of the value chain with higher profit margins. That is, firms that expand to the top-right and top-left ends of the smiling curve should perform better. Thus, in emerging countries, firms that follow the smiling curve should internalize their advertising, marketing, and R&D efforts and move from contractual agreements to brand and technology development in order to improve performance and enhance capabilities. Therefore, firms should benefit from following the smiling curve, and in emerging economies, firms should aim to develop brands and technological capabilities in segments that have more added value than the OEM segments.

'Brands have long been an essential component of the for-profit, marketing discipline, driven primarily by a need to create and maintain a point of difference in an increasingly competitive environment' (Hankinson, 2001: 231). According to the American Marketing Association, a brand can be defined as a 'name, term, design, symbol, or any other feature that identifies one seller's good or service as distinct from those of other sellers' (AMA, 2013a: 1). Owing to globalization, a global brand embodies 'special credibility, value, power, and enhanced preference' (Hsieh, 2004: 28) through

customers' global recognition. Since a brand is formed through consumers' recognition and awareness, advertising and marketing efforts play important roles in the establishment of a successful brand and should have positive impacts on firm performance. According to the smiling curve, firms should benefit more from owned brands than OEM businesses.

From a theoretical perspective, Coase argued that 'there were transaction costs in effecting exchanges through the market, and that the firm would emerge if the costs of organizing these exchanges within a firm were lower' (as cited in Buckley & Strange, 2011: 461). That is, economizing transaction cost involves efficiency and is central to the study of the boundary of the firm, which determines what activities are performed within or outside the firm (Williamson, 1981). Extended from these arguments on transaction costs, internalization theory further deliberates on the benefits, relative to costs, of coordinating economic activities externally via the market or internally within the firm (Buckley & Strange, 2011). While internalization theory may lack dynamism to deliberate on firm growth (Buckley & Casson, 1991; Cantwell, 2000; Buckley & Strange, 2011), the resource-based view perspective stresses firm-specific resources and capabilities as sources of advantage for firm growth (Barney & Hesterly, 2010; Buckley & Strange, 2011). That is, based on resource-based view, a firm can be regarded as 'a collection of productive resources' (Penrose, 1959: 24), and these resources are 'drivers of firm heterogeneity' (Kor & Mahoney, 2000: 114), whereas firm growth can be attributed to dynamic management and resources. Hence, resources, which are valuable, rare, and costly to imitate and can be exploited by organizations, can help sustain a competitive advantage (Barney & Hesterly, 2010). Evolved from resource-based view, the dynamic capability perspective furthermore emphasizes discussions over how a firm's resources can be created and refreshed in changing environments for sustained competitive advantage (Ambrosini & Bowman, 2009; Ambrosini, Bowman, & Collier, 2009). Thus, based on the aforementioned theoretical perspectives, internalizing brand developments through advertising and marketing efforts can help a firm such as a contract manufacturer not only to reduce transaction cost but also to gain resources for superior performance and sustained competitive advantage.

In particular, advertising plays a central role in the development of a brand image (Meenaghan, 1995) and the increase of a product's perceived trustworthiness (Li & Miniard, 2006). The American Marketing Association defines advertising as the 'placement of announcements and persuasive messages in time or space purchased in any of the mass media by business firms, non-profit organizations, government agencies, and individuals who seek to inform and/or persuade members of a particular target market or audience about their products, services, organizations, or ideas' (AMA, 2013b: 1). Empirical evidence also shows that consumers can be affected by different advertising strategies (Cui, Liu, Yang, & Wang, 2013). Hence, we argue that advertising is important for the success of a brand because it affects consumers' perceptions and attitudes. Based on the smiling curve, firms with brands in emerging economies can differentiate themselves from firms utilizing only contractual arrangement and enjoy more added values. Although advertising investment can be characterized by its 'inflexibility and location-bound nature' (Lee, Beamish, Lee, & Park, 2009: 6), we argue that increased advertising efforts can positively affect firm performance. Therefore, this study puts forth Hypothesis 1 to examine the impact on firm performance of following the smiling curve to internalize advertising efforts for an owned brand.

Hypothesis 1: Following the smiling curve to increase advertising intensity can positively affect firm performance.

In terms of marketing efforts to develop an owned brand, marketing can be defined as 'the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large' (AMA, 2013c: 1). Marketing efforts play a central role in developing a brand as well. The heart of marketing lies in the exchange process

(Medina & Duffy, 1998), and the function of marketing depends on product advertisement and distribution channel development (Houston, 1986; Medina & Duffy, 1998). Thus, advertising efforts can be regarded as influential as marketing efforts in establishing a successful brand. According to the American Marketing Association, an advertised brand is 'owned by an organization that uses a marketing strategy usually involving substantial advertising' (AMA, 2013d: 1). However, for this study, we examined advertising and marketing individually for two main reasons. First, advertising involves promoting the brand images of mostly finished or existing products, while marketing entails modifying 'product lines by creating a new brand or an innovation' (Medina & Duffy, 1998: 225). Hence, differences between advertising and marketing exist. Second, they are separated in the data from the *Taiwan Economic Journal* data bank, and we tested them separately to maintain the rigor and consistency of the present analysis. Based on the practical and theoretical viewpoints presented above, following the smiling curve to internalize marketing efforts for an owned brand should have a positive impact on firm performance, and therefore, we put forth Hypothesis 2.

