Goodwill Capital

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ABSTRACT. The concept of *goodwill* or *brand capital* is commonly employed by analysts in business and marketing to measure the asset value of a company name or a brand name, and consequently among accountants and business analysts, but is seldom used by economists. The purpose of this article is to begin to develop the concept of goodwill capital by presenting an analysis of what it is and some estimates of its likely magnitudes. We define goodwill capital, like the capital arising from R&D and advertising, as a form of *intangible* asset, albeit one which cannot be readily related to past investments in R&D, advertising, and capital equipment. We compute estimates of goodwill capital by deducting measures of these other three forms of capital from a firm's market value. For many companies, goodwill capital turns out to be the largest of its four capital stocks. Roughly half of our estimates of goodwill capital turn out to be *negative*.

Introduction

The concept of *goodwill* or *brand capital* is commonly employed by analysts in business and marketing to measure the asset value of a company name or a brand name (e.g., Ehrbar, 1998). When one company acquires another, GAAP accounting rules in the United States allow the acquirer to place goodwill capital from the acquired firm onto its balance sheet, and depreciate it for up to 20 years.[1] Thus, among accountants as among business analysts, the existence of goodwill capital seems to be taken for granted. The same cannot be said, however, for economists. It is generally accepted that both advertising and research and development have the fundamental property of an investment since they can affect future sales and costs, and hence the profits of a firm. Even though it too is a form of intangible capital stock, we have not been able to find a parallel treatment of the concept of goodwill capital in the economics literature.[2] *The New Palgrave*, for example, contains no entry under this heading.

The purpose of this article is to begin to fill this void by presenting an analysis of goodwill capital and some estimates of its likely magnitude in a sample of US firms. We shall define goodwill capital, like the capital arising from R&D and advertising, as a form of *intangible* asset, albeit one which cannot be readily related to past investments in R&D, advertising, and capital equipment. We compute estimates of goodwill capital by deducting measures of these other three forms of capital from a firm's market value. For several companies, our estimated goodwill capital is the largest of their four capital stocks. However, many other firms have negative goodwill capital stocks, implying that substantial past investments have failed to create valuable assets.

The article proceeds as follows. We first discuss the causes and characteristics of goodwill capital. In section II we discuss the procedures that have been used to measure intangible capital stocks. Estimates of advertising, R&D and goodwill capital are presented in section III. In section IV we consider whether goodwill capital is a purely random error that the market makes when evaluating a company's tangible and intangible capital stocks or whether it persists over time. The main findings are discussed in section V.

I. The nature of goodwill capital

Let us first consider the nature of physical capital, say machines. A given type of machine is capable of producing x widgets per hour. All machines of this type can produce the same number of widgets, but a firm faces a negatively sloped demand

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schedule so that additional machines yield lower returns as the output that they produce must be sold at lower prices. These relationships can be captured by writing the firm's output as a function of its capital stock, K_t, and say labor inputs, L_t, $x_t = f(K_t, L_t)$ and the relationship between its revenues, R_t, and its capital stock as $R_t = P_t(\chi_t)\chi_t$, $\partial R_t/\partial K_t > 0$, $\partial^2 R_t/\partial K_t^2 < 0$. Under the usual assumptions made about production functions and demand schedules, it is reasonable to assume that the marginal returns with respect to additions to the capital stock at a specific point in time decline smoothly.

At any point in time, a firm's capital stock is a collection of machines of different vintage. With time machines wear out and are capable of producing fewer and fewer units of output. If we call x_t^n the output of the firm that can be produced in period t with capital inherited from period $t - n$, then it is reasonable to assume that this output declines with time eventually becoming zero, i.e., $\lim_{n\to\infty} x_t^n = 0$. Thus, physical capital has two fundamental properties: diminishing marginal returns at a given point in time and diminishing returns from a given capital investment with the passage of time.

Now consider the nature of the *intangible* capital produced by investments in R&D. This capital consists of the *knowledge* that a firm acquires through R&D about product improvements or cost reductions. The process of acquiring this knowledge can be likened to that of searching for needles in a haystack, where each needle has a piece of information attached to it that allows the firm to lower its costs or improve its product.[3] At any point in time there is a fixed number of needles in the haystack, and thus the firm has to spend incrementally more to find needles. Similarly, a firm's marginal returns from R&D, measured in units of gathered information, declines with expenditures.

Surveys of corporate R&D departments by Mansfield et al. (1977, ch. 2) suggest that the average R&D project has a high probability of success, and is completed within a few years. These findings suggest that much R&D is fairly routine. Thus, each unit of information a firm gathers might be expected to make a similar contribution to the firm's profits, and most investments in R&D at a given point in time can be expected to exhibit diminishing marginal returns as do investments in physical capital.

Not all R&D fits this pattern, however. The occasional needle in the haystack has information attached to it that allows a company to introduce a dramatic improvement in its product, an entirely new product or a significant reduction in its costs.[4] Thus, some R&D projects have very high returns. This property makes R&D quite different from investment in plant and equipment. No firm buys a machine expecting it to produce a thousand widgets per hour, and discovers that it can produce a million per hour, or that the widgets that this particular machine produces can be sold at a price twice that of those produced by otherwise similar machines. But one R&D project can yield a gigantic increase in profits, another involving similar outlays may yield nothing. The stochastic nature of R&D implies that the R&D investments of some firms, at some points in time, are not characterized by smooth declines in marginal returns.[5]

As with capital equipment, the returns from a particular R&D investment can be expected to decline with the passage of time as other firms imitate a firm's innovations or make discoveries, which bring about *technological* obsolescence.[6] But unlike with the depreciation of physical capital, there is nothing deterministic about this process. Information does not *wear out*. Information loses its value not because of something the firm itself or nature inevitably does to erode its intangible capital, but because of what *other* firms do, and it is not predetermined that they will come up with inventions that destroy a firm's intangible capital. We, therefore, expect the process of intangible capital erosion, like the process of intangible capital creation to be quite stochastic.

Much the same can be said for advertising as for R&D. Where R&D is a process of *gathering* information, advertising is a process of *disseminating* it. Let us first think of advertising as messages informing potential buyers about a product's characteristics, say the expected number of miles that can be driven on a tire. Each message the tire producer purchases reaches a given number of potential buyers, some of whom may buy the firm's tires. The advertising shifts the firm's demand schedule outward. As the number of messages purchased increases, the number of *new* potential customers each message reaches declines, and thus so does the marginal value of purchasing an additional message. This sort of routine advertising should exhibit diminishing marginal returns to investments made at a particular point in time as with physical capital investments and routine R&D.

The returns from a given past advertising investment can be expected to decline with time as customers forget about the product or are informed about competing products. Thus, much of the intangible capital created through advertising should have the same properties as physical capital and routine R&D intangible capital – but again not all. When a company "informs" potential buyers that it sells "the best widget it the world," and a large fraction of them believes it, this company may be able to charge higher prices. The firm benefits from the advertising induced shift in its demand schedule until some other company succeeds in convincing buyers that it makes the world's best widgets – and this may take a long time. Advertising is most likely to have a dramatic effect on sales and profits, when it is coupled to the introduction of a new product. Here the returns to advertising and R&D become inseparable. The R&D is worthless if no one knows of the new product, and the impact of the advertising depends on the characteristics of the product being advertised.

Where changes in physical capital affect what goes into the production function and demand schedule of a firm, R&D and advertising shift them. Thus, most studies that model the returns to R&D and advertising treat them as shift parameters in the production function, or arguments in the demand function. For routine R&D and advertising such an approach should yield reasonable estimates of the returns and depreciation rates on these investments for the reasons given above. Incremental increases in advertising produce small shifts in the demand schedule, just as incremental R&D outlays either result in small shifts in demand or declines in costs, which in turn should also be reflected in sales if prices fall.

In contrast, the stochastic nature of the returns to major innovations makes it difficult if not impossible to estimate them using normal statistical procedures. At point in time t an important innovation is introduced, but there may be no similarly dramatic increase in previous R&D outlays to which this innovation can be attributed statistically. The returns from the innovation grow and then level off. If and when they go into decline may be a result not of changes in the innovator's R&D activity, but to the R&D of its rivals, which also may contain large stochastic components. Normal statistical procedures may not be capable of measuring the returns from these stochastic events as part of the value of a firm's intangible R&D stock.

Similar difficulties may also arise in trying to estimate the returns to advertising. Ex post Philip Morris' decision to place its Marlboro cigarettes in a red and white flip-top box, and to advertise them with cowboys and western scenery looks like a stroke of genius. Ex ante the company's managers could not have anticipated the consequences of this act. Philip Morris' rivals were making similar efforts at the time to launch new brands of filter cigarettes, but none of them has had the phenomenal success of the Marlboro brand. There would be no way from the data on Philip Morris' advertising to discern this, however.

Nor can data on a firm's own past investments reveal the source of goodwill capital, when it is investments by other companies or acts of nature that have created or destroyed a company's goodwill capital. The investments of other companies can not only destroy a firm's goodwill capital, they can create *negative* goodwill capital by destroying the value of past investments in physical capital, R&D, and advertising. To the extent that it is physical capital investment or routine R&D and advertising by rivals that affects the demand for a firm's product, these effects can be accounted for by including the rivals' outlays in a firm's demand schedule.[7] This method of accounting for negative goodwill capital also breaks down, however, when either the rivals' actions or chance events produce major shifts in a firm's demand schedule. Indeed, for major product innovations, a firm's "rivals" may not even be identifiable until *after* they have introduced the innovation that significantly alters the demand for a firm's product.

One could, of course, employ a case study approach and try to identify the profit stream stemming from each R&D project and marketing outlay.[8] Even such a labor intensive approach would be difficult to implement, however, for it is frequently very difficult to disentangle the contributions of multiple innovations, and the complementarity between product improvements and the marketing of the new products. Sheer luck often plays an important role in major marketing and technological developments, and it would be misleading, to say the least, to attribute the gains accruing due to luck to the perhaps incidental R&D and advertising that accompanies it.[9] And of course, it would be impossible to implement such a case study approach on a large scale. To go the case study route is to abandon any hope of measuring the various stocks of capital that firms possess for more than a handful of companies.

