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What Generates Goodwill?

An Examination of the Relation Between Purchased Goodwill and Acquired Firms' Expenditures on Advertising and Research and Development

March 1996

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Frances L. Ayres is Director of the School of Accounting at the University of Oklahoma. Betty R. Jackson is Associate Professor of Accounting and Tax at the University of Colorado at Boulder.

The Tax Foundation would like to congratulate Professors Ayres and Jackson for having been selected as Ernst & Young Visiting Professors for 1994.

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Executive Summary

Treatment of goodwill from both a tax and a financial accounting perspective is an ongoing problem. The issues stem largely from the fact that the transactions leading to recognition of goodwill (for both tax and financial accounting purposes) are limited to those in which an existing company is purchased in its entirety. From a tax perspective the issues relate to whether the current rules regarding amortization of goodwill achieve an economically efficient result as measured by tax rates on goodwill and other intangibles relative to rates on other assets. Determination of the appropriate tax treatment depends intrinsically upon the tax treatment given to the expenditures that create intangibles. From a financial accounting perspective the issues relate to determination of an appropriate amortization period for goodwill.

This research focuses on the costs to create goodwill. While a number of studies have argued that goodwill is created by expenditures on advertising and research and development, there have been no direct tests of this hypothesis. Using mergers from 1975-1992, this study examines the relation between purchased goodwill and preacquisition expenditures on advertising and research and development. Intangible assets generally are ignored during development because the conservatism bias reflected in financial reporting, coupled with a desire to find tax write-offs, provides little incentive for a company to try to value or report in any way self-developed intangibles. This bias causes management to be largely unaware of the level and value of a company's intangible assets until it becomes involved in a potential business combination. "Goodwill" often is attributed to a variety of factors including location, management quality, proprietary knowledge, and assorted other factors which may or may not relate to costs that are typically expensed for tax purposes. Whether or not purchased goodwill is created by expenditures on tax deductible items is an empirical question.

The research hypotheses (stated in the alternative form) follow:

H_{a1} :There is a positive relation between an acquired company's preacquisition expenditures on advertising and the amount of goodwill recognized by an acquiring company in a purchase business combination.

H_{a2}: There is a positive relation between an acquired company's preacquisition expenditures on research and development and the amount of goodwill recognized by an acquiring company in a purchase business combination.

The results strongly suggest that expenditures on advertising and R&D are a significant source of purchased goodwill. We also found that a number of firms that report no expenditures on either advertising or R&D report significant goodwill. Thus, we can conclude that advertising and R&D expenditures will contribute significantly to goodwill of companies acquired in purchase transactions. However, the source of goodwill remains unknown for acquired firms that do not spend on these items.

From a tax perspective the findings support the assumptions underlying the Gravelle and Taylor analysis for at least some firms. However, Gravelle and Taylor acknowledge that some intangibles may be created by expenditures that are not immediately expensed and that their analysis is predicated on the assumption that the expenditures are expensed as incurred. The results presented here suggest that it may be appropriate to examine the source of purchased goodwill in determining the tax treatment to the purchasing firm. Goodwill generated by expenditures other than

R&D and advertising should be evaluated and perhaps treated differently.

The results also indicate that capitalization of advertising and R&D may be theoretically superior to existing accounting practices. The issue then becomes one of determining the appropriate amortization period. A third issue is whether this suggests alternative tax treatments of advertising or R&E.

Introduction

In recent years the tax treatment of intangible assets and the expenditures that create those intangibles has become increasingly important from a tax policy perspective. Controversy over what qualified as an amortizable asset for tax purposes and what qualified as nonamortizable goodwill led to large numbers of litigated tax cases. In addition, many companies argued that U.S. firms have been damaged in international competition because of the unfavorable tax treatment given to goodwill in acquisitions by domestic companies.

Congress passed new IRC Sec. 197 in 1993 allowing ratable amortization over a 15-year period for most purchased intangibles including goodwill. A number of companies were adversely affected by the new law because they had been using shorter lives for amortizing some intangible assets. This legislation provides additional impetus to develop accurate and justifiable valuation methods for intangible assets. It also raises the question of whether a 15-year amortization period is appropriate for all intangibles covered by Sec. 197.

Goodwill is particularly significant because it has become an increasingly large component of the price of acquired companies over the past twenty years (Davis, 1992).The Compustat data base shows that for companies reporting intangible assets, intangibles as a percent of total assets rose from 4.8% to 8.2% from 1974 to 1991, while the number of companies with reported intangibles rose from 701 to 1,315.

The appropriate treatment of goodwill for tax purposes depends on understanding the factors that create it. The effective tax rate on an asset and the asset price are a function of the tax treatment of the asset from its creation through subsequent resales until the end of its useful life. Tax favored assets will have higher prices and lower pre-tax rates of return (Scholes and Wolfson [1989]).

The question of what creates goodwill remains untested in any direct fashion.This is partly due to the fact that assets are valued when they are bought and sold in arm's length transactions. The number of these transactions involving recorded goodwill is limited. A number of studies (see, for example, Morck and Yeung [1991], Hall [1993], and Hirschey [1982]) have examined the relation between stock prices and spending on advertising and research and development (R&D) in an effort to assess the extent to which these expenditures create benefits that persist over time. While these studies provide indirect evidence that spending on R&D and advertising are likely to create goodwill, they do not provide direct evidence that the expenditures translate into goodwill.