Hypothesis 2: Following the smiling curve to increase marketing intensity can positively affect firm performance.

In terms of developing technological capabilities, on the top-left side of the smiling curve, the intensity of R&D efforts indicates a firm's technological competence. Some scholars have identified R&D as one of the most valuable assets benefiting firm competitiveness (Kaplan & Norton, 1992; Yu & Wang, 2010). Kafouros and Forsans (2012: 363) supported them by arguing that 'in-house R&D plays a crucial role in enhancing firm performance.' Chauvin and Hirschey (1993) investigated the impact of R&D on market value and found a positive relationship between R&D and firm performance. Chan, Martin, and Kensinger (1990) further indicated that stock prices positively respond to higher R&D expenditures. Although research also shows that the positive relationship between R&D and firm performance is conditional (Demirel & Mazzucato, 2012), overall, we support the argument that reducing R&D expenditures is very likely to harm firm performance. As a result of the reduction in company expenses, the firm may also lack new products to launch and, with the lack of technical innovation, it may lose the opportunity to build its core competence in the market. A firm's R&D expenditures should be regarded as an important investment (Kaplan & Norton, 1992; Chauvin & Hirschey, 1993). Using R&D expenditures to build a company's core competence maintains its advantage in a dynamic market (Kaplan & Norton, 1992). Thus, based on the smiling curve and theories of internalization and resource-based view, R&D intensity should have a positive impact on firm performance, and this study puts forth Hypothesis 3 to examine the impact of following the smiling curve to internalize R&D efforts for establishing technological capabilities on firm performance.

Hypothesis 3: Following the smiling curve to increase R&D intensity can positively affect firm performance.

Downsizing and firm performance

The discussion on downsizing has expanded provocatively over the past 3 decades (Gandolfi & Hansson, 2011), and downsizing has become a significant part of organizational life (Gilson, Hurd, & Wagar, 2004). Downsizing has been called by other terms: resizing, declining, restructuring, reorganizing, re-engineering, streamlining, reduction-enforcing, rightsizing, retrenching, and slimming (Cascio, 2002). All these terms share certain similar meanings with downsizing. Tsai, Yen, Huang, and Huang (2007) argued that downsizing can help firms reduce redundancy, while Hamel and Prahalad (1994) further argued that downsizing can be used to implement organizational restructuring and

enhance productivity. Supporters of downsizing consider it necessary to give firms the flexibility to reduce the workplace and stay competitive (Gilson, Hurd, & Wagar, 2004). According to Dial and Murphy (1995), reducing the scale of the business is a specific practice of downsizing. Hamel and Prahalad (1994) indicated that organizational restructuring can be implemented through downsizing to increase cost-effectiveness and performance, that is, downsizing may positively affect firm performance.

However, a growing firm increases its competitive advantage by setting up new departments, recruiting new staff members, and making investments to acquire resources. Therefore, downsizing may not necessarily lead to rightsizing (Luan, Tien, & Chi, 2013), and firms that adopt downsizing strategies may fail to achieve the desired competitive advantages (Tsai et al., 2007) or may even face declining performance and dysfunctional behavior (Judge, Naoumova, & Koutzevol, 2003), that is, downsizing may negatively affect firm performance.

Although the evidence is inconclusive regarding whether downsizing can effectively contribute to better firm performance (Gandolfi & Littler, 2012), from a practical view on the smiling curve, firms that move toward the top-right and top-left ends of the smiling curve should perform better, earning more profit from both ends than from the bottom of the curve. Thus, the smiling curve should not frown (i.e., downsizing on advertising, marketing, and R&D) for better profitability. To investigate the impact of downsizing activities on firm performance, we issue the following hypotheses to examine the impact of downsizing advertising, marketing, and R&D:

Hypothesis 4a: Downsizing advertising efforts can negatively affect firm performance.

Hypothesis 5a: Downsizing marketing efforts can negatively affect firm performance.

Hypothesis 6a: Downsizing R&D efforts can negatively affect firm performance.