The route we have chosen to follow instead, is to define the unexplained and potentially stochastic component of a firm's total capital as its *goodwill capital*. The market value of a company at time t, MV_t, is the capital market's evaluation of the *total* assets of the firm at that time. If we define these total assets as consisting of the firm's physical capital stock and other tangible assets, KK_t, its stock of intangible R&D capital, RK_t, and its stock of intangible advertising capital, AK_t, then goodwill capital, GK_t, is given as

$$GK_t = MV_t - KK_t - RK_t - AK_t. \tag{1}$$

Goodwill capital is thus a residual, and like all residuals is in some sense "a measure of our ignorance." Although we cannot attribute it to a particular R&D outlay or advertising expenditure, we are not totally ignorant of its causes and characteristics. We expect positive goodwill capital, when it exists in significant quantities, to arise in connection with the introduction of important innovations and new products. In these cases, it may measure the magnitude of the "first-mover advantages" that pioneer brands often enjoy, advantages that do not seem to stem from any particular attribute of a product other than that it was one of the first to enter the market.[10] This form of goodwill capital is expected to be very long lived, quite possibly exhibiting a near zero rate of depreciation (Ehrbar, 1998). Moreover, when positive goodwill capital does depreciate we expect its decline in value often to be very rapid, precipitated by some stochastic event that shifts the demand schedule for a firm's product dramatically downward. Such stochastic events might be the introduction of a superior product by a new-firm startup or by a firm's existing rivals, an event that changes the public's perception of a product's quality, and so on.[11]

Equation (1) implies, of course, that goodwill capital can be negative. When negative, the market's evaluation of the entire firm is less than the sum of the stocks of existing assets that the firm has created through its past outlays on capital equipment, R&D, and advertising. In many cases where this sort of negative goodwill capital exists, we expect that it is due to the actions of its rivals, or chance events external to the firm of the type just described. But negative goodwill capital can also arise as a result of the decisions of a firm's own management. Managerial mistakes or excessive investments to satisfy managerial aspirations for growth can both give rise to negative goodwill capital. When negative goodwill capital arises, because of external events, we expect managers to make efforts to eliminate it. How successful they will be depends of course, on the nature of the external event. In general we expect this sort of negative goodwill capital to be short lived. When negative goodwill capital arises because of managerial failures and agency problems, however, it may be quite long lived – as long lived as the managers and the principal-agent relationship that they can exploit.

Although no one would want to buy negative goodwill capital, every manager would probably like to buy positive goodwill capital, if she could. Perhaps the best way to describe the difference between goodwill capital and the other three forms of capital we have been discussing is to emphasize that *new* goodwill capital cannot be bought on the market like the other forms of capital. A machine can be bought with the knowledge that it will produce n widgets per hour; an advertising message can be bought with the knowledge that it will reach m potential customers. Test tubes can be bought and chemists hired, but no one can simply select a research and marketing budget that creates a product with the success of Coca-Cola. If one could, then many would gladly match in today's dollars the investment Dr. John Pemberton made in 1886, when he first created the Coca-Cola syrup in a three-legged brass kettle in his backyard. Many would be willing to match in today's dollars the $2,300 Asa Candler paid for the Coca-Cola business in 1891, if it would buy them the subsequent stream of revenues that the Coca-Cola brand produced. If matching Coca-Cola's profits today were merely a matter of matching its current advertising outlays, there would be hundreds more equally profitable products on the market. What we define as goodwill capital is the unpurchaseable component of a company's assets.[12] As the example of Coca-Cola illustrates, goodwill capital may be particularly important for small, young firms, in the innovative stage of their life cycles. The "investments" that lead to the innovations that determine whether these companies succeed or not often are not part of formal R&D processes, but take the form of ideas and insights of the entrepreneurial founder and her employees. Investments such as these are particularly difficult to identify. The estimates of goodwill capital presented below are for much larger firms, where the problem of measuring other investments in intangible capital is less severe.

II. The measurement of goodwill capital

The simplest sort of production function to estimate has fixed coefficients with labor and output both proportional to the capital stock. Writing output or sales in year t, as S_t, and capital in t as K_t we have

$$S_t = \alpha K_t + \mu_t. \quad (2)$$

K_t in turn is the result of past investments, I_t

$$K_t = I_t + \lambda_{t-1}I_{t-1} + \lambda_{t-2}I_{t-2} + \ldots + \lambda_{t-n}I_{t-n} \quad (3)$$

where all investments prior to $t - n$ are assumed to make zero contribution to K_t, and $\lambda_{t-j} > \lambda_{t-j-1}$ beyond some period j. Substituting (3) into (2) we obtain an expression in which current sales are a function of current and lagged values of investment.

$$S = \alpha I_t + \alpha\lambda_{t-1}I_{t-1} + \alpha\lambda_{t-2}I_{t-2} + \ldots + \alpha\lambda_{t-n}I_{t-n} + \mu_t. \quad (4)$$

Time series data can be used to obtain estimates of α and the λ_{t-j} in (4), and these in turn can be used to obtain measures of the capital stock in each period with the help of (3).

Following Koyck (1954), the simplifying assumption is often made that $\lambda_{t-j} = \lambda^j$ with $\lambda < 1$. Assuming that (4) holds in every period, this assumption allows one to eliminate all lagged values of investment, and estimate both α and λ from the following equation:

$$S_t = \alpha I_t + \lambda S_{t-1} + \mu_t \quad (5)$$

Equation (5) has been used in many studies to estimate both the marginal impact of investment on sales, α, and the depreciation rate on the capital that this investment creates, $1 - \lambda$. If investments in plant and equipment, in R&D and in advertising all create capital stocks of one form or another, then I in (5) could stand for any one of these investments. A modified version of (5) in which all three investments were included would yield separate estimates of their marginal impacts, i.e., separate α's. It would not be possible in such an equation to estimate separate depreciation rates for each form of capital, however, since there is only one lagged dependent variable. Its coefficient would presumably be some weighted average of the three λs for the three forms of capital. Any study which uses (5) to estimate a λ and an α for a single form of investment suffers from two possible biases, therefore – an omitted variable bias because the other two investments have been left out, and a bias in the estimate of λ, because it proxies for three streams of investment not one. Because of these possible biases, we regard estimates of depreciation obtained from models resembling equation (4), where separate lagged investment terms are included to be much more reliable than those obtained from the coefficients on the lagged dependent variable in models resembling (5). In particular, we believe that the very low depreciation rates obtained on advertising capital in some studies are due to their having been estimated from the coefficient on lagged sales in an equation like (5).

Estimates of depreciation on physical capital in manufacturing cluster fairly closely around 10 percent (Hulten and Wycoff, 1981). We shall simply employ the figures of plant and equipment net of depreciation as reported in COMPUSTAT as our measure of company physical capital stocks, but we would have obtained very similar results if we had constructed a series for plant and equipment using (3) and assuming $\lambda_K = 0.9$. We add current assets, and inventories to physical capital stocks to obtain the total tangible capital of the firm, KK_t.[13]

Estimates of depreciation on R&D intangible capital range from under 10 percent to around 25 percent (see Table I). We consider the 25 percent figure an upper bound for the reasonable estimates in the literature. The true depreciation rate will depend largely on each firm's industry and the structure of the market. We shall, therefore, estimate intangible R&D capital stocks assuming depreciation rates of 10, 15 and 25 percent. The R&D capital stock in the initial year of our sample period, 1973, is estimated from a firm's R&D expenditures in that year under the assumption that one of the three depreciation rates $(1-\lambda)$ holds and that the firm's R&D capital is growing at a constant rate $g = 0.08$.[14]

$$RK_{73} = R_{73}/(g + (1 - \lambda_R)). \tag{6}$$

R&D capital stocks in all subsequent years are calculated using this estimate of the initial capital stock, the assumed depreciation on this stock, and equation (3), e.g.,

$$RK_{77} = R_{77} + \lambda_R R_{76} + \lambda_R^2 R_{75} + \lambda_R^3 R_{74} + \lambda_R^4 RK_{73}.$$

Thus, as we move away from 1973 our estimates of RK become less sensitive to the steady state assumptions made for the initial year.[15]

Advertising stocks were calculated in the same way as for R&D, but assuming depreciation rates of 33, 67 and 100 percent. Estimates of depreciation on advertising can be found as low as five percent in the literature but, as explained above, we consider many of these estimates as significantly downward biased. The most sophisticated econometric techniques applied to the most disaggregated data suggest that advertising's impact on sales is dissipated within a year, and thus that a 100 percent depreciation rate should be assumed.[16] We include estimates using 33 and 67 percent rates of depreciation in recognition of the fact that this remains a somewhat controversial issue.

A firm's goodwill capital in each year equals its market value in that year less the book value of its total tangible assets and the estimated values of its R&D and advertising stocks. Since we have three separate estimates of both RK and AK, we come up with nine estimates of goodwill capital for each company for each year. We are confident that the true value of a company's goodwill capital lies within the range of these values.

TABLE I
Prior studies estimated R&D and advertising depreciation rates

Advertising	Average	Range
Palda (1964)		31–47
Clarke (1976)	100	
Lambin (1976)	51.7	10–90
Hirschey (1982)	21.1	
Simon and Sullivan (1993)	About 50	
Landes and Rosenfield (1994)		0–100
Seldon and Doroodiou (1991)	100+	
R&D		
Baily (1972)	14.3	
Hirschey (1982)	25.8	
Goto and Suyuki (1989)		6.0– 24.6
Pakes and Schankerman (1984)	25	18–26
Pakes and Schankerman (1986)		
France	11	
Germany		11–12
U.K.		17–36
Hall (1993)* imposed rate	15	
Nadiri and Prucha (1996)	12	

III. Estimates of goodwill capital

To illustrate the orders of magnitude and patterns for the various types of capital, we first examine in detail two companies – Johnson & Johnson and Goodyear Tire & Rubber. Table II presents the book values of Johnson & Johnson's total tangible assets (KK), its R&D capital (RK) assuming 10, 15 and 25 percent depreciation rates, and its advertising capital (AK) assuming 33, 67 and 100 percent depreciation rates. Consistent with equation (3), advertising "capital" is simply one minus the corporate tax rate times a firm's current advertising when a 100 percent depreciation is assumed. Goodwill capital stocks are then calculated by subtracting KK and one measure of both advertising and R&D capital from the market value of Johnson & Johnson in each year. The minimum value of goodwill capital, GMIN, is obtained when the lowest depreciation rates are assumed for R&D and advertising capital – 10

TABLE II.1
Capital stock measures for Johnson & Johnson, 1973–1994

Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
KK	1189.09	1405.68	1551.50	1730.72	2019.79	2382.37	2873.95	3342.50	3820.40	4209.57	4461.50
RK10	189.09	229.07	271.95	312.88	363.17	430.20	523.62	646.61	777.77	917.46	1046.68
RK15	147.98	179.78	213.73	246.16	286.11	340.19	414.47	511.60	615.51	729.75	834.66
RK25	103.14	126.00	150.10	173.08	201.52	241.15	293.88	361.91	435.22	520.86	597.64
AK33	74.19	92.48	105.78	121.50	145.45	185.84	233.11	289.35	343.75	392.20	416.03
AK67	40.56	64.47	71.47	83.47	101.45	132.64	162.75	199.39	235.22	268.12	278.40
AK100	30.42	37.28	38.16	46.55	58.75	80.99	94.46	112.08	129.89	147.70	144.82
GMIN	5310.64	3297.60	3634.96	2707.10	2382.53	1936.71	1918.69	2729.72	2976.22	4908.42	3015.15
GMID	5385.38	3374.90	3727.49	2811.86	2503.59	2079.93	2098.19	2954.69	3247.01	5220.20	3364.80
GMAX	5440.36	3455.86	3824.43	2921.86	2630.88	2230.61	2287.07	3191.69	3532.63	5549.51	3735.40
Gmidrate	0.80	0.67	0.67	0.58	0.51	0.42	0.38	0.42	0.41	0.50	0.38