Gravelle and Taylor (1992) demonstrate that under certain conditions a single amortization period for all purchased intangibles is both tax neutral and efficient. The Gravelle and Taylor (G&T) analysis is based on the assumption that all costs that create and maintain intangible assets are tax deductible as incurred (p. 85, footnote 6). If this assumption does not hold, then the appropriate amortization period depends upon the useful life of the intangible and the amortization period used for the expenditure or expenditures that created the intangible assets.This study makes two contributions to the questions raised above. First, we provide a more direct test than have prior researchers of the extent to which expenditures on R&D and advertising are likely to create goodwill. We do so by examining the expenditures of acquired firms in the time period prior to their acquisition to determine the extent to which higher levels of preacquisition spending on R&D and advertising are associated with higher levels of goodwill at the time of the acquisition.This study is the first of which we are aware to use a transaction-based ap-

proach to determine the linkage between a firm's expenditures on items commonly believed to create goodwill (i.e. R&D and advertising) and the amount paid for goodwill in an arm's length transaction. In a sense the analysis could be viewed as a kind of "cost analysis" for goodwill.

Second, our approach allows a test of the maintained hypothesis of the Gravelle and Taylor analysis. By examining the extent to which goodwill is created primarily by expenditures on advertising and R&D, the validity of the assumptions underlying the Gravelle and Taylor analysis also can be tested.

The next section of this paper discusses tax cases and prior research related to goodwill. This is followed by the research design, hypotheses and methodology. The third section discusses the results, and in the final section, the conclusions and implications of the research are presented.

Background

Tax Issues

Intangible asset valuation and determination of appropriate amortization periods present difficult conceptual issues. Financial accountants and economists explore these issues to better understand the nature of the characteristics of goodwill, develop guidelines for improved income measurement, and favorably position U.S. companies for international competition. Tax policymakers are concerned with these issues, as well as the fairness and administrative efficiency of the tax system, and the revenue needs of the federal government. Taxpayers strive to minimize tax liability, while the IRS attempts to collect all the revenue implied by the tax code while minimizing administrative complexity and expense.

The opposing incentives of taxpayers and the IRS and the large amount of money at stake causes taxpayers to invest significant energy in identifying assets separable from goodwill. Pre-1993 tax law permitted no amortization of intangible assets unless a taxpayer could both determine a value for the asset and establish its useful life. As a result, taxpayers had incentives to carve out specific amortizable intangible assets; the IRS argued that the intangibles were simply unamortizable goodwill. The General Accounting Office (GAO) analysis (1991) showed that taxpayers, on average, allocated 23 percent of the purchase price of acquired companies to amortizable intangible assets and 7 percent to goodwill. The culmination of the IRS/taxpayer disputes came in two cases that affected numerous taxpayers.

In *Ithaca Industries* [97 TC 253, 1991] the taxpayer argued for amortization of its "workforce in place" and favorable supply contracts. The court found the supply contracts to be amortizable because they were capable of valuation and had a determinable life. In contrast, the court held that workforce in place was not an asset separable from the business and that it was a nonwasting asset. In *Newark Morning Ledger Co.* [113 S.Ct. 1670, 1993] the Supreme Court found subscriber lists to be amortizable, using essentially the same rationale as the Tax Court in *Ithaca Industries*. The court also commented on the practical and administrative difficulties of demonstrating a value and amortizable life.

Momentum gathered for enacting a statute to provide certainty with respect to intangible asset write-offs. In addition to arguments about ease and certainty of compliance, commentators and the GAO (GAO, 1991, pp. 34-35) expressed concern that the existing policy resulted in a competitive disadvantage in international markets for U.S. companies because many of the United States' major trading partners (e.g., Japan and Germany) allowed amortization of all intangibles, including goodwill. The result

was Sec. 197 which provides for a 15-year amortization period for most purchased intangibles. Taxpayers in the computer and motion picture industries successfully lobbied for shorter lives for computer software and interests in film, sound recordings, video tapes, books, etc. On the other end of the spectrum, the communication industry succeeded in getting licenses, permits and other government granted rights included as amortizable intangibles, even for rights granted for indefinite periods. In addition, despite discussions about requiring capitalization of expenditures generally thought to be related to increased intangible asset values (e.g., advertising and research and development), the tax treatment of self-created intangibles was unchanged.

Section 197 greatly enhances administrative and compliance simplicity. It creates a favorable outcome for taxpayers who purchase goodwill and leaves unchanged the tax treatment of computer software, visual and auditory creations, and other separately purchased intangible assets. However, some taxpayers lost tax benefits in this legislation, particularly those taxpayers who purchased assets for which lives shorter than 15 years previously had been established and defended. The GAO analysis (1991) reported an eight-year average life claimed by taxpayers, across all non-goodwill intangible assets.

Pressing revenue demands suggest that the change in tax treatment for purchased intangibles may cause Congress and the Internal Revenue Service to take a closer look at the tax treatment of activities that create intangibles. In Rev. Rul. 92-80 (1992-39 IRB 7) and PLR 9330034, the IRS stated its position [consistent with Reg. Secs. 1.162-(1)(a) and (20)(a)(2)] that the Supreme Court decision in *INDOPCO* (112 S.Ct. 1039, 1992) generally would not lead to a requirement to capitalize advertising or marketing costs. Capitalization of advertising expenditures has been considered before and is again under discussion. The extent to which advertising and R&D create value beyond the year of expenditure remains unclear, however.

While there are important valuation issues with respect to all intangible assets, in this study we focus on goodwill. Other intangible assets that are bought and sold (e.g., core deposits, customer lists, etc.) tend to be industry specific, while purchased goodwill is pervasive in most purchase business combinations.

