

R&D Intensity and Firm Value in Emerging Markets: Evidence from Indian Pharmaceutical Companies

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Abstract - Whether research and development expenditure is recognised by capital markets in the value they place on a firm is a question with a large developed-market literature but a comparatively thin emerging-market one, and almost no evidence that separates firms by the scale of their international operations. The evidence base is ten years of data, 2013-14 through 2022-23, for 76 listed Indian pharmaceutical firms, 42 domestic and 34 with established multinational operations. Fixed effects regressions are estimated under two complementary lenses: a signalling specification using current-year R&D intensity, and a resource-based specification using R&D intensity lagged by one, two, and three years, against three market-based indicators, Tobin's Q, the market-to-book ratio, and free float market capitalisation. R&D intensity carries almost no explanatory power for multinational firms under either specification. For domestic firms, current-year R&D intensity raises free float market capitalisation, consistent with a modest signalling effect, but lagged R&D intensity is significantly negatively associated with market-to-book value, the opposite of what resource-based reasoning predicts. The asymmetry suggests that where reported R&D captures only part of a firm's true innovation effort, as is plausible for internationally diversified firms, capital markets have little basis to price it at all, while for firms whose reported R&D is closer to a complete account of their research activity, markets appear to reward visible commitment but penalise spending that has not yet produced an observable commercial outcome.

Keywords - capital markets, emerging markets, firm valuation, panel data, pharmaceutical industry, resource-based view, signalling theory

I. INTRODUCTION

A firm that spends heavily on research and development is making a claim, implicit or otherwise, that this spending will eventually translate into products, patents, or capabilities that justify the cost. Whether capital markets accept that claim, and when, is a separate question from whether the claim is true, and the two have not always been found to move together.

In developed markets, a substantial body of work going back several decades has found that R&D spending is, at least partially, priced into equity valuations, whether because investors read current spending as a credible signal of management's private information about future prospects, or because accumulated research capability shows up with a lag as the underlying knowledge assets mature into commercial value. Far less is known about whether the same holds in emerging markets, where disclosure norms, investor sophistication, and the structure of the firms themselves can differ substantially from the US and European settings in which most of this evidence was generated.

The Indian pharmaceutical industry is a useful setting in which to examine this question directly. It is, by global standards, a large and successful generic manufacturing base that has spent much of the past two decades attempting a genuine transition toward higher-value innovation, spurred in part by the 2005 introduction of product patents under India's TRIPS obligations. That transition has been pursued unevenly. Some listed firms have built substantial international manufacturing and commercial operations of their own; others remain focused on the domestic market. This structural difference is likely to matter for how investors interpret a firm's reported R&D expenditure, since a firm with extensive overseas operations reports domestic figures that may represent only part of a larger, group-level research effort, whereas a firm without such operations reports what is closer to the whole of its research commitment.

At issue in what follows is whether R&D intensity carries through into market-based financial performance for Indian pharmaceutical companies, and whether that link changes with the scale of a firm's international operations. Two theoretical accounts motivate the empirical design. Signalling theory predicts that current-year R&D spending should raise contemporaneous market valuation, since only a firm with genuine confidence in its research programme would rationally bear the cost of that signal.

The resource-based view predicts, instead, that the payoff should appear with a lag, as research spending accumulates into knowledge assets that take time to mature into recognised value. Both predictions are tested here, using three complementary valuation measures and a ten-year panel that, notably, extends well past the period covered by the small existing literature on this question in India. Internationally diversified firms turn out to fit neither prediction particularly well, domestic firms fit a more qualified and, in one respect, genuinely counterintuitive pattern, and that latter pattern, a negative association between lagged R&D and market-to-book value, has not, to the authors' knowledge, been previously documented for this industry.

The remainder of the paper proceeds as follows. Section II sets out the two theoretical perspectives and the hypotheses they generate. Section III describes the sample, variables, and empirical model. Section IV reports the results. Section V discusses what the pattern of findings implies for how these two theories should be read in an emerging-market, internationally heterogeneous industry setting, and Section VI concludes.

II. THEORETICAL FRAMEWORK AND HYPOTHESES

A. Signalling Theory and Contemporaneous R&D Effects

The signalling framework introduced in [1] describes how a costly, observable action can credibly convey information that one party holds and another cannot directly verify. This logic was extended to corporate research spending in [2]: because R&D reduces current profit and its ultimate payoff is uncertain, a firm that increases R&D spending without genuine confidence in its research programme would be destroying value for no offsetting benefit. Investors who understand this logic should treat higher current-year R&D intensity as a credible, positive signal, and should price it into the firm's valuation in the same period the spending occurs. Empirical support for this contemporaneous relationship has been reported in US settings in [3] and [4], and the limited Indian pharmaceutical evidence available, from [5] and [6], points in the same direction, though neither study extends past 2012 or distinguishes firms by the scale of their international operations. This motivates the first hypothesis, tested separately for each firm type in this study:

H1: Current-year R&D intensity is positively associated with market-based financial performance.