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
KK	4541.37	5095.08	5876.66	6546.00	7119.00	7919.00	9506.00	10513.00	11884.00	12242.00	15668.00
RK10	1184.86	1330.48	1469.91	1778.42	2111.64	2466.59	2890.32	3357.55	3856.58	4354.95	4863.29
RK15	942.27	1055.58	1164.14	1432.85	1713.16	2000.89	2343.09	2722.23	3127.37	3517.97	3910.32
RK25	669.76	746.34	820.38	1044.96	1260.99	1465.85	1709.23	1982.67	2275.58	2537.90	2795.64
AK33	452.34	474.71	508.96	647.15	761.07	845.34	967.90	1121.28	1231.92	1347.07	1453.65
AK67	304.78	315.44	344.56	467.79	531.93	574.11	664.96	778.35	839.20	915.68	983.92
AK100	161.57	160.85	184.99	293.70	309.54	310.86	370.92	445.50	458.04	496.98	528.00
Gmin	652.05	2907.43	3729.48	4646.60	5351.08	9714.48	11850.65	24456.67	17490.00	12403.40	15418.86
Gmid	1042.20	3341.60	4199.65	5171.53	5978.70	10451.42	12700.82	25434.92	18611.92	13671.77	16841.56
Gmax	1457.93	3805.43	4702.98	5733.51	6653.27	11249.71	13628.72	26507.34	19844.88	15070.54	18412.16
Gmidrate	0.15	0.34	0.36	0.38	0.39	0.50	0.50	0.64	0.54	0.45	0.45

TABLE II.2
Capital stock measures for Goodyear Tire and Rubber, 1973–1994

Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
KK	3871.04	4241.63	4173.67	4336.12	4677.90	5231.10	5371.23	5368.30	5354.25	5193.50	5985.50
RK10	302.63	357.61	407.72	442.62	482.59	540.18	623.57	720.83	816.46	892.26	949.50
RK15	236.84	278.72	315.02	337.73	364.06	405.82	466.34	533.75	601.28	654.75	695.09
RK25	165.07	192.65	214.17	224.41	237.58	264.59	303.20	341.96	383.71	417.69	444.00
AK33	97.29	113.36	127.38	139.65	157.73	180.64	206.84	226.89	247.49	259.12	261.99
AK67	53.18	76.63	85.33	93.84	107.16	122.95	138.45	147.08	162.39	169.79	171.06
AK100	39.89	40.98	44.50	49.38	58.08	66.94	72.07	69.61	79.79	83.09	82.80
Gmin	–1174.10	–1511.17	–1015.40	–981.97	–1664.79	–3379.92	–3816.54	–3927.21	–3891.12	–2712.80	–3329.39
Gmid	–1064.21	–1395.55	–880.64	–831.27	–1495.70	–3187.87	–3590.92	–3660.31	–3590.84	–2385.96	–2984.05
Gmax	–979.14	–1273.84	–738.96	–673.49	–1320.13	–2990.63	–3361.40	–3391.04	–3290.67	–2062.20	–2644.71
Gmidrate	–0.34	–0.44	–0.24	–0.21	–0.41	–1.24	–1.51	–1.53	–1.42	–0.66	–0.77

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
KK	6194.26	6953.50	8609.50	8395.90	8618.30	8460.30	8963.60	8510.50	8563.70	8436.10	9123.30
RK10	1025.51	1099.15	1147.02	1245.88	1368.85	1491.50	1633.54	1749.85	1837.37	1914.34	1992.28
RK15	750.39	803.88	835.39	911.89	1008.34	1098.56	1202.89	1283.28	1338.72	1383.18	1431.06
RK25	481.44	517.27	534.55	591.44	663.10	721.46	788.99	834.45	859.77	875.33	898.56
AK33	272.87	288.17	303.60	348.91	385.14	434.16	483.02	487.26	512.18	517.25	519.24
AK67	179.95	192.09	203.81	241.92	261.61	296.90	327.43	316.12	341.53	337.89	338.87
AK100	89.76	98.83	106.94	138.07	141.70	163.68	176.42	150.02	175.89	163.81	163.81
Gmin	–4067.02	–3964.88	–3507.29	–3289.07	–4391.27	–4907.95	–6689.93	–4928.99	–4502.40	–2915.67	–5435.05
Gmid	–3698.99	–3573.52	–3095.87	–2848.08	–3907.22	–4377.76	–6103.69	–4291.28	–3833.09	–2205.16	–4693.47
Gmax	–3339.85	–3193.66	–2698.17	–2423.79	–3442.08	–3867.44	–5538.78	–3676.34	–3188.50	–1523.23	–3985.91
Gmidrate	–1.08	–0.82	–0.47	–0.42	–0.65	–0.80	–1.39	–0.74	–0.60	–0.28	–0.76

KK = value of physical capital stock.
RKxy = value of R&D capital assuming an annual depreciation rate of xy percent.
AKxy = value of advertising capital assuming an annual depreciation rate of xy percent.
Gmin = The minimum estimate of goodwill capital.
Gmax = The maximum estimate of goodwill capital.
Gmid = The midpoint estimate of goodwill capital.
Gmidrate = Gmid divided by the market value of the firm.

and 33 percent. The maximum value of goodwill capital, GMAX, is obtained when the highest depreciation rates are – 25 and 100 percent, i.e., *KK* and *RK*25 and current advertising are subtracted from market value. GMID is the middle estimate of the set of goodwill capital estimates. GMIDRATE is the ratio of the middle estimate of goodwill capital to Johnson & Johnson's market value in each year.

Several features of the estimates for Johnson & Johnson stand out. First, our estimates of Johnson & Johnson's goodwill capital are quite large at both the beginning and the end of our sample period. Indeed, even the smallest of our nine estimates of goodwill capital is larger than the sum of the three other stocks in the first four years of our sample period. Second, the impact of the poisoned Tylenol packages is clearly visible in the sharp decline in the company's goodwill capital in 1984. Third, it is easy to see that Johnson & Johnson succeeded in re-establishing most of its goodwill capital rather quickly.

A quite different picture is presented for Goodyear Tire & Rubber in the bottom half of Table II. Its goodwill capital is negative throughout the 22 year period. Even the maximum estimate of goodwill capital we obtain remains negative in all years. In six of the 22 years, our middle estimate of Goodyear's goodwill capital is negative and greater in absolute value than its market value.

Which if either of these patterns of goodwill capital stocks is typical of a broader sample of companies. Table III begins to answer this question. There were 53 companies in our COMPUSTAT database with complete R&D and advertising data over the 22 year period, 1973–1994. Table III presents the ratio of the middle estimate of goodwill capital to market value for each company in each year. Forty-seven percent of the 1166 ratios are negative. Although few firms match Goodyear in the size of their goodwill stocks relative to their market values, many resemble it in exhibiting a consistent pattern of negative goodwill stocks.

Johnson & Johnson is also not the only company that had positive goodwill capital for most of all of the sample period. Avon product starts and ends the 22 year period with substantial, positive goodwill capital stocks. Intel and Thomas & Betts have positive goodwill capital in every one of the 22 years.

Table IV presents the median and mean values of the ratios of goodwill capital to market value for the 53 companies from Table III. The distributions of these ratios are negatively skewed, so that means for each measure are uniformly less than the medians. Slightly more than one third – 8 of 22 – of the medians of the middle-value goodwill capital to market value ratios are negative (see second row from the bottom). Thus, although many firms had negative goodwill capital stocks in some years more than half of these 53 companies had market values greater than their combined tangible and intangible assets for more than half of the years between 1973 and 1994.

Although our sample of 53 companies contains several large and well-known firms, it is still rather small compared to say the Fortune 500, or the full COMPUSTAT sample. One might thus legitimately wonder how representative the results reported so far are for these larger samples of firms. Many firms were eliminated from our sample by the requirement that they reported *both* R&D and advertising over the 22 year sample period. In many cases it was missing advertising that caused a company to be dropped from the sample. Given that the best econometric estimates of advertising's depreciation imply 100 percent annual depreciation rates, i.e., advertising creates *no intangible capital*, we decided to expand the size of our sample by calculating goodwill capital by deducting only tangible and R&D capital from market value. There were 344 companies for which we had sufficient data to calculate R&D stocks over the 1973–1994 period (the 53 companies already discussed are of course not in this sample). Since these estimates ignore advertising entirely, they if anything *over*estimate a firm's goodwill capital by not deducting any advertising. However, we find an even greater preponderance of negative means and medians for the 344 additional companies for which we made no deduction for advertising than for the 53 for which we did adjust (see Table V). Mean goodwill capital was negative in each of the 22 years in our sample using our minimum and middle estimates for it. Even our maximum goodwill capital estimates had negative means in 16 of the 22 years. Although in any given year many firms in our sample of 397 large U.S. corporations had a positive goodwill capital stock, most of our estimates of goodwill capital imply that in any year a majority of the firms had negative goodwill stocks (see medians in Tables IV and V).

It is of course possible that our estimates of goodwill capital do not reflect *actual* differences between the true market values of the companies and the values of the different capital stocks, but are merely a reflection of some systematic biases in the way we calculate the various components of goodwill capital. We have tried to avoid this criticism by calculating three different measures of both R&D and advertising capital, but biases may also have arisen in our calculations of company market values and tangible capital stocks. The literature on Tobin's q contains many suggestions for how these two values should be calculated. Indeed, almost no two studies have calculated the numerators and denominators of q, which are essentially our MV and KK, in the same way.[17] To check for possible biases in our procedure, therefore, we have estimated goodwill capital stocks using data assembled by Bronwyn Hall (1990).

Hall's data have four advantages for our purposes: (1) They are derived from the same COMPUSTAT data bank that we and most other scholars use, and therefore any differences between the two sets of estimates that we observe must stem from the way in which the different components of goodwill capital are treated not from the data source. (2) Unlike most other studies, Hall also assembled R&D and advertising data. (3) In constructing the stock of tangible capital, Hall recalculated both the value of plant and equipment and of inventories to allow for differences in inflation rates over time, while we have simply employed the book values of these entities. She also estimated the market value of long-term debt when calculating the market value of a firm, while we have used the book value. Thus, if significant biases were introduced by these choices, they should show up as significant differences between the goodwill stocks using the NBER data and our estimates. (4) Her sample period, 1973 through 1991, is very close to ours.[18]

There are 93 companies in the NBER data for which both R&D and advertising are reported. We calculated R&D and advertising intangible capital stocks for these companies *exactly* as we did for our 53 firm sample. Goodwill capital stocks were then obtained by subtracting these two intangible capital stocks and the NBER estimate of tangible capital from the NBER estimate of the market value of a company. Table VI reports the means and medians for the minimum, middle and maximum measures of goodwill capital using the NBER data. It should be compared with Table IV. Both tables tell a very similar story. We were also able to produce an analog to Table V for a sample of 314 companies in the NBER data bank for which R&D data were available, but advertising was missing. It too resembles our Table V. The estimates of positive and negative goodwill capital that we have made do not tell a significantly different story from that told by the numbers obtained with the NBER data.