What Creates Goodwill?

"Goodwill" has been defined as "superior earning power." It often is attributed to a variety of factors including location, management quality, proprietary knowledge, and assorted other factors that may not relate to costs that are typically expensed for tax purposes. For example, an intangible asset may develop due to a fortunate set of circumstances that serves to make a company a very desirable acquisition. In practice, an effort is made to measure goodwill only at the time one firm seeks to acquire another. Even then, the value of goodwill is a residual amount which is the difference between the total price paid for the target company and the fair market value of its identifiable assets.

Efforts to determine empirically what factors create goodwill have employed a variety of indirect methods. Grabowski and Mueller (1978) regressed profit rates (adjusted for R&D expenses) on several variables including expenditures on R&D. They concluded that firms in research-intensive industries earn significantly above-average returns on their R&D capital. Griliches (1981) also found a positive relation between R&D expenditures and large firms' intangible capital by regressing firm values on R&D expenditures and number of patents.

Austin (1993) employed the capital as-

set pricing model to estimate the effect on firm value of a "patent event" (variables related to the patent's scope, its association with an end product, and its membership in certain scientific classes). He found that excess returns were associated with patent events, especially those related to product-linked patents and patents announced in *The Wall Street Journal.* Other researchers have employed stock market values to determine the effect of unionization on the returns to R&D investments (Connolly, Hirsch, and Hirschey, 1986).

Hall (1993) examined the relation between a firm's expenditures on advertising and R&D and the market value of the firm over the period 1973-1991. She concluded that advertising and R&D are valued differently by the market, and that the market value of R&D is about five times as high as that for advertising. Hall's approach compared the contemporaneous market value of firms incurring R&D expenditures with the expenditures made over time.

In summary, while numerous studies have examined the degree to which expenditures on advertising and R&D are associated with higher stock prices, there have been no direct attempts to test this linkage in a transaction setting. The purchase of one company by another creates a unique setting in which to test the relation between these variables and their market value. When one company acquires another in its entirety, both tax law and financial accounting standards require valuation of the acquired company's assets. The price paid for the company in excess of the market value of the underlying identifiable assets represents the market value of the purchased goodwill.

Research Design

Hypothesis Development

As evidence to support tax law revisions, Gravelle and Taylor [1992] argue that neutrality (i.e., providing equal tax rates across intangibles of differing durabilities) does not require that write-off periods for intangible assets be based on the useful life of the intangible asset. They conclude that the adoption of a single amortization period represents "a rare case where economic neutrality and administrative simplicity point to the same solution" (G&T, p. 85). The crux of their argument is that, because present laws allow expensing of costs needed to create or replace intangible assets (such as advertising), the flow of income is identical for short-lived and long-lived intangibles. The authors state that the "central flaw" in the perspective that useful lives must provide the foundation for the amortization period is:

> the failure to recognize that the treatment of used assets cannot be divorced from the treatment of new assets in assessing economic efficiency and tax neutrality, as both practices act together to determine incentives to invest and trade (G&T, p. 81).

A tested hypothesis of the Gravelle and Taylor analysis is the assumption that expenditures to maintain intangible assets are currently expensed for tax purposes. If intangibles are created by expenditures that are not currently expensed, then the issue of the appropriate or neutral tax treatment becomes more complex.

The tax treatment of self-created intangibles is driven by the practical problem of identifying which expenses have created assets that will benefit future periods. Current tax rules allow immediate expensing of most costs, such as advertising, that are thought to create intangibles. However, the GAO points out that changing the tax treatment of intangibles also raises the issue of how expenditures that lead to the creation of intangibles should be treated (GAO [1991]).

Gravelle and Taylor's conclusions are significant as a foundation for tax policy decisions. They are intuitively appealing and generally supported by previous research using indirect evidence. The assumption that purchased goodwill is generated by tax deductible expenses has not been tested directly, however. This research seeks to provide empirical evidence regarding the extent to which this assumption holds. Affirmation that it does hold provides a foundation for future research aimed at determining the appropriate tax treatment of self-created intangibles and examining related issues.

Intangible assets generally are ignored during development because the conservatism bias reflected in financial reporting, coupled with a desire to find tax write-offs, provides little incentive for a company to try to value or report in any way self-developed intangibles. This bias causes management to be largely unaware of the level and value of a company's intangible assets until it becomes involved in a potential business combination. "Goodwill" often is attributed to a variety of factors including location, management quality, proprietary knowledge, and assorted other factors which may or may not relate to costs that are typically expensed for tax purposes. Whether or not purchased goodwill is created by expenditures on tax deductible items is an empirical question.

Our research hypotheses relate to the Gravelle and Taylor assumption that intangible assets are created primarily by tax deductible advertising and research and development. If this assumption is true, then we would expect, if all other factors are held constant, to find a positive relation between advertising and R&D expenditures and the amount of goodwill recognized when a company is acquired. Alternatively, if these expenditures do not create value beyond the period incurred, then no relation would be expected.

The research hypotheses (stated in the alternative form) follow:

H_{a1}: There is a positive relation between an acquired company's preacquisition expenditures on advertising and the amount of goodwill recognized by an acquiring company in a purchase business combination.

H_{a2}: There is a positive relation between an acquired company's preacquisition expenditures on research and development and the amount of goodwill recognized by an acquiring company in a purchase business combination.