B. The Resource-Based View and Lagged R&D Effects

A different account, developed in [7] and extended to knowledge-based assets in [8], holds that sustainable competitive advantage comes from resources that are valuable, rare, and difficult for competitors to imitate or replace. Research spending, on this account, is an investment in exactly this kind of resource, but one that takes time to mature: the scientific knowledge, regulatory experience, and product pipeline that a research programme generates cannot be assembled instantly, and their commercial value becomes visible only once development, trials, and approval have run their course. This logic was operationalised in [9] by treating R&D as a depreciating intangible asset, finding a positive relationship between accumulated R&D capital and subsequent stock returns in US manufacturing firms, a finding replicated across several European markets in [10]. If the same capability-accumulation logic applies in the Indian pharmaceutical setting, lagged R&D intensity, rather than current-year spending, should be the stronger predictor of market valuation. This motivates the second hypothesis:

H2: Lagged R&D intensity is positively associated with market-based financial performance.

Neither hypothesis specifies in advance whether the relationship should differ between domestically focused firms and firms with established multinational operations. There is, however, a structural reason to expect that it might. A firm whose research and commercial activity is confined to India reports R&D expenditure that is a reasonably complete account of its own innovation effort. A firm that has built manufacturing, research, or commercial operations overseas reports Indian R&D expenditure that captures only the domestic portion of what may be a considerably larger, internationally distributed research programme. Both hypotheses are accordingly tested separately for domestic and multinational firms throughout this paper.

III. DATA AND METHODOLOGY

C. Sample and Data Sources

Seventy-six Bombay Stock Exchange-listed pharmaceutical firms make up the sample, chosen by market capitalisation as of 13 May 2023 and split into two groups. Forty-two carry no established overseas operational presence and remain majority Indian-owned with no controlling foreign parent; the remaining thirty-four run their own manufacturing, research, or commercial operations abroad.

Ten years of data, 2013-14 through 2022-23, yield 420 firm-year observations for the first group and 340 for the second. All figures come from the CMIE Prowess database, checked against what each company reported in its own annual filings.

D. Variable Measurement

Three indicators of market performance serve as dependent variables here. Tobin's Q sums market capitalisation and book debt, then divides by book assets. The second, market-to-book value, takes that same market capitalisation and sets it against book equity instead. The third, free float market capitalisation, is log-transformed to correct skewness and reflects how much of a firm's equity actually trades publicly. R&D intensity itself, expressed as total R&D spending over net sales, enters the model in its current-year form to test H1, and again lagged one, two, and three years to test H2. A set of seven controls rounds out each specification: firm size, leverage, employee productivity, working capital turnover, ownership concentration, firm age, and operating cash flow.

E. Empirical Model

Every specification in this paper is estimated with fixed effects, a choice confirmed in each case by a Hausman test. The signalling specification takes the form:

$$Y_{it} = \alpha + \beta_1 RD_INT_{it} + \beta_2 LTA_{it} + \beta_3 DE_{it} + \beta_4 EP_{it} + \beta_5 WCT_{it} + \beta_6 OS_{it} + \beta_7 AGF_{it} + \beta_8 OCFR_{it} + u_i + \varepsilon_{it} \quad (1)$$

where Y is, in turn, Tobin's Q, the market-to-book ratio, or free float market capitalisation, and u_i is the firm-specific fixed effect. The resource-based specification is identical except that RD_INT is replaced by its one-, two-, and three-year lags, entered simultaneously. Both specifications are estimated separately for the domestic and multinational sub-samples, with heteroscedasticity-robust standard errors throughout.

IV. RESULTS

A. Descriptive Statistics

R&D intensity averages 6.31 per cent of net sales among multinational firms and 0.12 per cent among domestic firms, confirming the much larger absolute research commitment of the multinational group. All three performance indicators show considerable dispersion in both sub-samples. Variance inflation factors for all explanatory variables remain below 2, ruling out multicollinearity as an explanation for the results below.

B. Signalling Effect: Current-Year R&D Intensity

Table I reports the signalling specification for multinational firms and Table II the same specification for domestic firms. Among multinational firms, R&D intensity carries a positive coefficient against all three indicators, but none approaches significance. Firm size is the only variable that reaches significance with any consistency. The domestic sub-sample tells a similar story for Tobin's Q and the market-to-book ratio, but breaks from it for free float market capitalisation, where the coefficient turns positive and significant at the 5 per cent level, the only statistically significant contemporaneous R&D effect found across both sub-samples and all three indicators, lending qualified support to H1.