Economic downturn: the moderator

An economic downturn can be variously defined as 'a significant decline in economic activity spread across the economy, lasting more than a few months' (Regalia, 2008: 1) or as 'a situation in which the economy of a country experiences a sudden downturn brought on by a financial crisis' (Businessdictionary.com, 2013: 1). During an economic downturn, the environment can be full of uncertainties. These environmental uncertainties may cause a firm to have more difficulty predicting demands and inputs and adjusting its value chain in response to threats (Kogut, 1991) and negatively affect firm performance (Park, Park, & Lee, 2012). Firms may fail to increase investments due to an economic downturn. Thus, during an economic downturn, downsizing becomes a top strategy that firms adopt to build an advantage (Fisher & White, 2000; Cascio, 2002). However, as argued earlier, an economic downturn can create an environment in which a firm can grow by taking advantage of undervalued assets through mergers and acquisitions. Downsizing strategies can not only negatively affect firm performance, but a firm that downsizes its operations or investments may also perform even worse during an economic downturn, that is, the smiling curve should not frown during an economic downturn to enhance a firm's performance, and an economic downturn can negatively moderate the relationship between downsizing actions and firm performance. Therefore, we establish the following hypotheses:

Hypothesis 4b: During an economic downturn, a firm that downsizes advertising efforts can worsen its performance.

Hypothesis 5b: During an economic downturn, a firm that downsizes marketing efforts can worsen its performance.

Hypothesis 6b: During an economic downturn, a firm that downsizes R&D efforts can worsen its performance.
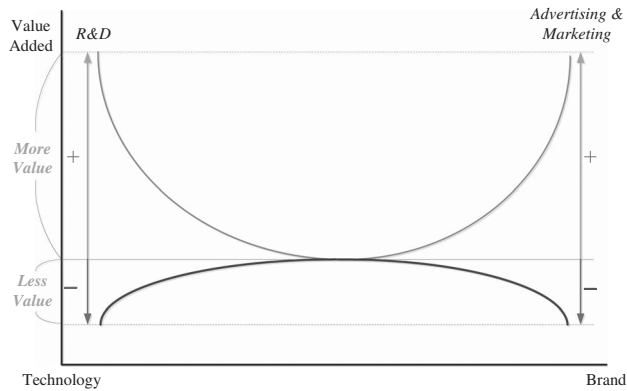
FIGURE 3. SMILING CURVE (ADAPTED FOR THE PRESENT STUDY). ADAPTED FROM STAN SHIH'S 'REENGINEERING ACER' (1996, 2004B) (CHINESE VERSION), 'MILLENNIUM TRANSFORMATION: CHANGE MANAGEMENT FOR NEW ACER' (2004A) (CHINESE VERSION), AND 'SMILE AND BEAT YOUR PATH' (2012) (CHINESE VERSION)

METHOD

Data and sample

Based on and extended from the Smiling Curve, as Figure 3 shows, we tested our hypotheses with data from 1996 to 2010 collected from the *Taiwan Economic Journal* data bank, the Financial Data Bank, the Market Observation Post System, and the websites of sample firms. The data yielded a sample of 436 listed companies in 11 industries: food, plastics, textiles, automotive, electronic cables, pharmaceuticals, glass, pulp, steel, rubber, and electronics. We also tracked disclosures in annual reports and the daily news records of these firms from 1996 to 2010 and compiled information from company self-descriptions to determine when firms announced downsizing. Overall, this study pooled the data for 436 firms from 1996 to 2010 and evaluated the final sample that met the data requirements. This study examined the models using cross-sectional time-series regressions. To reduce concerns about heteroskedasticity and autocorrelation, we used cross-sectional and time-series linear models that considered feasible generalized least squares in the presence of heteroskedasticity and autocorrelation across panels. This study also employed industry experts' opinions to identify occurrences of significant downsizing, that is, downsizing occurs when the intensity of advertising, marketing, and R&D each decreased by >40%.

Variables

Dependent variable
Firm performance.　 This study measured firm performance using the return on assets (ROA), or net income divided by total assets, to indicate a company's profitability relative to its total assets. This study also considered the lag effects of investment or divestment on firm performance and therefore included firm performance from the same year, y0, and the following 3 years, y1, y2, and y3. Thus, four ratios of ROA from different years (y0, y1, y2, and y3) are employed to reflect firm performance.

Independent variables
Advertising intensity.　 This study used advertising expenses divided by sales to measure advertising intensity.

Marketing intensity. This study used marketing expenses divided by sales to measure marketing intensity.

R&D intensity. This study used R&D expenses divided by sales to measure R&D intensity.

Downsizing advertising. Downsizing advertising was measured by the decrease of advertising intensity between years. The value was 1 when advertising intensity decreased by >40%. Otherwise, the value was 0.

Downsizing marketing. Downsizing marketing was measured by the decrease of marketing intensity between years. The value was equal to 1 when marketing intensity decreased by >40%. Otherwise, the value was 0.

Downsizing R&D. Downsizing of R&D was measured by the decreases of R&D intensity between years. The value was equal to 1 when R&D intensity decreased by >40%. Otherwise, the value was 0.