Results and Discussion

Two models were developed for this study. The first model shows the value of purchased goodwill as a share of a company's total value as a function of advertising and R&D expenditures. The second model is the same as the first except the values for goodwill, advertising, and R&D are not deflated by the value of the company's total assests. The two models and variations on them were run on three sample groups. The first consisted of all matched pairs. This included all acquired companies, even those for which data on R&D and advertising was coded as missing or immaterial (90 firm pairs). The second sample consisted of only firm pairs with material reported amounts of R&D or advertising (71 firm pairs). Finally, separate regressions were run for the 54 firm pairs with positive levels of R&D (on the R&D variables alone) and for the 50 firm pairs with positive levels of advertising (on the advertising variables alone).

Tables 3 and 4 present descriptive statistics on the sample. Advertising ranged from $0 to $89 million, R&D spending from

$0 to $29 million, and goodwill from $0 to $2 billion. Table 4 shows a positive correlation between spending on both advertising and R&D and goodwill. R&D and advertising are not significantly correlated.

Regressions based on a 90 firm sample are reported in Tables 5 and 6. Table 5 reports the results from four forms of the model based on the weighted variables, and Table 6 reports on the unweighted variables. (All t-statistics are based on White's corrected standard errors.) The results from Table 5 are statistically significant (at $p < .05$) for both advertising and R&D as well as for total intangible spending (advertising + R&D). The coefficients are positive as predicted. However, when the regressions were run using the unweighted variables (Table 6), the results, while positive, are no longer significant. This is consistent with Barth and Kallapur (p. 13) who note that "deflating by a proxy highly correlated with the true scale factor *worsens* coefficient bias and *decreases* efficiency."

Nineteen firms in the initial sample did not report material amounts of either advertising or R&D. This tends to bias the regression coefficients downward. The regression was rerun using firms with a material amount of advertising or R&D (71 firm pairs). These results, from the weighted and unweighted samples respectively, are reported in Tables 7 and 8. Table 7 reports results for the weighted sample. The results are statistically significant ($p < .05$) for both advertising and R&D consistent with the results on the 90 firm pair sample. The results from Table 8 are also significant (at $p < .10$) when both advertising and R&D are included and using the sum of advertising and R&D (TOTIN2). However, they are not significant for either advertising or R&D alone. This result suggests that spending on advertising and R&D contribute to total goodwill, but it is difficult to specify the relative contribution of each. To parse out the effect of advertising and R&D, separate regressions were run using only firms with advertising (50 firm pairs) and only firms with R&D (54 firm pairs). The results reported in Tables 9 and 10 are statistically significant (at $p < .10$) for both the weighted and the unweighted models. This suggests that for firms with either advertising or R&D expenditures, these items are significantly associated with creation of goodwill.

Consistent with Hall (1993) we find that the coefficient on R&D (RDAVG) is much higher than that on advertising (ADVAVG), meaning that the effect of a dollar spent on R&D on the value of goodwill is greater than that for the dollar of advertising. Overall a change in R&D has abouts 2.2 times the effect of a change in advertising expenditure. The interpretation of the unweighted form of the regression coefficients is straightforward. That is, the coefficient can be viewed as the price paid for goodwill per dollar expended on advertising and/or R&D by the acquired company. Given some assumptions about the length of the payments and the rate of amortization, it is possible to determine the approximate cost of the capital created by expenditures on advertising and R&D. Overall it appears that advertising is more costly than R&D. Ignoring amortization, the coefficients from Table 10 imply a cost of capital of approximately 5 percent for R&D and 16 percent for advertising.[1] In large part this difference may be due to a more rapid amortization period.

Conclusion

The results provide strong support that expenditures on advertising and R&D are a significant source of purchased goodwill. We also found that a number of firms that report no expenditures on either advertising or R&D report significant goodwill. Thus, we can conclude that advertising and R&D expenditures will contribute significantly to goodwill of many companies ac-

quired in purchase transactions. However, the source of goodwill remains unknown for acquired firms that do not spend on these items.

From a tax perspective, the findings support the assumptions underlying the Gravelle and Taylor analysis for at least some firms. However, Gravelle and Taylor acknowledge that some intangibles may be created by expenditures that are not immediately expensed and that their analysis is predicated on the assumption that the expenditures are expensed as incurred. Our results suggest that it may be appropriate to examine the source of purchased goodwill in determining the tax treatment to the purchasing firm. Goodwill generated by expenditures other than R&D and advertising should be evaluated and perhaps treated differently.

The results also indicate that capitalization of advertising and R&D may in some instances be theoretically superior to existing tax and accounting practices. The issue then becomes one of determining the appropriate amortization period in these cases.

Table 1

Completed Acquisitions with both Acquiring and Acquired Company on Compustat

Year	Number of Firms Acquired
1975	18
1976	8
1977	23
1978	26
1979	26
1980	16
1981	23
1982	16
1983	20
1984	33
1985	29
1986	31
1987	30
1988	32
1989	21
1990	11
1991	5
1992	8
Total Acquisitions	376

Table 2

Sample Elimination Criteria

Companies gathered from Moody's "Additional Companies Formerly Included Index" with both the acquired and acquiring company publicly available and with Compustat listing	376
Acquired company data available on Compustat for years t-5 through t-1 prior to the acquisition	(49)
Acquiring company data available on Compustat for years t and t+1 after the acquisition	(160)
Pooling of Interest	(20)
Other (primarily lack of disclosure regarding purchase)	(57)
Final Base Sample (firm pairs)	90
Firms in base sample with material advertising	50
Firms in base sample with material research and development	54
Firms in base sample with material advertising or research and development	71

Table 3

Summary Statistics for Variables Used in Regressions of Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill, Sample of 90 U.S. Firms (Millions $)