IV. The persistence of goodwill capital

The discussion in Section I suggests that positive goodwill capital may arise from first-mover advantages and other chance events that give a company a permanent, or at least long-lived advantage over its rivals. Negative goodwill capital arises due to the actions of a firm's rivals or of its own management that destroys assets. Both positive and negative goodwill capital may be much longer lived than the other forms of capital.

The alternative or null hypothesis would be that our measures of goodwill capital, since they are calculated as residuals, represent white noise. Since goodwill capital is measured by subtracting three slowly changing accumulations of past investments from a company's current market value, changes in goodwill capital are driven by changes in a firm's market value, which in turn will largely reflect changes in its share price. Changes in share price are caused by information about the company, like current profits, revenue growth, its level of investment in capital equipment, R&D and advertising, common factors affecting the stock market and random disturbances. If a firm's market value is a measure of the value of its *total* assets, and these consist of *only* the value of cumulated past investments, then the expected value of goodwill capital should be

TABLE III.1
Goodwill capital as a fraction of market value for companies for which complete advertising data exists, 1973–1983

Company Name	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Analogic Corp	–0.04	–0.56	–0.81	–0.39	0.27	0.59	0.56	0.53	0.64	0.54	0.61
Armstrong World Inds Inc	0.06	0.05	0.07	0.10	–0.24	–0.40	–0.48	–0.70	–0.58	–0.24	–0.19
Avon Products	0.81	0.58	0.62	0.69	0.64	0.61	0.47	0.35	0.28	0.17	0.12
Barry (R G)	–0.35	–0.44	–0.45	–0.43	–0.23	0.11	0.00	–0.15	–0.41	–0.22	–0.20
Bausch & Lomb Inc	0.30	–0.05	0.09	0.01	0.17	0.02	0.33	0.47	0.39	0.29	0.31
Borden Inc	–0.22	–0.26	–0.15	–0.06	–0.19	–0.34	–0.41	–0.41	–0.50	–0.19	–0.13
Bristol Myers Squibb	0.33	0.28	0.38	0.31	0.23	0.21	0.16	0.26	0.23	0.32	0.40
Campbell Soup Co	0.33	0.16	0.24	0.22	0.23	0.11	–0.01	–0.11	–0.21	–0.11	0.06
Carter-Wallace Inc	–1.50	–1.31	–1.61	–1.74	–1.43	–1.53	–1.39	–0.66	–1.19	–0.24	–0.47
Clark Equipment Co	0.17	–0.22	–0.26	0.02	–0.16	–0.21	–0.27	–0.46	–0.60	–0.28	–0.04
Clorox Co/De	0.63	–0.07	0.15	0.18	0.13	0.06	–0.18	–0.29	–0.26	–0.18	0.30
Coherent Inc	0.62	–0.06	0.22	–0.25	–0.22	0.41	0.38	0.25	–0.08	–0.02	0.25
Colgate-Palmolive Co	0.35	0.25	0.30	0.25	0.06	–0.14	–0.27	–0.31	–0.24	–0.15	–0.10
Computer Products Inc	0.36	–0.30	–0.64	0.46	0.66	0.47	0.51	0.66	0.62	0.60	0.65
CPC International Inc	–0.09	–0.02	0.06	0.08	–0.01	–0.05	0.01	–0.03	–0.02	0.06	0.02
Cross (A.T.) & Co – Cl A	0.80	0.43	0.59	0.59	0.55	0.52	0.56	0.49	0.60	0.57	0.61
Data General Corp	0.83	0.38	0.53	0.60	0.47	0.46	0.39	0.28	–0.05	–0.60	0.14
Del Laboratories Inc	–0.64	–0.98	–0.66	–0.28	–0.42	–0.42	–0.52	–0.59	–0.60	–0.44	–0.22
Dynamics Corp of Amer	–0.07	–1.09	–0.34	–0.17	–0.57	–0.64	–0.38	–0.31	–0.44	–0.32	0.03
Eastman Kodak Co	0.75	0.52	0.68	0.57	0.27	0.16	–0.14	0.08	0.03	0.13	–0.01
Ford Motor Co	–0.56	–0.65	–0.55	–0.40	–0.52	–3.15	–4.42	–5.58	–5.06	–2.98	–1.88
Gelman Sciences Inc	0.39	0.00	0.25	0.37	0.40	0.38	0.41	0.20	0.27	–0.04	0.28
General Mills Inc	0.32	0.25	0.26	0.18	0.19	0.05	0.02	0.07	–0.32	–0.07	–0.27
Gillette Co	0.34	0.07	0.17	0.01	–0.12	–0.16	–0.21	–0.25	–0.16	0.00	0.03
Goodyear Tire & Rubber Co	–0.34	–0.44	–0.24	–0.21	–0.41	–1.24	–1.51	–1.53	–1.42	–0.66	–0.77
Hasbro Inc	–0.40	–0.63	–0.57	–0.46	–0.59	–0.65	–0.59	–0.72	–0.64	–0.10	0.28
Helene Curtis Inds	–0.92	–1.26	–0.60	–0.99	–0.81	–0.78	–0.78	–0.32	–0.42	–0.15	–0.04
Hershey Foods Corp	–0.17	–0.42	0.04	0.08	–0.08	–0.13	–0.11	–0.27	–0.08	0.13	0.12
Hormel Foods Corp	–0.18	–0.30	–0.34	–0.24	–0.24	–0.29	–0.18	–0.17	–0.31	–0.15	–0.12
Intel Corp	0.82	0.45	0.74	0.70	0.50	0.47	0.62	0.55	0.19	0.41	0.62
Intl Rectifier Corp	–0.18	–0.21	–0.17	–0.43	–0.31	–0.16	–0.12	–0.04	–0.16	–0.31	0.32
Johnson & Johnson	0.80	0.67	0.67	0.58	0.51	0.42	0.38	0.42	0.41	0.50	0.38
Knape & Vogt Mfg Co	0.15	–0.16	–0.12	–0.06	–0.09	–0.12	–0.47	–0.42	–0.47	–0.58	0.05
Koss Corp	0.64	0.39	0.12	0.19	–0.17	0.04	–0.31	–0.34	0.46	–0.10	0.21
Mattel Inc	–0.07	–0.22	0.00	–0.25	–0.19	–0.31	–0.36	–0.35	–0.32	–0.38	0.06
Minnesota Mining & Mfg Co	0.73	0.50	0.54	0.51	0.40	0.46	0.28	0.20	0.06	0.29	0.32
Mts Systems Corp	–0.46	–0.22	–0.57	–0.05	0.21	0.15	0.27	0.26	–0.13	–0.25	–0.02
Ohio Art Co	–1.31	–1.19	–0.51	–0.57	–0.24	–0.31	–0.55	–0.59	–0.43	–0.40	–0.28
Outboard Marine Corp	0.17	–0.63	–0.40	–0.27	–0.48	–0.43	–0.63	–0.84	–0.79	–0.51	–0.15
Pall Corp	0.02	–0.08	0.39	0.45	0.43	0.59	0.54	0.67	0.59	0.54	0.66
Polaroid Corp	0.58	–0.46	–0.01	0.12	–0.31	0.18	–0.36	–0.52	–0.72	–0.56	–0.30
Procter & Gamble Co	0.67	0.60	0.54	0.48	0.36	0.24	0.04	–0.12	–0.17	–0.17	0.01
Quaker Oats Co	0.26	0.05	–0.18	–0.03	–0.22	–0.22	–0.33	–0.21	–0.25	–0.18	0.00
Research Inc	–0.48	–0.76	–0.88	–0.72	–0.06	0.17	–0.19	0.31	0.14	–0.19	0.09
Robbins & Myers Inc	–0.44	–0.61	–0.69	–0.43	–0.33	–0.09	–0.01	0.07	0.11	–0.48	–0.30
Rubbermaid Inc	0.68	0.18	0.44	0.38	0.26	0.14	0.19	0.05	0.25	0.46	0.53
Sherwin-Willliams Co	–0.48	–0.59	–0.44	–0.39	–0.48	–0.60	–0.49	–0.37	–0.30	–0.02	0.06
Stanley Works	0.00	–0.46	–0.20	0.00	–0.07	–0.10	0.18	0.04	0.01	0.22	0.25
Starrett (L.S.) Co – Cl A	0.09	–0.03	–0.15	–0.22	–0.08	–0.07	–0.10	–0.16	0.29	–0.04	0.19
Talley Industries Inc	–0.45	–0.39	–0.41	–0.43	–0.34	–0.47	–0.60	–0.62	–0.59	–0.48	–0.36
Thomas & Betts Corp	0.75	0.51	0.59	0.61	0.52	0.50	0.43	0.45	0.47	0.39	0.54
Toro Co	0.23	–0.21	–0.23	–0.25	–0.27	0.08	0.09	–0.12	–0.38	–0.45	–0.23
Warner-Lambert Co	0.50	0.23	0.36	0.22	0.06	–0.06	–0.21	–0.28	–0.21	–0.07	–0.06

TABLE III.2
Goodwill capital as a fraction of market value for companies for which complete advertising data exists, 1984–1994