Economic downturn. We used binary variables to distinguish periods of economic downturn and non-economic downturn in firms' external environments as determined by decreases or increases of the gross domestic product. We used the binary variable 1 to represent an economic downturn for a year with a negative gross domestic product growth and 0 for a non-economic downturn year.

Control variables

Firm size. A firm changing its strategies and operations may encounter organizational inertia that affects its performance. Kelly and Amburgey (1991) showed that inertia can vary with firm size. Hannan and Freeman (1984) argued that firm size is associated with resistance to change. Therefore, this study controlled for firm size and used total assets to calculate firm size. To control for the potential diminishing impact of firm size, a logarithmic transformation of the assets was used in the analysis.

Firm age. Kelly and Amburgey (1991) showed that inertia can also vary with firm age, and Hannan and Freeman (1984) argued that inertia increases with age. Therefore, this study also controlled for firm age. To calculate firm age, we subtracted the founding year from the years tested in the study. A logarithmic transformation of firm age was used in the analyses to control for the potentially diminishing impact of firm age.

Past equity performance. Inefficient and ineffective expansion of a firm usually leads to poor equity performance, and downsizing may improve the firm's equity performance (John, Lang, & Netter, 1992). Since a firm's prior performance is a concern to shareholders (Hitt, Hoskisson, & Ireland, 1994; Love & Nohria, 2005), this study controlled for the previous year's equity performance by including the return on equity in the models. Return on equity was calculated as net income divided by shareholder equity.

Industry. This study examined firms across 11 different industrial sectors. Some sectors are more labor oriented than others. To control for the industrial differences that may affect firm performance, we included the industry effect as a control variable. We divided firms' revenues by their numbers of employees to measure the effect of industrial differences on labor intensity.

RESULTS

Table 1 shows the descriptive statistics and correlation matrix. The economic downturn and the downsizing strategies for advertising, marketing, and R&D are represented by binary variables (0, 1). Firm size and age are in the logarithmic forms. In the regression analysis, collinearity among variables did not exist. Table 2 shows the breakdown of firms sampled for the present study.

Table 3 presents the results of the regression analysis performed to test the hypothesis (Hypothesis 1) for Model 1 using four measures of firm performance: ROA over 4 years in the base year (y0) and in the next 3 years (y1, y2, and y3). The findings reveal that advertising intensity can negatively affect firm performance in the base year (y0; $\beta = -9.2659$, $p < .01$), the 1st year after (y1, $\beta = -13.0092$, $p < .01$), and the 2nd year after (y2, $\beta = -20.6341$, $p < .01$). However, the findings fail to support a significant relationship between advertising intensity and future performance during the 3rd year after (y3, $\beta = 3.6474$, n.s.). Therefore, the findings from Model 1 fail to support Hypothesis 1, and the evidence indicates that advertising intensity does not positively affect performance. That is, following the smiling curve to increase advertising intensity does not significantly improve firm performance.

Table 4 presents the results of the regression analysis performed to test Hypothesis 2 for Model 2 using four measures of firm performance: ROA over 4 years in the base year (y0) and the next 3 years (y1, y2, and y3). The findings reveal that marketing intensity has a negative impact on firm performance in the base year (y0, $\beta = -3.336$, $p < .01$) but a positive impact on firm performance in the 3rd year after (y3, $\beta = 6.848$, $p < .01$). During the year after (y1, $\beta = 1.957$, n.s.) and the 2nd year after (y2, $\beta = 0.395$, n.s.), the results show no significant relationship between marketing intensity and firm performance. These mixed findings reveal limited support for Hypothesis 2, and the evidence indicates that a lag effect may characterize the positive relationship between marketing intensity and firm performance. That is, following the smiling curve to increase marketing intensity does not improve firm performance until a later time.

Based on the same measures of firm performance over 4 years in the base year (y0) and the next 3 years (y1, y2, and y3), Model 3 examines the relationship between R&D intensity and firm performance. Table 5 illustrates the results of the regression analysis performed to test Hypothesis 3 for Model 3. Unlike the findings for Models 1 and 2, the results for Model 3 show significant but different relationships between R&D intensity and firm performance in all the tested years. R&D intensity has a negative impact on firm performance in the base year (y0, $\beta = -11.340$, $p < .01$) but positive impacts on firm performance in the next 3 years (y1, y2, and y3) (y1, $\beta = 7.863$, $p < .05$; y2, $\beta = 13.779$, $p < .01$; y3, $\beta = 16.988$, $p < .01$). These findings reveal high support for Hypothesis 3, and the evidence indicates that R&D intensity may negatively affect firm performance in the year of investment but will improve firm performance in the following years. Hence, following the smiling curve to increase R&D intensity can improve a firm's future performance.