Simple Statistics					
Variable	N	Mean	Std. Dev.	Minimum	Maximum
AVGADV	90	0.025	0.064	0	0.557
AVGRD	90	0.020	0.032	0	0.199
AVGRD2	90	3.864	7.466	0	29.504
AVGADV2	90	6.433	16.617	0	89.004
GWCHG2	90	152.365	321.891	0	2001.000
GWCHG	90	0.599	0.859	0	3.638
TOTIN2	90	10.298	18.832	0	89.004
TOTIN	90	0.045	0.072	0	0.579
TA_{t-1}	90	407.519	898.166	2.463	6388.265

AVGADV = $\sum_{i=(t-4)}^{(t-2)} (ADV_i/TA_{t-1})/3$

ADV_i = Advertising expense in year i (Acquired firm)

TA_{t-1} = Total assets of acquired firm in year t-1, where t is the acquisition year

AVGRD = $\sum_{i=(t-4)}^{(t-2)} (RD_i/TA_{t-1})/3$

AVGRD2 = $\sum_{i=(t-4)}^{(t-2)} RD_i/3$

RD_i = Research and development expense in year i (Acquired firm)

AVGADV2 = $\sum_{i=(t-4)}^{(t-2)} ADV_i/3$

GWCHG2 = Change in goodwill for acquiring firm from purchasing target firm

GWCHG = GWCHG2/TA_{t-1} = total change in goodwill weighted by acquired firm's total assets in year t-1

TOTIN2 = AVGADV2 + GWCHG2

TOTIN = TOTIN2 / TA_{t-1}

Table 4

Correlation Matrix of Variables Used in Regression of Acquired Firm Expenditures on Advertising and Research & Development on Purchased Goodwill, Sample of 90 U.S. Firms (Millions $)

Correlation Analysis
Pearson Correlation Coefficients / Prob > |R| under Ho:
Rho=0 / N=90

Variable	AVGADV	AVGRD	AVGRD2	AVGADV2	GWCJG2	GWCHG	TOTIN2	TOTIN	TA_{t-1}
AVGADV	1.000 0.000	0.000 0.997	-0.062 0.559	0.391 0.000	.012 .910	.314 .002	.320 .002	.892 .001	0.070 .506
AVGRD		1.000 0.000	0.343 0.000	-0.111 0.294	-.083 .435	.221 .037	.037 .726	.452 .000	-.150 .157
AVGRD2			1.000 0.000	0.091 0.389	.229 .030	.229 .030	.477 .000	.101 .350	.333 .001
AVGADV2				1.000 0.000	.274 .009	.021 .838	.919 .000	.299 .004	.271 .101
GWCHG2					1.000 0.000	.278 .014	.333 .001	-.027 .801	.472 .001
GWCHG						1.000 0.000	.012 .907	.380 .000	-.121 .258
TOTIN2							1.000 0.000	.303 .003	.371 .000
TOTIN								1.000 0.000	-.132 .217
TA_{t-1}									1.000 0.000

AVGADV = $\sum_{i=(t-4)}^{(t-2)} (ADV_i/TA_{t-1})/3$

ADV_i = Advertising expense in year i (Millions $) (Acquired firm)

TA_{t-1} = Total assets of acquired firm in year t-1, where t is the acquisition year

AVGRD = $\sum_{i=(t-2)}^{(t-1)} (RD_i/TA_{t-1})/3$

AVGRD2 = $\sum_{i=(t-2)}^{(t-1)} RD_i/3$

AVGADV2 = $\sum_{i=(t-4)}^{(t-2)} ADV_i/3$

RD_i = Research and development in year i (millions $) (Acquired firm)

GWCHG2 = Change in goodwill for acquiring firm from purchasing target firm

GWCHG = GWCHG2/TA_{t-1} - total change in goodwill weighted by acquired firm's total assets in year t-1

TOTIN2 = AVGADV2 + GWCHG2

TOTIN = TOTIN2/TA_{t-1}

Regression Summary Statistics From Regressing Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill, 90 U.S. Firms (Weighted By Acquired Firm Total Assets) (Millions $)

Model 1a: $GWCHG = b_0 + b_1\ AVGADV + b_2\ AVGRD + u$
Model 1b: $GWCHG = b_0 + b_1\ AVGADV + u$
Model 1c: $GWCHG = b_0 + b_2\ AVGRD + u$
Model 1d: $GWCHG = b_0 + b_3\ TOTIN + u$

		Model 1a			Model 1b			Model 1c			Model 1d		
Variable	Pred. Sign	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value
Intercept (b_0)	?	.374	3.96	.0001	.492	5.21	.0001	.482			.392	4.46	.000
AVGADV (b_1)	+	4.206	3.27	.0007	4.207	3.23	.0001	--	--	--	--	--	--
AVGRD (b_2)	+	5.823	3.82	.0653	--	--	--	5.826	1.58	.0588	--	--	--
TOTIN (b_2)	+	--	--	--	--	--	--	--	--	--	4.536	4.24	.000
Adj.R^2		.13			.09			.04			.14		
Nobs		90			90			90			90		

p-value = based on one-sided null if coefficient sign is predicted and a two-sided null otherwise

AVGADV = $\sum_{i=(t-4)}^{(t-2)} (ADV_i/TA_{t-1})/3$

AVGRD = $\sum_{i=(t-4)}^{(t-2)} (RD_i/TA_{t-1})/3$

GWCHG = $GWCHG2/TA_{t-1}$ - total change in goodwill weighted by acquired firm's total assets in year t-1
TOTIN = AVGADV + AVGRD
TA_t = total assets for acquiring company in year t
RD_i = research and development expenditures for the acquired company in year i
ADV_i = advertising expense for acquired company in year i