TABLE I
FIXED EFFECTS RESULTS, SIGNALLING SPECIFICATION
(MULTINATIONAL FIRMS)

Variable	TQ	MVBV	FFMC
RD_INT	0.077	0.201	0.001
LTA	-9.339***	-24.911***	-0.040
OS	0.233***	0.571**	-0.037***
OCFR	-0.001***	-0.002***	-0.000
Obs.	340	340	340
R ²	0.711	0.519	0.847

*** p<0.01, ** p<0.05, * p<0.10. Controls DE, EP, WCT, AGF omitted for space.

TABLE II
FIXED EFFECTS RESULTS, SIGNALLING SPECIFICATION (DOMESTIC FIRMS)

Variable	TQ	MVBV	FFMC
RD_INT	0.045	-0.189	0.002**
LTA	-21.550**	-81.179*	-0.036
OS	0.545	3.559	-0.022***
OCFR	-0.016	-0.340**	0.000
Obs.	420	420	420
R ²	0.427	0.310	0.187

*** p<0.01, ** p<0.05, * p<0.10. Controls DE, EP, WCT, AGF omitted for space.

C. Resource-Based View: Lagged R&D Intensity

Table III and Table IV report the resource-based specification for multinational and domestic firms respectively. Among multinational firms, none of the three lagged R&D terms reaches significance against Tobin's Q or the market-to-book ratio. Among domestic firms, both the one-year and three-year lags carry a significant negative coefficient against the market-to-book ratio, the reverse of what H2 predicts.

The other two indicators for domestic firms show no equivalent pattern at any lag, narrowing the negative finding specifically to the market-to-book measure.

TABLE III
FIXED EFFECTS RESULTS, RESOURCE-BASED VIEW (MULTINATIONAL FIRMS)

Variable	TQ	MVBV	FFMC
L1 (1-yr lag)	0.073	0.034	-0.004*
L2 (2-yr lag)	-0.043	-0.011	0.002
L3 (3-yr lag)	-0.004	-0.153	0.003
Obs.	238	238	238
R ²	0.739	0.578	0.841

*** p<0.01, ** p<0.05, * p<0.10. Controls omitted for space.

TABLE IV
FIXED EFFECTS RESULTS, RESOURCE-BASED VIEW (DOMESTIC FIRMS)

Variable	TQ	MVBV	FFMC
L1 (1-yr lag)	-2.336	-15.371**	-0.004
L2 (2-yr lag)	-0.625	-2.118	-0.002
L3 (3-yr lag)	-0.401	-2.157***	0.003
Obs.	294	294	294
R ²	0.380	0.330	0.169

*** p<0.01, ** p<0.05, * p<0.10. Controls omitted for space.

V. DISCUSSION

Multinational firms show essentially no relationship between R&D intensity and any of the three valuation measures, under either the contemporaneous or the lagged specification. One explanation, consistent with the sample's own structure, is that reported domestic R&D expenditure for a firm with substantial overseas operations is simply not a reliable proxy for that firm's total innovation effort. If a meaningful share of a multinational firm's actual research activity occurs, or is directed from, outside the Indian entity whose accounts investors observe, then neither theory has the input it requires to generate a market response, since both assume the reported figure is a reasonably complete account of the firm's research commitment.

Domestic firms present a more complicated picture precisely because their reported R&D is a more complete measure, which is what makes the negative lagged market-to-book result worth taking seriously. Two explanations seem plausible and are not mutually exclusive. The first is a genuine, if uncomfortable, market response: sustained R&D spending that has not yet produced a visible commercial outcome may come to be read less as an investment and more as an ongoing cost.

The second is reverse causality: a firm whose market-to-book ratio has already begun to decline, for reasons unrelated to its research programme, may increase R&D spending defensively. Disentangling these two stories would need an instrument for R&D spending or a formal causality test, neither of which this fixed effects framework can provide on its own.

Read together, the findings suggest a modest refinement to how these two theories should be applied outside the developed-market settings in which they were originally tested. Both work reasonably well as accounts of how a complete, transparent research disclosure should be priced. Neither, in standard form, anticipates a setting in which a material share of sample firms report R&D figures that are structurally partial, nor one in which the market appears willing to penalise, rather than merely ignore, persistent spending without a visible payoff.

VI. CONCLUSION

The question this paper opened with, whether R&D intensity shows up in market-based financial performance for Indian pharmaceutical companies, and whether that pattern shifts with a firm's international operational scale, has now been tested directly. Neither theoretical account finds much purchase among multinational firms. Domestic firms tell a more layered story: current-year spending broadens the shareholder base, a partial signalling result, while spending lagged by one and three years is significantly and negatively tied to the market-to-book ratio, directly contradicting resource-based reasoning.

For firm management, R&D disclosure alone does not appear sufficient to sustain investor confidence, and pairing spending with clearer communication of interim milestones is likely to matter. For policymakers, incentive design calibrated to firm-reported expenditure alone may be missing part of the picture for internationally diversified firms. For researchers, distinguishing a genuine market penalty from a reverse-causal response to declining valuation would require firm-level innovation output data not available for the present study.

The study is limited by its reliance on expenditure rather than output measures of innovation, a three-year lag structure that may not capture the full gestation period of pharmaceutical research, and a design that cannot fully resolve the direction of causality behind its most striking result.



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