Next, Model 4 examined the impact of downsizing strategies involving advertising on firm performance in the base year (y0) and the next 3 years (y1, y2, and y3) and whether an economic downturn moderates the relationship between downsizing strategy on advertising and firm performance. The results in Table 6 show that downsizing on advertising does not have any significant impact on firm performance (y0, $\beta = -0.012$, n.s.; y1, $\beta = 0.154$, n.s.; y2, $\beta = 0.230$, n.s.; y3, $\beta = -0.148$, n.s.) and thus do not support Hypothesis 4a.

However, the results also show that an economic downturn can negatively moderate the relationship between downsizing on advertising and firm performance in the base year (y0, $\beta = -1.794$, $p < .01$) but does not moderate the relationship between downsizing on advertising and firm performance in the next 3 years (y1, y2, and y3) (y1, $\beta = 0.536$, n.s.; y2, $\beta = 0.018$, n.s.; y3, $\beta = -0.182$, n.s.). Thus, the findings partially support Hypothesis 4b, and the evidence indicates that downsizing on advertising can worsen firm performance during an economic downturn (when firm performance is measured by ROA from the base year, y0), as is also shown in Figure 4.

Smiling curve

TABLE 1. DESCRIPTIVE STATISTICS AND CORRELATION MATRIX

	Mean	Std	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Firm performance (y0)	9.196	9.968	–													
2. Firm performance (y1)	9.118	10.023	0.718**	–												
3. Firm performance (y2)	8.92	9.969	0.556**	0.718**	–											
4. Firm performance (y3)	8.828	9.745	0.483**	0.568**	0.725**	–										
5. Advertising intensity	0.006	0.018	−0.035**	−0.034**	−0.036**	−0.013	–									
6. Marketing intensity	0.061	0.167	−0.072**	−0.057**	0.002	0.030*	0.438*	–								
7. R&D intensity	0.026	0.049	−0.013	0.028*	0.074**	0.092**	0.013	0.215**	–							
8. Downsizing advertising	0.296	0.457	0.000	0.003	0.009	0.006	−0.204**	−0.110**	0.029	–						
9. Downsizing marketing	0.05	0.247	0.017	0.015	0.026	0.034*	−0.018	−0.087**	0.012	0.141**	–					
10. Downsizing R&D	0.087	0.281	−0.057**	−0.050**	−0.037*	−0.030	−0.045**	−0.027	−0.113**	0.080**	0.162**	–				
11. Firm size	15.355	1.428	−0.018	−0.097**	−0.132**	−0.147**	−0.071**	−0.096**	−0.079**	−0.030	−0.031*	−0.012	–			
12. Firm age	3.0724	0.59	−0.243**	−0.254**	−0.249**	−0.243**	0.034**	−0.028*	−0.315**	−0.088**	−0.111**	−0.009	0.310**	–		
13. Past equity performance	8.214	22.636	0.514**	0.350**	0.287**	0.256**	0.002	−0.041**	−0.028*	−0.071**	−0.082**	−0.116**	0.037**	−0.131**	–	
14. Industry	656.828	1801.317	0.448**	0.299**	0.234**	0.258**	−0.049**	−0.088**	−0.061**	0.028	0.032*	−0.011	0.162**	−0.072**	0.235**	–
15. Economic downturn	0.2	0.4	−0.111**	−0.042**	0.003	0.009	−0.011	0.003	0.040**	0.020	−0.036*	−0.054*	0.087**	0.124**	−0.026*	−0.051**

Note. R&D = research and development.

*$p \leq .05$; **$p \leq .01$.

TABLE 2. BREAKDOWN OF THE SAMPLED FIRMS

Firm size	Number of firms	Firm employee	Number of firms	Firm age	Number of firms	Industry	Number of firms
0–1,000,000	17	1–100	12	1–10	42	Food	20
						Plastics	21
				11–20	138	Textiles	46
1,000,001–10,000,000	315	101–1,000	329			Automotive	4
				21–30	129	Electric cables	13
						Glass	4
10,000,001–100,000,000	90	1,001–10,000	90	31–40	77	Pulp	7
						Steel	28
				41–50	43	Rubber	9
100,000,001 and above	14	10,001 and above	5			Electronics	251
				51 and above	7	Pharmaceuticals	33

Note. Firm size is presented by firm assets in New Taiwan Dollars; firm size, employee, and age are presented by average figures (from 1996 to 2010).

TABLE 3. RESULTS OF THE REGRESSION MODELS (MODEL 1: HYPOTHESIS 1)

	Dependent variable: firm performance (y0, y1, y2, and y3)			
	y0	y1	y2	y3
Advertising intensity	−9.266**	−13.009**	−20.634**	3.647
Firm size	−.360**	−0.609**	−0.580**	−0.347**
Firm age	−2.881**	−3.748**	−3.078**	−3.198**
Past equity performance	0.076**	0.045**	0.040**	0.021**
Industry	0.003**	0.001**	0.001**	0.001**
Constant	20.956**	29.100**	26.306**	22.759**
Model statistics				
Wald χ^2	3,731.54**	819.73**	564.37**	429.75**
N/n	5,819/436	5,432/436	5,118/436	4,768/436

Note. N/n = number of observations/number of firms.
Note. **$p \leq .01$.