Table 5

Regression Summary Statistics From Regressing Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill, 90 U.S. Firms (Millions $)

Model 2a: $GWCHG2 = b_0 + b_1\ AVGADV2 + b_2\ AVGRD2 + b_4\ TA_{t-1} + u$

Model 2b: $GWCHG2 = b_0 + b_1\ AVGADV2 + b_4\ TA_{t-1} + u$

Model 2c: $GWCHG2 = b_0 + b_2\ AVGRD2 + b_4\ TA_{t-1} + u$

Model 2d: $GWCHG2 = b_0 + b_3\ TOTIN2 + b_4\ TA_{t-1} + u$

		Model 2a			Model 2b			Model 2c			Model 2d		
Variable	Pred. Sign	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value
Intercept (b_0)	?	60.42	1.69	.0948	69.831	2.88	.4694	73.808	2.62	.0102	61.031	2.54	.0127
AVGADV2 (b_1)	+	3.056	.73	.4699	3.059	.73	.2347	--	--	--	--	--	--
AVGRD2 (b_2)	+	3.439	.49	.3118	--	--	--	3.451	.51	.3040	--	--	
TOTIN2 (b_3)	+	--	--	--	--	--	--	--	--	--	3.118	.87	.1920
TA_{t-1} (b_4)	?	.145	1.34	.1850	.154	1.60	.1124	.160	1.52	.1333	.145	1.39	.1671
Adj.R^2		.23			.23			.21			.23		
Nobs		90			90			90			90		

p-value = based on one-sided null if coefficient sign is predicted and a two-sided null otherwise

AVGADV2 = $\sum_{i=(t-4)}^{(t-2)} ADV_i/3$

AVGRD2 = $\sum_{i=(t-4)}^{(t-2)} RD_i/3$

TOTIN2 = AVGADV2 + GWCHG2

TA_{t-1} = Total assets of acquired firm in year t-1, where t is the acquisition year

GWCHG2 = Change in goodwill for acquiring firm from purchasing target firm

Table 6

Regression Summary Statistics From Regressing Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill, 71 U.S. Firms With Material Research & Development or Advertising (Weighted by Acquired Firm Total Assets) (Millions $)

Model 1a: GWCHG = $b_0 + b_1$ AVGADV + b_2 AVGRD + u
Model 1b: GWCHG = $b_0 + b_1$ AVGADV + u
Model 1c: GWCHG = $b_0 + b_2$ AVGRD + u
Model 1d: GWCHG = $b_0 + b_3$ TOTIN + u

		Model 1a			Model 1b			Model 1c			Model 1d		
Variable	Pred. Sign	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value
Intercept (b_0)	?	.268	2.54	.0131	.4590	4.22	.0000	.4369	4.15	.0000	.306	3.33	.0014
AVGADV (b_1)	+	4.633	4.22	.0000	.3815	3.49	.0000	--	--	--	--	--	--
AVGRD (b_2)	+	7.134	1.70	.0452	--	--	--	6.454	1.64	.052	--	--	--
TOTIN (b_3)	+	--	--	--	--	--	--	--	--	--	5.07	5.69	.0000
Adj.R^2		.18			.11			.06			.18		
Nobs		71			71			71			71		

p-value = based on one-sided null if coefficient sign is predicted and a two-sided null otherwise

AVGADV = $\sum_{i=(t-4)}^{(t-3)} (ADV_i/TA_{t-1})/3$

AVGRD = $\sum_{i=(t-4)}^{(t-2)} (RD_i/TA_{t-1})/3$

TOTIN = AVGADV + AVGRD

GWCHG = GWCHG2 / TA_{t-1} - total change in goodwill weighted by acquired firm's total assets in year t-1

Table 7

Regression Summary Statistics From Regressing Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill, 71 U.S. Firms With Expenditures on Research and Development or Advertising (Millions $)

Model 2a: GWCHG2 = $b_0 + b_1$ AVGADV2 + b_2 AVGRD2 + b_4 TA_{t-1} + u
Model 2b: GWCHG2 = $b_0 + b_1$ AVGADV2 + b_4 TA_{t-1} + u
Model 2c: GWCHG2 = $b_0 + b_2$ AVGRD2 + b_4 TA_{t-1} + u
Model 2d: GWCHG2 = $b_0 + b_3$ TOTIN2 + b_4 TA_{t-1} + u

		Model 2a			Model 2b			Model 2c			Model 2d		
Variable	Pred. Sign	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value
Intercept (b_0)	?	42.439	2.52	.0140	74.588	3.01	.0035	74.040	2.42	.0090	51.765	2.16	.017
AVGADV2 (b_1)	+	4.889	1.31	.0962	4.329	1.10	.1369	--	--	--	--	--	--
AVGRD2 (b_2)	+	8.825	1.44	.0760	--	--	--	7.087	1.08	.1421	--	--	--
TOTIN2 (b_3)	+	--	--	--	--	--	--	--	--	--	5.318	1.70	.046
TA_{t-1} (b_4)	?	.0458	1.01	.1583	.089	2.21	.0153	.092	1.11	.1341	.057	1.78	.078
Adj.R^2		.24			.19			.15			.23		
Nobs		71			71			71			71		

p-value = based on one-sided null if coefficient sign is predicted and a two-sided null otherwise