Company Name	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Analogic Corp	0.16	0.32	0.01	0.01	–0.57	–0.38	–0.57	–0.47	–0.58	–0.38	–0.42
Armstrong World Inds Inc	–0.10	0.04	0.17	0.11	0.07	0.05	–0.23	–0.14	–0.02	0.24	–0.10
Avon Products	0.08	0.27	0.25	0.20	–0.35	0.38	–0.12	0.45	0.53	0.40	0.48
Barry (R G)	–0.26	–0.13	0.00	–0.32	–0.48	–0.13	–0.75	–0.76	–0.37	0.08	0.00
Bausch & Lomb Inc	0.34	0.38	0.36	0.18	0.24	0.36	0.32	0.51	0.45	0.28	0.02
Borden Inc	–0.10	0.16	0.09	0.04	0.10	0.16	–0.05	–0.02	–0.17	–0.34	–0.37
Bristol Myers Squibb	0.46	0.51	0.54	0.47	0.45	0.62	0.64	0.71	0.57	0.44	0.40
Campbell Soup Co	0.12	0.18	0.41	0.37	0.17	0.47	0.41	0.58	0.53	0.43	0.43
Carter-Wallace Inc	–0.16	0.20	0.47	0.21	0.11	0.21	0.23	0.44	0.36	0.12	–0.32
Clark Equipment Co	–0.32	–0.12	–0.24	–0.19	–0.11	–0.07	–0.43	–0.31	–0.53	0.15	0.02
Clorox Co/De	0.09	0.23	0.40	0.41	0.24	0.37	0.40	0.30	0.34	0.38	0.31
Coherent Inc	0.54	–0.04	–0.19	–0.08	–0.37	–0.04	–0.68	–0.30	–0.71	–0.33	–0.43
Colgate-Palmolive Co	0.02	–0.17	–0.01	–0.15	0.00	0.31	0.16	0.33	0.35	0.37	0.33
Computer Products Inc	0.47	0.35	0.19	–0.13	–0.01	–0.01	–0.28	–0.08	–0.08	–0.23	–0.10
CPC International Inc	0.01	0.12	0.02	0.26	0.17	0.33	0.29	0.34	0.31	0.27	0.25
Cross (A.T.) & Co – Cl A	0.51	0.60	0.65	0.64	0.69	0.66	0.48	0.50	0.38	0.29	0.22
Data General Corp	0.24	0.03	–0.18	–0.05	–0.52	–0.61	–1.22	–0.41	–0.76	–0.75	–0.63
Del Laboratories Inc	–0.22	–0.09	–0.14	–0.24	–0.24	–0.20	–0.48	–0.33	–0.34	–0.25	–0.02
Dynamic Corp of Amer	0.09	0.10	0.00	–0.20	–0.07	–0.10	–0.98	–0.93	–0.74	–0.60	–0.32
Eastman Kodak Co	–0.14	–0.20	0.03	0.01	–0.21	–0.38	–0.45	–0.30	–0.47	–0.08	–0.28
Ford Motor Co	–2.22	–1.98	–1.62	–1.56	–1.69	–1.89	–2.22	–1.95	–1.78	–1.48	–1.54
Gelman Sciences Inc	–0.03	0.08	0.11	0.02	–0.12	0.06	–0.27	–0.34	–0.36	–0.03	0.23
General Mills Inc	0.00	0.45	0.54	0.25	0.40	0.46	0.56	0.56	0.54	0.41	0.57
Gillette Co	0.09	0.14	0.32	0.31	0.35	0.28	0.33	0.60	0.57	0.53	0.58
Goodyear Tire & Rubber Co	–1.08	–0.82	–0.47	–0.42	–0.65	–0.80	–1.39	–0.74	–0.60	–0.28	–0.76
Hasbro Inc	0.16	0.22	0.17	–0.22	–0.19	–0.06	–0.33	0.24	0.27	0.26	0.07
Helene Curtis Inds	–0.25	–0.15	–0.04	–0.25	–0.06	–0.22	–0.14	0.00	–0.02	–0.36	–0.34
Hershey Foods Corp	0.16	0.28	0.41	0.31	0.27	0.39	0.34	0.38	0.35	0.31	0.29
Hormel Foods Corp	–0.15	–0.01	0.15	0.26	0.21	0.35	0.29	0.40	0.40	0.33	0.34
Intel Corp	0.36	0.36	0.19	0.44	0.25	0.36	0.18	0.24	0.46	0.48	0.37
Intl Rectifier Corp	0.47	0.29	0.02	0.10	0.07	0.00	0.22	0.23	–0.34	0.06	0.11
Johnson & Johnson	0.15	0.34	0.36	0.38	0.39	0.50	0.50	0.64	0.54	0.45	0.45
Knape & Vogt Mfg Co	–0.07	0.09	0.35	0.23	0.04	–0.01	–0.15	–0.06	0.11	0.02	0.09
Koss Corp	–0.04	–0.94	0.44	0.55	0.36	0.12	–0.01	–0.31	–0.15	0.51	0.55
Mattel Inc	–0.06	–0.02	–0.14	–0.21	–0.11	0.19	0.10	0.43	0.43	0.45	0.43
Minnesota Mining & Mfg Co	0.23	0.27	0.36	0.35	0.24	0.35	0.30	0.35	0.33	0.34	0.26
Mts Systems Corp	–0.07	–0.11	0.07	0.18	0.04	–0.02	–0.19	–0.10	–0.05	–0.01	–0.21
Ohio Art Co	–0.04	0.38	0.31	0.02	–0.08	–0.30	–0.69	–0.44	0.05	–0.54	–0.43
Outboard Marine Corp	–0.21	–0.36	–0.15	–0.04	–0.20	–0.31	–0.97	–0.65	–0.65	–0.26	–0.20
Pall Corp	0.57	0.55	0.61	0.58	0.51	0.52	0.46	0.65	0.63	0.55	0.49
Polaroid Corp	–0.48	–0.08	0.20	–0.12	0.26	0.33	–0.06	–0.10	–0.06	–0.10	–0.19
Procter & Gamble Co	–0.14	–0.13	0.04	0.13	–0.17	0.05	0.32	0.15	0.18	0.23	0.22
Quaker Oats Co	0.03	0.27	0.42	0.22	0.10	0.43	0.11	0.44	0.25	0.42	0.33
Reserach Inc	–0.24	–0.12	–0.30	–0.15	–0.05	–0.44	–1.04	–1.40	–1.37	–1.07	–0.96
Robbins & Myers Inc	–0.36	–0.27	–0.39	–0.28	–0.36	–0.21	–0.20	0.18	0.08	0.15	–0.14
Rubbermaid Inc	0.54	0.63	0.68	0.62	0.59	0.66	0.66	0.78	0.72	0.71	0.61
Sherwin-Williams Co	0.04	0.24	0.29	0.16	0.12	0.24	0.23	0.37	0.40	0.43	0.35
Stanley Works	0.18	0.26	0.24	0.18	0.18	0.33	0.14	0.35	0.36	0.37	0.24
Starrett (L.S.) Co – Cl A	0.06	0.25	0.32	0.25	0.25	0.14	0.10	0.00	–0.02	–0.03	–0.17
Talley Industries inc	–0.27	–0.12	–0.14	–0.09	–0.11	–0.11	–0.17	–0.17	–0.16	–0.04	0.01
Thomas & Betts Corp	0.47	0.51	0.49	0.52	0.42	0.40	0.35	0.43	0.35	0.28	0.32
Toro Co	–0.31	–0.09	0.24	0.16	0.07	0.05	0.05	–0.19	–0.21	–0.04	–0.04
Warner-Lambert Co	0.02	0.28	0.33	0.33	0.22	0.40	0.41	0.43	0.30	0.17	0.23

TABLE IV
Median and mean goodwill capital as a fraction of market value for 53 firm sample in each year, 1973–1994

Year	Median GMIN	Mean GMIN	Median GMID	Mean GMID	Median GMAX	Mean GMAX
1973	0.136	0.048	0.172	0.097	0.186	0.125
1974	–0.176	–0.218	–0.157	–0.165	–0.137	–0.110
1975	–0.124	–0.113	–0.060	–0.060	–0.017	–0.006
1976	–0.024	–0.067	0.006	–0.014	0.037	0.040
1977	–0.112	–0.098	–0.084	–0.045	–0.060	0.010
1978	–0.081	–0.158	–0.045	–0.103	0.018	–0.047
1979	–0.163	–0.246	–0.119	–0.185	–0.083	–0.123
1980	–0.190	–0.278	–0.150	–0.210	–0.105	–0.143
1981	–0.250	–0.309	–0.171	–0.236	–0.100	–0.162
1982	–0.218	–0.193	–0.146	–0.126	–0.072	–0.059
1983	–0.004	–0.015	0.050	0.044	0.093	0.102
1984	–0.063	–0.073	0.016	–0.012	0.081	0.048
1985	0.080	0.008	0.136	0.064	0.200	0.120
1986	0.133	0.088	0.190	0.137	0.212	0.185
1987	0.111	0.040	0.161	0.090	0.191	0.140
1988	0.023	–0.039	0.071	0.016	0.104	0.072
1989	0.089	0.024	0.141	0.080	0.190	0.138
1990	–0.014	–0.180	0.050	–0.104	0.107	–0.026
1991	0.135	–0.043	0.183	0.028	0.232	0.101
1992	0.085	–0.064	0.108	0.011	0.169	0.087
1993	0.107	–0.004	0.172	0.070	0.279	0.146
1994	0.068	–0.047	0.086	0.030	0.141	0.108
% < 0	54.5	77.3	36.4	50.0	31.8	36.4
% < 0 through 1991	63.2	73.7	42.1	57.9	36.8	42.1

zero. All deviations from zero are due to random shocks and should disappear over time. One way to test this hypothesis for an individual firm would be to test whether its mean goodwill stock was significantly different from zero. Such a test would assume that the impact of any random shocks is dissipated in a year, however. An alternative test, which allows for a slower adjustment to temporary shocks, relies on estimates from equation (7).

$$GM_{it} = \alpha_i + \beta_i GM_{it-1} + \mu_{it} \tag{7}$$

where GM_{it} is firm i's goodwill capital as a percent of its market value in period t. Estimates of α_i and β_i allow one to project a firm's goodwill capital into the indefinite future. This permanent or projected goodwill capital, GM_{ip}, is given by

$$GM_{ip} = \frac{\hat{\alpha}_i}{1 - \hat{\beta}_i} \tag{8}$$

The null hypothesis would be that GM_{ip} is insignificantly different from zero for all firms.

GM_{ip} was estimated using the middle value goodwill/market value ratios for the period 1973 to 1994, for our 53 firm sample with complete R&D and advertising data. Twenty-one of the 53 long-run projected goodwill capital stocks are significantly different from zero at the 10 percent or better level (two-tailed test). Eleven of the 21 are positive, 10 negative. Part A of Table VII presents our estimates of the long run projected ratios of goodwill capital to market value for these 21 companies. As a further check on the sensitivity of our calculations to our definitions, we have also included the estimates that we obtained for these 21 companies in the NBER data set. One should not expect a perfect match from the projections, because the NBER data define both tangible capital and market values slightly differently, and the estimates are based on data for only the 1973–1991 period, while ours extend up through

TABLE V
Median and mean goodwill capital as a fraction of market value for all firms in each year, 1973–1994 (using only RD data – 344 firms)

Year	Median GMIN	Mean GMIN	Median GMID	Mean GMID	Median GMAX	Mean GMAX
1973	–0.087	–0.023	–0.071	–0.006	–0.053	0.013
1974	–0.323	–0.250	–0.296	–0.228	–0.271	–0.202
1975	–0.232	–0.170	–0.204	–0.145	–0.191	–0.117
1976	–0.085	–0.075	–0.073	–0.051	–0.050	–0.025
1977	–0.111	–0.106	–0.085	–0.081	–0.061	–0.054
1978	–0.093	–0.149	–0.075	–0.124	–0.062	–0.097
1979	–0.074	–0.160	–0.062	–0.133	–0.040	–0.105
1980	–0.059	–0.104	–0.032	–0.076	–0.005	–0.047
1981	–0.093	–0.179	–0.064	–0.147	–0.024	–0.114
1982	–0.046	–0.135	–0.026	–0.102	0.000	–0.068
1983	0.067	0.020	0.092	0.048	0.123	0.078
1984	–0.003	–0.092	0.024	–0.058	0.054	–0.024
1985	0.062	–0.054	0.083	–0.021	0.105	0.012
1986	0.070	0.000	0.092	0.030	0.116	0.062
1987	0.019	–0.069	0.043	–0.037	0.078	–0.003
1988	–0.009	–0.087	0.024	–0.053	0.056	–0.018
1989	–0.013	–0.120	0.017	–0.083	0.056	–0.044
1990	–0.181	–0.346	–0.137	–0.297	–0.098	–0.246
1991	–0.115	–0.211	–0.065	–0.162	–0.024	–0.110
1992	–0.047	–0.186	–0.006	–0.134	0.035	–0.081
1993	0.009	–0.048	0.052	0.000	0.093	0.049
1994	–0.011	–0.060	0.048	–0.009	0.104	0.041
% < 0	77.3	90.9	59.1	86.4	50.0	72.7

1994. Nevertheless, all but two of the estimates have the same signs, and many are quite near one another. For example, our estimate of GM_{ip} for Johnson & Johnson is 0.43, while the corresponding estimate with the NBER data is 0.51. Our estimate for Goodyear is –0.81, while the corresponding estimate with the NBER data is –0.84.