Model 5 examines the impact of downsizing of marketing strategies on firm performance in the base year (y0) and the next 3 years (y1, y2, and y3) and whether an economic downturn moderates the relationship between downsizing marketing and firm performance. The results in Table 7 show that downsizing marketing activities does not have any significant impact on firm performance in the next year (y1, $\beta = 0.102$, n.s.) and the 3rd year after (y3, $\beta = 0.659$, $p < .1$). However, downsizing on marketing activities can positively affect firm performance in the base year (y0, $\beta = 1.100$, $p < .01$) and the 2nd year after (y2, $\beta = 0.864$, $p < .01$). These findings fail to support Hypothesis 5a, and the evidence indicates that downsizing on marketing activities does not negatively affect firm performance. The results also demonstrate that an economic downturn fails to significantly moderate the relationship

TABLE 4. RESULTS OF THE REGRESSION MODELS (MODEL 2: HYPOTHESIS 2)

	Dependent variable: firm performance (y0, y1, y2, and y3)			
	y0	y1	y2	y3
Marketing intensity	−3.336**	1.957	0.395	6.848**
Firm size	−0.242**	−0.431**	−0.371**	−0.178†
Firm age	−2.849**	−3.803**	−3.179**	−3.283**
Past equity performance	0.079**	0.045**	0.041**	0.023**
Industry	0.003**	0.001**	0.001**	0.001**
Constant	19.352**	26.111**	23.410**	20.185**
Model statistics				
Wald χ^2	3,380.53**	648.49**	418.21**	382.05**
N/n	5,540/428	5,160/428	4,847/427	4,502/426

Note. N/n = number of observations/number of firms.
Note. †p < .10; **p ≤ .01.

TABLE 5. RESULTS OF THE REGRESSION MODELS (MODEL 3: HYPOTHESIS 3)

	Dependent variable: firm performance (y0, y1, y2, and y3)			
	y0	y1	y2	y3
R&D intensity	−11.340**	7.863*	13.779**	16.988**
Firm size	−0.307**	−0.582**	−0.558**	−0.367**
Firm age	−3.096**	−3.592**	−2.874**	−2.908**
Past equity performance	0.076**	0.048**	0.041**	0.022**
Industry	0.003**	0.001**	0.001**	0.001**
Constant	21.019**	27.898**	24.845**	21.833**
Model statistics				
Wald χ^2	3,653.08**	797.87**	519.00**	467.63**
N/n	5,814/436	5,435/436	5,128/436	4,781/436

Note. N/n = number of observations/number of firms; R&D = research and development.
Note. *p ≤ .05; **p ≤ .01.

between downsizing marketing and firm performance in all the years tested in the model (y0, y1, y2, and y3) (y0, β = −0.970, n.s.; y1, β = 0.536, n.s.; y2, β = −1.431, n.s.; y3, β = −0.286, n.s.). Thus, the findings fail to support Hypothesis 5b, and the evidence indicates that downsizing marketing efforts fails to interact with the economic downturn to affect firm performance in all the years tested.

Model 6 examines the impact of downsizing R&D strategies on firm performance in the base year (y0) and the next 3 years (y1, y2, and y3) and whether an economic downturn moderates the relationship between downsizing R&D and firm performance. The results in Table 8 show that downsizing on R&D activities does not have a significant impact on firm performance in all years tested (y0, β = 0.200, n.s.; y1, β = −0.174, n.s.; y2, β = −0.026, n.s.; y3, β = 0.010, n.s.). These findings fail to support Hypothesis 6a, and the evidence indicates that downsizing on marketing activities does not significantly affect firm performance. The results also show that an economic downturn fails to significantly moderate the relationship between downsizing on marketing and firm

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TABLE 6. RESULTS OF THE REGRESSION MODELS (MODEL 4: HYPOTHESES 4A AND 4B)

| | Dependent variable: firm performance (y0, y1, y2, and y3) | | | | | | | |
| | Hypothesis 4a | | | | Hypothesis 4b | | | |
	y0	y1	y2	y3	y0	y1	y2	y3
Downsizing advertising	−0.012	0.154	0.230	−0.148	0.393*	0.049	0.228	−0.166
Firm size	−0.477**	−0.765**	−0.633**	−0.431**	−0.611**	−0.782**	−0.634**	−0.411**
Firm age	−2.055**	−2.850**	−2.751**	−2.578**	−1.985**	−2.885**	−2.766**	−2.572**
Past equity performance	0.160**	0.108**	0.076**	0.045**	0.155**	0.107**	0.076**	0.043**
Industry	0.002**	0.001**	0.001**	0.001**	0.003**	0.001**	0.001**	0.001**
Economic downturn					−0.657**	0.311	0.347†	0.292
Downsizing advertising × economic downturn					−1.794**	0.536	0.018	−0.182
Constant	19.782**	27.524**	25.279**	21.689**	21.410**	27.825**	25.280**	21.338**
Model statistics								
Wald χ^2	9,274.47**	818.13**	463.58**	384.69**	3,122.66**	820.31**	475.58**	321.90**
N/n	3,433/388	3,274/388	3,124/388	3,948/385	3,433/388	3,274/388	3,124/388	2,948/385

Note. N/n = number of observations/number of firms.
Note. †p < .10; *p ≤ .05; **p ≤ .01.