AVGADV2 = $\sum_{i=(t-4)}^{(t-2)} ADV_i/3$

AVGRD2 = $\sum_{i=(t-4)}^{(t-2)} RD_i/3$

TOTIN2 = AVGADV2 + GWCHG2

GWCHG2 = Change in goodwill for acquiring firm from purchasing target firm

Ta_{t-1} = Total assets of acquired firm in year t-1, where t is the acquisition year

Table 8

Table 9

Regression Summary Statistics From Regressing Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill, (Weighted by Acquired Firm Total Assets) (Millions $), 50 U.S. Firms With Advertising and 54 U.S. Firms With Research and Development

Model 1b: $GWCHG = b_0 + b_1\ AVGADV + u$

Model 1c: $GWCHG = b_0 + b_2\ AVGRD + u$

		Model 1b			Model 1c		
Variable	Pred. Sign	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value
Intercept (b_0)	?	.315	2.89	.0056	.430	3.08	.0032
AVGADV (b_1)	+	5.156	5.96	.0000	--	--	--
AVGRD (b_2)	+	--	--	--	12.86	2.67	.0050
TOTIN (b_3)	+	--	--	--	--	--	--
Adj.R^2		.25			.05		
Nobs		50			54		

p-value = based on one-sided null if coefficient sign is predicted and a two-sided null otherwise

AVGADV = $\sum_{i=(t-4)}^{(t-2)} (ADV_i/TA_{t-1})/3$

AVGRD = $\sum_{i=(t-4)}^{(t-2)} (RD_i/TA_{t-1})/3$

TOTIN = AVGADV + AVGRD

GWCHG = GWCHG2 / TA_{t-1} - total change in goodwill weighted by acquired firm's total assets in year t-1

Table 10

Regression Summary Statistics From Regressing Preacquisition Spending on Advertising and Research & Development on Purchased Goodwill
50 U.S. Firms With Advertising and 54 U.S. Firms With Research and Development (Millions $)

Model 2b: $GWCHG2 = b_0 + b_1\ AVGADV2 + b_4\ TA_{t-1} + u$

Model 2c: $GWCHG2 = b_0 + b_2\ AVGRD2 + b_4\ TA_{t-1} + u$

		Model 2b			Model 2c		
Variable	Pred. Sign	Parameter Estimate	t-stat	p-value	Parameter Estimate	t-stat	p-value
INTERCEPT (b_0)	?	32.349	1.32	.1922	33.203	2.18	.0334
AVGADV2 (b_1)	+	5.833	1.44	.0779	--	--	--
AVGRD2 (b_2)	+	--	--	--	12.865	2.67	.0005
TOTIN2 (b_3)	+	--	--	--	--	--	--
TA_{t-1} (b_4)	?	.0589	3.33	.0016	.0258	.66	.5100
Adj.R^2		.26			.43		
Nobs		50			54		

p-value = based on one-sided null if coefficient sign is predicted and a two-sided null otherwise

AVGADV2 = $\sum_{i=(t-4)}^{(t-2)} ADV_i/3$

AVGRD2 = $\sum_{i=(t-4)}^{(t-2)} RD_i/3$

TOTIN2 = AVGADV2 + GWCHG2

GWCHG2 = Change in goodwill for acquiring firm from purchasing target firm

Ta_{t-1} = Total assets of acquired firm in year t-1, where t is the acquisition year

Appendix

Sample and Methodology

When one company acquires another company, the price paid is a negotiated price. Essentially what is being purchased is the acquired company's tangible and intangible assets. Tangible assets generally are reflected on the acquired company's balance sheet at depreciated cost. Intangible assets usually are not reported unless the acquired company has purchased intangibles.[2]

The base sample consisted of 376 acquisitions between 1975 and 1992 for which both the acquired and acquiring firm were publicly traded. Table 1 shows the number of firms in the base sample, by year. Once the base sample was identified, additional screening criteria were applied. First, for a firm to remain in the sample, it was necessary that data for both the acquiring and acquired company be available on Compustat during the period surrounding the acquisition (defined as four years before the acquisition for the acquired firm and the acquisition year plus one year for the acquiring firm). In addition, it was necessary that the acquired firm be acquired in a purchase combination (for financial reporting purposes). This criterion assures that information on purchased goodwill was potentially available.[3] Table 2 provides a summary of the firm pairs deleted for various reasons from the sample. The sample on which initial analyses were conducted consisted of 90 firm pairs. Analyses were also conducted on several subsets of the data.

Figure 1 panels a. and b. show the grouping across time and industry (two-digit SIC codes). As can be seen from Figure 1, the sample is well diversified on both dimensions. There are more observations in the mid to late 1980s, but no one year dominates the sample. Twenty-three two-digit SIC codes are represented with a maximum of eight firms from any one industry.

Data on research and development and advertising expense for the acquired firms were obtained from the Compustat data base (data items #45 and #46 respectively). For the acquiring firm the data needed was the amount of purchased goodwill related to the particular combination. Compustat does not provide a reliable source of this data. The information on the amount of purchased goodwill related to each acquisition was obtained from the annual report of the acquiring company in the acquisition year.

The amount of disclosure regarding the acquisition varied widely. The "cleanest" disclosures indicated specifically the company purchased and the amount of goodwill related to that specific company. An example is the 1989 purchase of Ransburg by Illinois Tool Works. The footnote disclosure for this acquisition follows:

> **Acquisitions and Dispositions**-In 1989, the Company acquired all of the outstanding common stock of Ransburg Corporation (Ransburg) for $192,000,000 which includes payment for outstanding options and investment banking, legal and accounting fees paid by both parties. The acquisition has been accounted for as a purchase, and accordingly, the acquired assets and liabilities have been recorded at their estimated fair value at the date of acquisition. The results of operations are included in the Statement of Income from the acquisition date. On a preliminary basis, the excess of purchase price over the fair market value of net assets acquired was $104,000,000 . . . (from Illinois Tool Works Annual Report, 1989).