There were an additional 24 companies for which complete NBER data were available on R&D and advertising, and for which we estimated long run projected ratios of goodwill capital to market value that were significant at the 10 percent level. These estimates are presented in Part B of Table VII. Many of the companies' names should be familiar to most readers. American Home, Eli Lily, and Merck are all projected to have significant, positive long run goodwill capital to market value ratios using the NBER data. Xerox and Zenith are two familiar names for which we projected substantial negative goodwill capital/market value ratios using the NBER data. Only three of these additional 24 companies were in our sample of 53 firms with complete R&D and advertising data. Estimates of GM_{ip} for these three companies using our data were not significant at the 10 percent level, however.

Combining the estimates in both parts of Table VII, there are 35 projected ratios of goodwill capital to market value made with the NBER data that are significant at the 10 percent level. Nearly four times the number one expects by chance. Thus, both sets of data imply the existence of significant amounts of goodwill capital in a substantial minority of companies.

The same conclusion can be drawn using our sample of 344 companies for which complete R&D data existed, but advertising data were missing. Combining the two samples we had 391 long-run projected goodwill capital to market value ratios. Forty-four percent of the projected ratios were significantly different from zero at the 10 percent level (two-tailed test).[19] This number is obviously far greater than the 10 percent one would expect to observe by chance using the 10

TABLE VI
Median and mean goodwill capital as a fraction of market value for a 93 firm sample in each year, 1973–1994. – NBER data

Year	Median GMIN	Mean GMIN	Median GMID	Mean GMID	Median GMAX	Mean GMAX
1973	0.283	0.106	0.309	0.147	0.327	0.174
1974	–0.268	–0.403	–0.215	–0.344	–0.176	–0.282
1975	–0.104	–0.153	–0.026	–0.100	0.052	–0.044
1976	–0.036	–0.116	0.048	–0.066	0.098	–0.015
1977	–0.183	–0.290	–0.075	–0.232	–0.006	–0.171
1978	–0.190	–0.301	–0.152	–0.241	–0.037	–0.180
1979	–0.109	–0.339	–0.068	–0.272	–0.032	–0.204
1980	–0.275	–0.378	–0.209	–0.297	–0.136	–0.215
1981	–0.386	–0.470	–0.307	–0.383	–0.244	–0.296
1982	–0.137	–0.299	–0.066	–0.221	0.019	–0.142
1983	–0.009	–0.090	0.057	–0.023	0.099	0.044
1984	–0.015	–0.096	0.038	–0.027	0.090	0.042
1985	0.189	0.064	0.236	0.130	0.281	0.195
1986	0.248	0.193	0.277	0.244	0.315	0.295
1987	0.184	0.022	0.222	0.085	0.274	0.150
1988	0.240	0.156	0.288	0.216	0.330	0.278
1989	0.298	0.160	0.351	0.227	0.373	0.297
1990	0.158	–0.175	0.222	–0.068	0.265	0.045
1991	0.285	0.086	0.337	0.173	0.404	0.263
% < 0	57.9	63.2	42.1	63.2	31.6	47.4

percent significance level cut-off. Of the significant projections, 54 percent were negative.

V. Discussion

There are essentially two ways to view our calculations. The way we favour is to say that goodwill capital is a very real and important asset for many firms. For roughly half of the 450 companies in our sample goodwill capital is negative, and for many of these companies their negative goodwill stocks are both large and persistent. A large component of the *total* assets of many other companies consists of positive capital that cannot be directly related to past investments in plant and equipment, R&D and advertising. This positive goodwill capital is also often large and persistent. To understand how and why some companies can be very successful, and others not, one must understand how some companies create this valuable asset, while the actions of other companies lead to asset destruction.

We discussed in Section I how both negative and positive goodwill capital can come into existence. In the case of negative goodwill capital, either some event external to a company – like an innovation by a rival – wipes out the value of a substantial amount of a firm's existing capital, or the firm's management consciously or inadvertently creates negative goodwill capital by investing in tangible and intangible capital projects that have rates of return less than a company's cost of capital. In this regard, our estimates of negative goodwill capital are consistent with and reconfirm the findings of Mueller and Reardon (1993). They estimated that roughly four out of five large US corporations had average returns on investment that were less than their costs of capital over the 1970 to 1988 period. Mueller and Reardon estimates for these companies imply that investments in physical and intangible capital over their sample period did not create assets that the capital market valued as high as the investments made. Our results here indicate that a large number of firms have market values that are less than the sum of the cumulated investments they have made after adjusting for depreciation. The fraction of companies in our sample with negative goodwill capital is considerably smaller than the fraction of companies in the Mueller/Reardon sample with

TABLE VII
Long run projected goodwill stocks as a fraction of market value

Company	Mueller/Supina		NBER	
	GM_{ip}	*t*-stat	GM_{ip}	*t*-stat
Part A: Projections Sig. at the 10% level				
Avon Products	0.325	3.504	0.431	3.383
Barry (R G)	–0.250	–2.853	–0.435	–4.199
Bausch & Lomb Inc	0.246	3.648	0.337	2.416
Bristol Myers Squibb	0.426	3.527	1.718	0.180
Clark Equipment Co	–0.221	–4.665	–0.627	–4.649
Cpc International Inc	0.181	1.778	–2.813	–0.236
Cross (A.T.) & Co – Cl A	0.494	8.176	0.747	32.924
Del Laboratories Inc	–0.300	–2.288	–0.304	–0.356
Dynamics Corp of Amer	–0.388	–3.246	–1.348	–2.072
Ford Motor Co	–2.314	–2.673	0.157	0.051
Goodyear Tire & Rubber Co	–0.810	–4.390	–0.838	–1.896
Intel Corp	0.416	8.430	0.519	7.451
Johnson & Johnson	0.432	8.201	0.514	7.674
Minnesota Mining & Mfg Co	0.307	7.334	0.366	6.172
Ohio Art Co	–0.264	–1.822	–0.207	–0.184
Outboard Marine Corp	–0.444	–5.544	–0.747	–2.931
Pall Corp	0.551	8.873	0.678	5.830
Polaroid Corp	–0.171	–2.058	–0.586	–1.693
Rubbermaid Inc	0.473	3.814	0.442	1.852
Thomas & Betts Corp	0.431	12.498	0.505	23.329
Toro Co	–0.120	–1.736	–0.161	–1.317
Part B: Additional projections significant at the 10% level, NBER data estimates				
ACME United Corp			0.245	1.687
American Home Products Corp			0.616	8.353
Baltek Corp			–0.948	–1.656
Becton Dickinson & Co			0.180	2.099
Black & Decker Corp			0.260	2.611
Borden Inc	–0.30	–1.80	–0.06	–0.04
Brunswick Corp			–1.04	–1.73
Champion Parts Inc			–0.400	–3.900
Coherent Inc	–0.34	–2.50	–0.33	–1.14
Data General Corp	–0.63	–1.43	–0.89	–1.01
Deere & Co.			–0.353	–2.074
Gelman Sciences Inc	0.078	0.782	0.181	2.389
Helene Curtis Inds	–0.55	–1.96		
Hewlet-Packard Co			0.425	4.648
Hunt Mfg			0.395	2.433
Johnson Products			–0.861	–1.782
Kellogg Co			0.505	1.688
Lee Pharmaceuticals			–1.00	1.76
Lilly (Eli) & Co			0.440	3.560
Loctite Corp			0.590	12.353
Marion Merrell Dow Inc			0.601	2.848
Merck & Co			0.568	3.266
Mts Systems Corp	–0.16	–2.03	–0.14	–0.97
Neutorgena Corp			0.810	31.961
Optical Radiation Corp			0.414	4.212
Pfizer Inc			0.324	2.977
Research Inc	–0.545	–1.350	0.580	5.474
Robbins & Myers Inc	–0.28	–2.13	–0.41	–0.44
Siliconix Inc			–0.70	–2.57
Starrett (L.S.) Co – Cl A	0.022	0.302	0.256	5.001
Trans-Lux Corp			–0.798	–1.689
Xerox Corp			–0.403	–2.311
Zenith Corp			–0.756	–4.280

returns on investment less than their costs of capital, however. There are several possible reasons for this. First, our data run through 1994, while the Mueller/Reardon data stop in 1988. Inspection of Tables IV and V reveals that goodwill capital increased across our sample in the early 1990s.[20] Second, our estimates are of different capital *stocks*, while Mueller and Reardon estimated returns on *changes* in stocks. A company could have a large positive stock of goodwill capital due, say, to a first-mover advantage and at the same time make investments at returns less than its cost of capital. These investments would reduce the value of its goodwill capital, but would not necessarily make it negative. Third, it should be recalled that we have computed R&D and advertising capital stocks by cumulating only $(1 - t)$ times the investments actually made, where t is the corporate tax rate. If we were to create intangible capital stocks from the actual investments made, two-thirds of our projected goodwill capital stocks would be negative.

Roughly half of our estimates of goodwill capital are positive. We noted in Section I, that this form of capital often does not arise "out of thin air," but rather is the result of some investments or action of the firm that has a far greater return than its normal investments. Although these investments might in principle be identified and linked to the returns they produced, in practice the stochastic nature of this process makes such calculations difficult if not impossible. This is obviously the case when the stochastic event creating a firm's positive goodwill capital is exogenous and external to the firm – like a change in consumer preferences or in a firm's regulatory environment.

The alternative interpretation of our findings is that goodwill capital does not actually exist and persist, and our "estimates" of it are really inaccurate estimates of one or more of the other capital stocks. With respect to the companies for which we estimate persistently negative goodwill capital stocks, this objection implies that we have *over*-estimated one or more of the other three stocks.

The book value of a company's assets closely approximates Lewellen and Badrinath's (1997) estimate of the true value of a firm's assets when inflation is modest, however, and is *less* than their estimates when inflation is important. Lewellen and Badrinath's (1997) estimates in turn tend to be smaller than most others. Thus, the most likely bias introduced by our use of book values to measure company tangible stocks is in the direction of larger goodwill capital. The number of firms in our sample with negative goodwill capital and the size of these stocks would increase if we measured tangible assets as, say, Smirlock, Gilligan and Marshall (1984) did.