Smiling curve
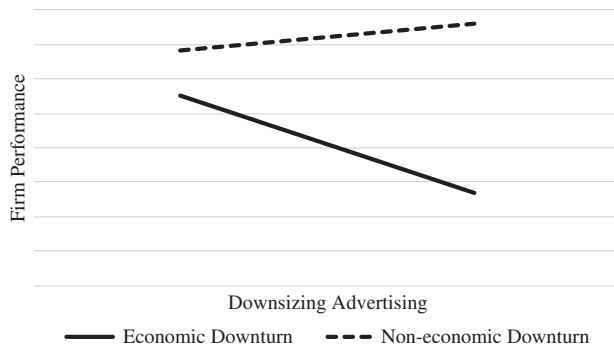
performance in all years tested (y0, $\beta = 0.030$, n.s.; y1, $\beta = -0.218$, n.s.; y2, $\beta = -0.741$, n.s.; y3, $\beta = 1.086$, n.s.). Thus, the findings fail to support Hypothesis 6b, and the evidence indicates that downsizing R&D efforts fails to interact with the economic downturn to affect a firm's current and future performance.

In short, the empirical findings show mixed support for the hypotheses tested and reveal that following the smiling curve may not improve a firm's current performance but may affect its future performance in different ways: a firm that internalizes advertising efforts may negatively affect its future performance, while a firm that internalizes marketing efforts and R&D efforts may improve its future performance. The popular use of downsizing practices to streamline businesses may lead to better performance only under limited circumstances, because only downsizing marketing activities can positively affect a firm's current and some future performance. In addition, contrary to conventional wisdom, downsizing practices may not necessarily lead to significant differences in firm profitability during economic downturns and non-economic downturns, because only downsizing advertising efforts during an economic downturn can significantly worsen a firm's current performance.

DISCUSSION AND CONCLUSION

Does following the smiling curve matter to firm performance? This study used Taiwanese firms to examine whether firms in emerging markets can improve their performance by following the smiling curve to internalize brand efforts and technological capabilities from OEM arrangements. The findings show mixed evidence for the effects of the smiling curve. In an emerging economy, pursuing brands through advertising efforts might not be a good strategy for firms because advertising intensity can negatively affect present and future firm performance. However, efforts to pursue brands through marketing may affect firm performance differently from advertising. Pursuing brands through marketing efforts can negatively affect the present performance of a firm, but such marketing efforts can benefit a firm's future performance. Thus, there is a lag effect in the impact of the smiling curve on marketing's contribution to firm performance. That is, the benefits of following the smiling curve by internalizing marketing efforts may not be realized immediately but will appear in the following years. Hence, a firm in an emerging economy that aims to pursue own-brand strategies should carefully consider investing in advertising because the return on such investments may not be optimistic. However, investing in marketing may improve firm performance in the long run, although the benefits from investing in marketing are challengeable in the short run. R&D investments made by firms in emerging economies may also improve firm performance in the long run, while the impact of such

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TABLE 7. RESULTS OF THE REGRESSION MODELS (MODEL 5: HYPOTHESES 5A AND 5B)

| | Dependent variable: firm performance (y0, y1, y2, and y3) | | | | | | | |
| | Hypothesis 5a | | | | Hypothesis 5b | | | |
	y0	y1	y2	y3	y0	y1	y2	y3
Downsizing marketing	1.100**	0.102	0.864*	0.659†	1.234**	0.087	0.910**	0.724*
Firm size	−0.121†	−0.202*	−0.156†	−0.158	−0.101	−0.207*	−0.175†	−0.157
Firm age	−2.764**	−3.444**	−2.929**	−2.963**	−2.643**	−3.499**	−3.091**	−2.945**
Past equity performance	0.111**	0.077**	0.077**	0.047**	0.110**	0.075**	0.065**	0.045**
Industry	0.003**	0.001**	0.000**	0.001**	0.003**	0.001**	0.000**	0.001**
Economic downturn					−1.201**	0.526**	0.447**	0.392*
Downsizing marketing × economic downturn					−0.970	0.536	1.431	−0.286
Constant	16.682**	21.434**	18.943**	19.101**	16.331**	21.561**	19.869**	19.024**
Model statistics								
Wald χ^2	3,458.46**	627.16**	512.33**	389.14**	3,511.13**	639.50**	411.98**	384.09**
N/n	5,064/424	4,688/422	4,379/419	4,038/416	5,064/424	4,688/422	4,379/419	4,038/416

Note. N/n = number of observations/number of firms.
Note. †p < .10; *p ≤ .05; **p ≤ .01.