In other cases, disclosures were minimal or companies grouped a number of acquisitions together, or disclosures regarding the acquisition were in multiple footnotes. United Technologies indicates in Note 3,

"Acquisitions and Dispositions," that Sheller-Globe had been acquired in 1988 and 1989. Note 8 discusses goodwill separately and indicates that,"The goodwill increased $436.3 million primarily as a result of completion of the acquisition of Sheller-Globe." In cases involving multiple acquisitions, if sufficient data was provided on the purchase price, but goodwill was provided only in a single amount, we allocated goodwill using relative market prices. For example, in 1989 Cablevision Systems Corporation acquired A-R Cable Services Inc. Parts of Note 3 follow:

> **1988 Acquisitions**-On January 4, 1988, the Company acquired A-R Cable Services Inc. . .The cost of the A-R acquisition was approximately $463,808,000. . . In April and in July 1988 the Company acquired Cable-vision Systems in the suburbs of Cleveland, Ohio. The total purchase price, including expenses, amounted to $53,467,000. These acquisitions were accounted for as purchases (Cable-vision Systems Corporation 1989).

Cablevision Systems reported the total "excess cost over fair value of net assets acquired" to be $182,418,000 but did not show the amount for A-R separately. Since A-R clearly was the major acquisition, the goodwill allocated to the A-R acquisition was calculated as ($463,808)/($463,808+ $53,467) * $182,418,000, or $163 million. If the detail given on the acquisition was not sufficient to obtain a reliable estimate of goodwill the observation was omitted from the sample.

As discussed above, intangible assets generally are not recorded as assets as they are developed. In fact, present accounting rules preclude capitalization of advertising and R&D costs. Thus to the extent that these costs create assets, it is necessary to use flow amounts or expenditures on these items as a proxy for their underlying asset value. We use average expenditures for three years ending two years before the acquisition. The year immediately prior to the acquisition was not used for two reasons. First, fiscal year differences between the acquiring and the acquired firm and timing aspects of the purchase combination lead to lack of data availability for some acquired firms in year t-1. Second, acquired firms may change their expenditures on these items in response to a pending acquisition. A number of companies in our sample reached merger agreements in the year prior to actual completion of the merger. The dependent variable in the models discussed below is the change in goodwill pursuant to the acquisition.

Two basic model forms were run using various subsets of the data. Equation 1 shows the model with total assets of the acquired company as a deflator.

$$GWCHG=b_0+b_1*AVGADV+b_2*AVGRD+u,$$

where GWCHG=(Purchased goodwill for acquisition i), (TA_{t-1}),

$$AVGADV=\sum_{i=(t-4)}^{(t-2)} (ADV_i / TA_{t-1})/3,$$

$$ACGRD=\sum_{i=(t-4)}^{(t-2)} (RD_i / TA_{t-1})/3 \qquad (1)$$

$GWCHG_t$ = goodwill change associated with acquisition in year t, where t is the acquisition year,

TA_t = total assets for acquiring company in year t,

RD_i = research and development expenditures for the acquired company in year i,

ADV_i = advertising expense for acquired company in year i.

Deflating by size is a common method of controlling for scale related coefficient

bias and the associated heteroscedasticity problem. Total assets in year t-1 was used as the scale variable for several reasons. First, large firms will spend more on advertising and R&D, ceteris paribus. Second, using total assets provides a proxy for the market value of tangible assets purchased. Common equity of the acquired firm has some theoretical advantages as a scale variable. However, common equity is sometimes negative and may be small relative to the size of goodwill in some cases. The correlation between total assets and common equity was very high for the firms in this sample (.86).

However, recent work by Barth and Kallapur (1994) indicates that deflation is not effective in mitigating scale related coefficient bias and in some cases worsens the bias. They conclude that a more effective means of addressing scale problems is to include a scale proxy as an independent variable and to report inferences using the White standard errors to correct for heteroscedasticity (White, 1980). In addition to having statistical advantages, the use of unweighted variables in the regressions allows a more direct interpretation of the coefficients than is the case when the variables are weighted. Specifically, in a regression of R&D and/or advertising against goodwill the coefficient can be interpreted as the dollar amount of goodwill created by $1 spent on these items. Then given some assumptions about interest rates, amortization periods, and the duration of the payments, the reasonableness of the coefficients and their relative contribution in valuing goodwill can be examined.

The unweighted form of the model is given below in Equation 2:

$$GWCHG2=b_0+b_1*AVGADV2+b_2*AVGRD2+b_4*TA_{t-1}+u, \quad \text{where } GWCHG2=(\text{Purchased goodwill for acqutsition } t),$$

$$AVGADV2=\sum_{t=(t-4)}^{(t-2)}(ADV_t/3),$$

$$ACGRD2=\sum_{t=(t-4)}^{(t-2)}(RD_t/3) \qquad (2)$$

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Endnotes

[1]The present value of an annuity of $1 for 20 years is 12.46 at 5% and 5.92 at 16%.

[2]An exception is self-developed computer software, which is capitalized and amortized.

[3]As discussed later, some acquiring companies did not provide sufficient disclosure regarding purchased goodwill to include them in the sample.