To check the sensitivity of our findings to the definitions of market value and tangible capital we used, we have repeated our calculations using the NBER measures of market value and tangible capital stocks. A very similar picture emerges using the NBER definitions as with ours. Although different definitions do, of course, produce somewhat different estimates, we are confident that the qualitative picture our data paints is not an artifact of the way we have calculated goodwill capital.

A second sort of criticism of our estimates would be that we have failed to account for *all* of the intangible capital of a firm. One obvious candidate for an additional form of intangible capital is cumulated employee training expenditures.[21] These may create firm-specific human capital that produces rents that the company retains. What we have labelled as positive goodwill capital might merely be the value of the rents from past investments in training. We lacked data on employee training expenditures, and thus omitted them from our calculations.[22] Although we believe that these sorts of rents exist for some firms, we find it difficult to believe that they would account for all of the positive goodwill capital which we have estimated. For example, the estimates in Table VII would imply that Rubbermaid's stock of employee human capital had a value equal to almost 50 percent of its market value. And, of course, missing firm-specific human capital cannot account for the *negative* goodwill stocks which we have measured for some companies.

To check the sensitivity of our estimates of goodwill to the assumptions that we have made regarding depreciation, we calculated the depreciation rates that would have to exist for R&D and advertising in each year to make a company's goodwill capital in that year equal zero. We first set the depreciation rate on R&D equal to 15 percent and calculated the value of depreciation on advertising that was needed each year. We then set the deprecation on advertising equal to 0.67 and calculated the needed depreciation rates for R&D. Both sets of calculations were made using Equation 6 assuming a steady state with zero growth.

To reduce a firm's goodwill capital to zero in every year, large and highly variable depreciation rates must be assumed. For example, we must assume that Colgate-Palmolive's depreciation on advertising gyrates between minus 388 percent and plus 1199 percent. Sometimes these figures produce reasonable *averages* – in Colgate-Palmolive's case the mean of the depreciation rates required for advertising is 11 percent. But for many companies even the averages seem implausible. To eliminate all of Thomas & Betts's persistently positive goodwill capital stocks we need to assume depreciation rates on advertising that range from 0.5 to 2.8 percent with a mean of 1.9 percent. The range for R&D would have to be from 1.3 to 6.5 percent with a mean of 3.9 percent. Some observers might believe that these required depreciation rates are not out of the range of plausibility and will prefer to assume that Thomas & Betts does not possess some mysterious fourth form of asset – that which we have chosen to call goodwill capital – but merely possesses very long-lived advertising or R&D capital. We prefer not to adopt this sort of assumption to eliminate all the persistently positive goodwill capital of a Thomas & Betts or an Intel, because this way of eliminating persistently positive goodwill capital merely replaces long-lived goodwill capital with long-lived R&D or advertising capital. The mystery of why some firms have persistently positive goodwill capital gets replaced by the mystery of why the investments in intangible capital of some of the firms depreciate very slowly, while the investments of others depreciate immediately or even destroy existing assets.

The assumption that either R&D or advertising destroys existing assets must be made to eliminate the persistently negative goodwill capital of a company like Goodyear Tire and Rubber. To eliminate all of its negative goodwill capital, we need to assume that it has a sufficiently large stock of either negative R&D capital or negative advertising capital. In the case of advertising we must assume that this negative capital depreciates over a range of from nine to four percent with a mean of six percent. The range for R&D would have to be from 39 to 5.5 percent with a mean of 12 percent. Although Goodyear's investments in R&D and/or advertising fail to create positive intangible capital, the firm perversely continues year after year to replace this odd form of capital. Here the advantage of assuming a fourth form of capital not directly related to a firm's investments seems to us obvious.

Although it is difficult to measure the value of goodwill capital stocks precisely, we believe that we have shown that for many firms they are quite large and persistent, so large and persistent in fact that they warrant additional research as to their cause. Given that a firm's market value reflects the present value of its future profits' stream, one might begin to try and explain positive goodwill capital by rounding up the ususal suspects in profitability studies – industry characteristics like concentration and entry barriers, firm characteristics like market share and diversification.[23] Some of these variables, like market share for example, may be due to the same stochastic factors that cause goodwill capital to come into existence. Thus, to account fully for significant positive goodwill capital, in addition to these variables, we suspect that more difficult to measure attributes like first-mover advantages, organizational form and "corporate culture" may prove to be important in explaining goodwill stocks.

Organizational form and corporate culture may also help to explain the large and persistent negative stocks of goodwill capital that appear to exist. Here, however, the culture would appear to be more one of destroying assets than creating them, and the organizational and governance structure may only serve to protect the managers from outside control. This is not the place to unravel these causal relationships and corporate differences. We hope, however, that our work has illustrated that there is indeed something to explain.

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Appendix

The market value of the firm is defined as the sum of the market values of its common and preferred shares and its long and short term debt.

$$MV_t = P_tN_t + PFD_t + LTD_t + STD_t$$

where

MV_t is the market value of the firm at the end of year t,
P_t (A199) is the price of a common share at the end of year t,
N_t (A25) is the number of common shares outstanding at the end of year t,
PFD_t is the value of the firm's preferred stock at the end of year t, estimated by dividing its preferred dividend payments (A19) in year t by the *Moody's* dividend yield on medium grade preferred stock for that year,
LTD_t (A9) is the book value of the firm's long term debt outstanding at the end of year t, and
STD_t (A5) is the book value of the firm's short term liabilities at the end of year t, including long term debt maturing within one year t.

We include all short term liabilities of the firm not just short term debt on the grounds that accrued taxes, accounts payable, etc. also have implicit market values, and that the firm must possess some form of assets to offset these obligations just as it possesses assets that were obtained from long term debt, common stock and preferred stock issues.

Tangible capital, KK_t (A6) is defined simply as the book value of the firm's total net assets at the end of year t. Following Lindenberg and Ross (1981) most studies that calculate Tobin's q replace the book values of net plant and equipment and inventories with estimates of their current values after taking into account inflation. It is not clear whether this adjustment is appropriate in our case, given our objective in this paper. What we seek to calculate is the value the market places on any assets that the firm possesses other than the value the market places on the firm's tangible assets, and intangible R&D and advertising capital. For KK_t, therefore, we wish to subtract from the firm's market value the value that the market places on the firm's existing tangible capital at the end of year t. Does the market implicitly follow the procedure proposed by Lindenberg and Ross, or one of the variations thereon which others have proposed, when it values the firm's intangible capital, or does it simple value the firm's tangible capital at its accounting value? The latter assumption seems to us just as plausible as the first. If the market does value the firm's tangible capital at its accounting value, then we should get a more accurate value of its goodwill capital's market value by subtracting the accounting asset number, than a perhaps better estimate of the replacement cost of its tangible capital. Other studies that imply the book value of total assets to represent the stock of tangible capital include Hirschey (1982).

The COMPUSTAT figures for R&D (A46) and advertising (A45) were used to calculate intangible stocks for these two investments as described in the text.

Again following Lindenberg and Ross (1981) many studies have adopted different procedures to calculate the current market value of a company's long term debt. In periods of inflation, debt issued in the past has a market value lower than its book value. This implies that we have *underestimated* market values for some firms and thus *overestimated* their goodwill stocks. Substituting market for book values of debt would thus only strengthen our conclusion that a substantial number of companies have large, negative goodwill stocks.

An almost bewildering number of procedures for calculating Tobin's q, and thus a firm's tangible capital and market value, have been proposed. In addition to the differences with our procedure already discussed, the biggest difference comes in the treatment of short term debt. Some studies appear to add only debt maturing in one year to market value rather than all current liabilities as we do (Perfect and Wiles, 1994). Fama and French (1997) add the total book value of all liabilities after deducting deferred taxes and the investment tax credit. Smirlock, Gilligan and Marshall (1984) add current liabilities and "other liabilities," which they define as "the book value of assets less the book values of common and preferred stock, debt, and current liabilities" (p. 1059). They also subtract deferred taxes "on the assumption that equity investors never expect to pay these non-interest-bearing amounts."

While most studies add some measure of liabilities other than just long and short term debt to the numerator of Tobin's q, Lewellen and Badrinath (1997, p. 111) subtract "all liabilities other than short- and long-term debt" from the denominator, i.e., from their estimate of tangible capital stock. Since we are concerned with the difference between MV and KK, whether one should add liabilities to MV or subtract them from KK does not matter with respect to our calculation of goodwill capital. But for studies that work with the ratios of these two variables conceivably it would.

Although several studies have constructed intangible capital stocks, and several more have related firm market values to R&D and advertising intensity, none to our knowledge has calculated an estimate of Tobin's q that includes measures of these intangible capital stocks in its denominator – what would be the equivalent to taking account of goodwill capital in ratio form. Nor are we aware of any studies that have calculated it as a residual, as we have, and have examined its properties.

Notes

1 Up until the year 2000, the Financial Accounting Standards Board has allowed up to 40 years.

2 Although sometimes, as with Roberts and Samuelson (1988), what we call advertising capital – intangible capital due to past advertising – is called goodwill capital.

3 Sidney Winter (1984) models the innovation process somewhat in this way.

4 Citing Winter (1984) again, we can make the distinction between the kind of *routine* R&D that characterizes most large corporations, and the *entrepreneurial* R&D that produces major breakthroughs.

[5] The stochastic nature of R&D was emphasized by Richard Nelson (1961). Cohen and Klepper (1992) present a model of the R&D process that stresses its stochastic nature. Scherer et al. (2000) present evidence from a variety of sources implying that the returns from innovations are distributed according to a Pareto distribution with infinite mean and variance.

[6] Hall (1993) finds some evidence that either the rate of return to R&D or R&D depreciation rates changed from 1973 to 1991. She reports that the returns from R&D capital fell from 0.8–1.0 of tangible asset returns during 1979–1983 to a low of 0.2–0.3 during 1986–1991. Chauvin and Hirschey's (1997) results suggest that the decline in returns to R&D may have begun as early as 1982.

[7] See, for example, Roberts and Samuelson (1988), Glenn Thomas (1989), and Megna and Mueller (1991).

[8] Such an approach is implied as the proper way to measure returns on *physical* capital in Fisher and McGowan's (1983) critique of the use of accounting profit rates to calculate returns on capital.

[9] The role luck has played in the discovery of major innovations like penicillin has been much discussed (see, case studies in Jewkes et al. (1969)).

Immediately following "the great Chicago fire" at the end of the 19th century, the Uhlein Brewing Co. of Milwaukee shipped its beer to Chicago and distributed it without cost to the citizens who were without other means of liquid refreshment. This act of goodwill created a national brand image for its beer, and eventually made the manufacturer of Schlitz, "the beer that made Milwaukee famous," the second largest brewing company in the United States. While one could certainly add up the opportunity costs of the beer given away, without the "luck" of the fire and the stroke of genius to capitalize on it, this "marketing strategy" could not have succeeded.

[10] See Schmalensee (1982), Lieberman and Montgomery (1988), and Mueller (1997).

[11] Examples of product innovations that displaced existing products and destroyed any goodwill capital associated with them abound in the electronics industry dating back to the transistor's displacement of vacuum tubes, through IBM's decline following the introduction of PCs, and Apple Computer's loss of market because of Microsoft.