TABLE 8. RESULTS OF THE REGRESSION MODELS (MODEL 6: HYPOTHESES 6A AND 6B)

| | Dependent variable: firm performance (y0, y1, y2, and y3) | | | | | | | |
| | Hypothesis 6a | | | | Hypothesis 6b | | | |
	y0	y1	y2	y3	y0	y1	y2	y3
Downsizing R&D	0.200	−0.174	−0.026	0.010	0.236	−0.138	0.087	−0.135
Firm size	−0.349**	−0.532**	−0.497**	−0.344**	−0.317**	−0.539**	−0.480**	−0.337**
Firm age	−2.530**	−3.132**	−2.997**	−2.949**	−2.466**	−3.194**	−3.038**	−2.942**
Past equity performance	0.116**	0.077**	0.070**	0.047**	0.116**	0.077**	0.069**	0.047**
Industry	0.003**	0.001**	0.000**	0.001**	0.003**	0.001**	0.001**	0.001**
Economic downturn					−1.342**	0.527**	0.549**	0.048
Downsizing R&D × economic downturn					0.030	−0.218	−0.741	1.086
Constant	19.750**	25.620**	24.559**	21.895**	19.447**	25.768**	24.314**	21.773**
Model statistics								
Wald χ^2	2,753.52**	579.16**	440.18**	398.01**	2,813.02**	605.91**	446.62**	398.70**
N/n	4,341/384	4,022/382	3,750/380	3,471/377	4,341/384	4,022/382	3,750/380	3,471/377

Note. N/n = number of observations/number of firms; R&D = research and development.
Note. **$p \leq .01$.

Smiling curve

investments on short-term performance may not be preferable. Therefore, following the smiling curve matters to firm performance under some circumstances, and some benefits may take some time to be realized. The evidence-based findings of this study partially support the practical impacts of the smiling curve but further extend to highlight the theoretical lens of resources-based perspectives and the evolutionary process of design management (Erichsen & Christensen, 2013).

Can downsizing actions negatively affect firm performance and worsen it during an economic downturn? Contrary to conventional wisdom, downsizing on advertising and R&D did not affect firm performance in any year of data in this study, but downsizing on marketing positively affected firm performance in the base year and the 2nd year after. The finding of a positive relationship between downsizing marketing efforts and base-year performance is consistent with the finding of the smiling curve that marketing intensity is negatively related to a firm's current performance. Furthermore, these evidence-based findings challenge the argument that an economic downturn can worsen the relationship between downsizing strategies and firm performance. An economic downturn only negatively moderated the relationship between downsizing advertising and firm performance in the present year and did not affect the relationship between downsizing marketing and firm performance and between downsizing R&D and firm performance in the years tested by this study. Thus, downsizing on marketing can benefit firm performance under certain circumstances, and an economic downturn fails to interact with downsizing marketing efforts to affect firm performance. An economic downturn also fails to interact with downsizing R&D efforts to affect firm performance, but can only negatively moderate the relationship between downsizing advertising efforts and a firm's present performance. Therefore, the impacts of downsizing strategies on firm performance and their interactions with an economic downturn are not as significant as expected, and a firm should be careful when considering downsizing strategies to improve performance, especially during an economic downturn.

To sum up, some value to a firm that follows the smiling curve may take time to be realized, and a firm may frown if it expects only short-term advantages. Downsizing activities may not always be the appropriate strategy to improve firm performance, regardless of the economic conditions. That is, a smiling curve should not frown during an economic downturn because it will not enhance firm performance. These findings imply that a firm should carefully consider and evaluate downsizing strategies to ensure that downsizing leads to rightsizing.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

This study has some limitations. First, it includes only firms publicly listed in Taiwan. Thus, the generalizability of the findings to other regions is debatable. Future research may extend the research scope to other regions to seek further evidence and validate the present findings.

Second, a firm's R&D efforts should affect not only technological capabilities, but also brand value. In other words, the influence from the customers' end may affect product development from the innovation's end (e.g., Lin, Tu, Chen, & Huang, 2013), that is, both ends of the smiling curve may jointly affect firm performance. Future research may consider including or controlling for more factors that may affect firm performance.

Finally, this study focuses on operational downsizing practices for analyzing the effect of the smiling curve, but future research may consider other non-operational strategies (i.e., human resources-related downsizing) to seek more evidence from various perspectives to enrich the related studies in this stream.

ACKNOWLEDGMENTS

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