



# Are scientific indicators of patent quality useful to investors?

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## Abstract

Together with the number of patents and the value of R&D expenditures, scientific measures of patent quality give investors a useful basis upon which to judge the economic merit of the firm's inventive and innovative activity. Especially in the case of small cap and relatively low P/E high tech companies, we find a favorable stock-price influence when both the number of patents, the scientific merit of those patents, and R&D spending is high. Patent quality information also appears germane in the case of large cap high-tech companies with relatively high P/E ratios. In short, patent citation information may indeed help investors judge the future profit-earning potential of a firm's scientific discoveries.

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## 1. Introduction

Stock-price effects of corporate research and development (R&D) expenditures have been used to provide useful, albeit indirect, evidence on the economic consequences of the firm's inventive and innovative activity. For example, Chan et al. (2001) report that companies with relatively high R&D intensity tend to earn large excess returns. In a similar vein, Sundaram et al. (1996) show that corporate research and development (R&D) spending announcements have predictably positive effects on the market value of the firm.

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These “predictive studies” document the ability of R&D expenditures to forecast future stockholder returns.

In a related line of research, called “association studies,” researchers investigate the contemporaneous connection between stock prices and R&D intensity. [Toivanen et al. \(2002\)](#), and [Chauvin and Hirschey \(1993\)](#), among others, follow a long line of research to document evidence that R&D expenditures have large, positive and consistent cross-sectional influences on the market value of the firm. This is despite the fact that current accounting convention mandates an expense as incurred rather than capitalization treatment of R&D expenditures in the United States.<sup>1</sup> Like information on current cash flows, data on R&D spending appears to help investors form appropriate expectations concerning the size and variability of future cash flows. Corporate spending on R&D can be viewed as a form of investment in intangible assets with predictably positive effects on future cash flows. In a study of R&D expenditures, sales, and employment for some 1000 large manufacturing firms during the 1957–1977 period, [Griliches \(1986\)](#) confirms that privately financed R&D expenditures have earned a relatively high rate of return on investment.<sup>2</sup>

Consistent with the fact that only a handful of firms is responsible for substantial R&D spending, positive stock-price effects of R&D are most evident in the case of large firms. Nevertheless, smaller firms are not precluded from making profitable investments in R&D. [Hirschey and Spencer \(1992\)](#) show that the well-targeted R&D efforts of the smallest firms can be highly profitable. While prior research strongly suggests that data on R&D spending helps investors form appropriate expectations concerning the magnitude and variability of future cash flows, these results give only indirect evidence on the stock-price effects of inventive output. This stems from the fact that R&D expenditures are a useful indicator of R&D *input*, whereas patents are an effective indicator of R&D *output* (see [Griliches, 1990](#)).

In this study, we seek direct evidence on the market value implications of inventive and innovative output by studying the association between stock prices and patent quality for firms of varying sizes and growth opportunities. In recent papers, [Bloom and Van Reenen \(2002\)](#) and [Hirschey et al. \(2001\)](#), extend a long line of research by documenting the fact that patents have an economically and statistically significant impact on firm-level productivity and market value, respectively. We posit that the stock-price effects of patent output will be most pronounced in the case of high-quality patents, where patent quality is measured by scientific merit. In a related study, [Chung et al. \(1998\)](#) argue that the share

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<sup>1</sup> In the United States, the only exception to the “expense as incurred” rule for R&D pertains to software development costs which are capitalized and amortized over an estimated useful life. [Aboody and Lev \(1998\)](#) show that software capitalization-related variables are significantly associated with stock prices and future earnings and conclude that software capitalization summarizes information relevant to investors.

<sup>2</sup> Corporate spending on advertising and promotion and worker training, among other types of such expenditures, also has the potential to result in the creation of intangible assets. However, [Chauvin and Hirschey \(1993\)](#) show that while the total amount of money spent on corporate advertising and R&D is substantial, only a handful of firms devote significant amounts to both advertising and R&D. Given the high-tech manufacturing firms included in our sample, there is little reason to suspect any bias due to the omission of advertising data in this study of patent quality. We also found no evidence that the stock-price effects of patent quality are influenced by the pace of spending for capital equipment (results available on request).

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