Examples of events that destroyed brand images and goodwill capital, but where not a result of technological innovation, would be the losses experienced by Johnson & Johnson in 1982, when a deranged individual laced some of its Tylenol bottles with poison, and by the Schlitz Brewing Co. after a couple of batches of "grey beer" were distributed from one of its breweries. Mitchell (1989) estimated that the Tylenol poisonings decreased Johnson & Johnson's brand-name capital by \$1.24 billion (14 percent of the forecasted value of the company). Thus, in 1982, the combination of advertising stock and goodwill capital associated with Tylenol must have been in excess of 14% of the company's market value. The firm's management responded quickly and decisively to the poisoning event with massive outlays to replace existing stocks of its product and reassure the public of the product's quality. These efforts quickly succeeded in restoring the value of Johnson & Johnson's goodwill capital.

In the case of Schlitz, delays and mistakes by its management confounded the image problems caused by the grey beer, and the company soon ceased to operate as an independent entity. For a discussion of Schlitz's demise see Aaker (1992).

[12] We emphasize again that only *newly* created goodwill capital cannot be bought. Today, of course, it would be possible to purchase Cocal-Cola's goodwill capital by buying the company.

One might argue that when negative goodwill exists because of the over-investment policies of growth-oriented managers, it is being "bought," so that it is really only *positive* goodwill capital that cannot be bought on the market.

[13] Details on constructing KK and the market value of the firm are discussed in the Appendix.

[14] This follows Hall (1990).

[15] When a company uses before tax profits to purchase a normal asset, say a bond, it can only purchase $(1 - t)\pi$ of these assets, because $t\pi$ must be paid to the government in taxes (t is the corporate profit tax rate). When the company invests in R&D, on the other hand, the full amount π can be invested, since R&D can be expenses for tax purposes. To treat R&D, advertising and all other investments alike, we thus define a firm's R&D or advertising investment in any year as $(1 - t)$ times the actual amount spent. We thank Stefan Fölster for suggesting this procedure.

Below we discuss what happens when this adjustment is not made.

[16] Clark (1976) surveyed the econometric literature and found very conflicting estimates of the duration interval for the effect of advertising on sales. He concluded that the cumulative effect of advertising on sales lasts for months rather than years. See, also Comanor and Wilson's (1979) critique of the early studies estimating low depreciation on advertising, and Assmus, Farley and Lehrmann (1984).

[17] For recent comparisons and critiques of the different methods that have been used, see Perfect and Wiles (1994) and Lewellen and Badrinath (1997). See also the discussion of our methodology in the appendix.

[18] Hall's data are available over the Internet and thus allow others to readily verify our calculations.

[19] A table with the projected goodwill capital to market value ratios and their t-values for the 397 companies is available from the authors on request.

[20] Mueller and Yurtoglu (2000) estimate much higher returns for U.S. companies over the 1985–1995 period than Mueller and Reardon estimated over 1969–1988.

[21] Konar and Cohren's (forthcoming) study of company environmental policies suggest the possibility of an "environmental capital."

[22] Since general investments in human capital cannot be appropriated by the firm, it is unlikely that they could result in sustained goodwill stocks.

[23] Our estimates of persistently large goodwill capital stocks are, of course, consistent with the literature that has identified persistent differences in profitability across companies (Mueller, 1977, 1986, 1990; Geroski and Jacquemin, 1988).

References

Aaker, David A., 1992, 'Whatever Happened to . . .', *Across the Board* **29**, 29–31.

Assmus, Gert, John U. Farley and Donald R. Lehmann, 1984, 'How Advertising Affects Sales: Meta-Analysis of Econometric Results', *Journal of Marketing Research* **21**(1), 65–74.

Chauvin, Keith W. and Mark Hirschey, 1997, 'Market Structure and the Value of Growth', *Managerial and Decision Economics* **18**, 247–254.

Caves, Richard E. and David P. Greene, 1996, 'Brands' Quality Levels, Prices, and Advertising Outlays: Empirical Evidence on Signals and Information Costs', *International Journal of Industrial Organization* **14**(1), 53–70.

Clark, Darral G., 1976, 'Econometric Measurement of the Duration of Advertising Effect on Sales', *Journal of Marketing Research*, 345–357.

Cohen, Wesley M. and Steven Klepper, 1992, 'The Anatomy of Industry R&D Intensity Distributions', *American Economic Review* **82**(4), 773–799.

Comanor, William S. and Thomas A. Wilson, 1979, 'The Effect of Advertising on Competition: A Survey', *Journal of Economic Literature* **17**, 453–476.

Doroodian, Khosrow and Barry J. Seldon, 1991 'Advertising and Cigarette Consumption', *Eastern Economic Journal* **17**(3), 359–366.

Ehrbar, Al, 1998, *EVA: The Real Key to Creating Wealth*, John Wiley & Sons, Inc.

Fama, Eugene F. and Kenneth R. French, 1997, 'Industry Costs of Equity', *Journal of Finance* **43**, 153–193.

Fisher, Franklin M. and John J. McGowan, 1983, 'On the Misuse of Accounting Rates of Return to Infer Monopoly Profits', *American Economic Review* **73**, 82–97.

Geroski, Paul and Alexis Jacquemin, 1988, 'The Persistence of Profits: A European Comparison', *Economic Journal* **98**, 375–389.

Hall, Bronwyn H., 1990, 'The Manufacturing Sector Master File: 1959–1987', NBER Working Paper No. 3366.

Hall, Bronwyn H., 1993, 'The Stock Market's Valuation of R&D Investment During the 1980s', *American Economic Review Papers and Proceedings* **83**(2), 259–264.

Hirschey, Mark, 1982, 'Intangible Capital Aspects of Advertising and R&D Expenditures', *The Journal of Industrial Economics* **30**(4), 375–390.

Hirschey, Mark, and Jerry J. Weygandt, 1985, 'Amortization Policy for Advertising and Research and Development Expenditures', *Journal of Accounting Research* **23**(1), 327–335.

Hulten, Charles R. and Frank C. Wycoff. 1981, 'The Measurement of Economic Depreciation', in Charles R. Hulten (ed.), *Depreciation, Inflation and the Taxation of Income from Capital*, Washington, DC: Urban Institute, pp. 81–125.

Jewkes, John, David Sawers and Richard Stillerman, 1969, *The Sources of Invention*, rev. ed., New York: Norton.

Klette, Tor Jakob, 1996, 'R&D, Scope, and Plant Performance', *RAND Journal of Economics* **27**(3), 502–522.

Konar, Shameck and Mark A. Cohen, 'Does the Market Value Environmental Performance?" *Review of Economics and Statistics*, forthcoming.

Koyck, L. M., 1954, *Distributed Lags and Investment Analysis*, Amsterdam: North-Holland.

Lieberman, M. B. and D. B. Montgomery, 1988, 'First-Mover Advantages', *Strategic Management Journal* **9**, 41–58.

Landes, Elisabeth M. and Andrew M. Rosenfield, 1994, 'The Durability of Advertising Revisited', *The Journal of Industrial Economics* **42**(3), 263–276.

Lewellen, Wilbur G. and S. G. Badrinath, 1997, 'On the Measurement of Tobin's *q*', *Journal of Financial Economics* **44**, 77–122.

Lindenberg, Eric B. and Stephen A. Ross, 1981, 'Tobin's *q* Ratio and Industrial Organization', *Journal of Business* **54**(1), 1–32.

Mansfield, Edwin, John Rapaport, Anthony Romeo, Edmond Villani, Samuel Wagner and Frank Husei, 1977, *The Production and Application of New Industrial Technology*, New York: Norton.

Megna, Pamela, and Dennis C. Mueller, 1991, 'Profit Rates and Intangible Capital', *Review of Economics and Statistics* **73**, 632–642.

Mueller, Dennis C., 1977, 'The Persistence of Profits Above the Norm', *Economica* **44**, 369–380.

Mueller, Dennis C., 1986, *Profits in the Long Run*, Cambridge: Cambridge University Press.

Mueller, Dennis C., ed., 1990, *The Dynamics of Company Profits*, Cambridge, England: Cambridge University Press.

Mueller, Dennis C., 1997, 'First-Mover Advantages and Path Dependence', *International Journal of Industrial Organization* **15**, 827–852.

Mueller, Dennis C. and Elizabeth A. Reardon, 1993, 'Rates of Return on Corporate Investment', *Southern Economic Journal* **60**, 430–453.

Mueller, Dennis C. and B. Burcin Yurtoglu, 2000, 'Country Legal Environments and Corporate Investment Performance', *German Economic Review* **1**, 187–220.

Mitchell, Mark L., 1989, 'The Impact of External Parties on Brand-Name Capital: The 1982 Tylenol Poisonings and Subsequent Cases', *Economic Inquiry* **27**(4), 601–618.

Nakao, Takeo, 1993, 'Market Share, Advertising, R&D, and Profitability: An Empirical Analysis of Leading Industrial Firms in Japan', *Review of Industrial Organization* **8**(3), 315–328.

Nelson, Richard R., 1961, 'Uncertainty, Learning and the Economics of Parallel Research and Development Efforts', *Review of Economics and Statistics* **43**, 351–369.

Pakes, Ariel and Mark Schankerman, 1986, 'Estimates of the Value of Patent Rights in European Countries During the Post-1950 Period', *Economic Journal* **96**, 1052–1076.

Pakes, Ariel and Mark Schankerman, 'The Rate of Obsolescence of Patents, Research Gestation Lags, and the Private Rate of Return to Research Resources', in Zvi Griliches (ed.), *R&D, Patents and Productivity*, Chicago: University of Chicago Press, pp. 73–88.

Perfect, Steven B. and Kenneth W. Wiles, 1994, 'Alternative Constructions of Tobin's *q*: An Empirical Comparison', *Journal of Empirical Financial* **1**, 313–341.

Roberts, Mark J. and Larry Samuelson, 1988, 'An Empirical Analysis of Dynamic, Nonprice Competition in an

Oligopolistic Industry, *Rand Journal of Economics* **19**, 200–220.

Scherer, F. M., Dietmar Harhoff and Jörg Kukies, 2000, 'Uncertainty and the Size Distribution of Rewards from Innovation', *Journal of Evolutionary Economics* **10**, 175–200.

Schmalensee, Richard, 1982, 'Product Differentiation Advantages of Pioneering Brands', *American Economic Review* **72**, 349–366.

Smirlock, Michael, Thomas Gilligan and William Marshall, 1984, 'Tobin's q and the Structure-Performance Relationship', *American Economic Review* **74**, 1051–1060.

Thomas, Lacy Glenn, 1989, 'Advertising in Consumer Goods Industries: Durability, Economies of Scale, and Heterogeneity', *Journal of Law and Economics* **32**, 163–193.

Winter, Sidney G., 1984, 'Schumpeterian Competition in Alternative Technological Regimres', *Journal of Economic Behavior and Organization* **5**, 287–320.