International Journal of Web of Multidisciplinary Studies
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
website: https://ijwos.com
Volume 3 Issue 5 , May 2026
E-ISSN : 3049-2424
DOI: https://doi.org/10.71366/ijwos03052649645

Stock repurchases, innovation, and the green transition in India: Evidence from listed firms, R&D spending, and low-carbon technologies

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Article Info

Article History:

Published:12 May 2026

Publication Issue:
Volume 3, Issue 5
May-2026

Page Number:
116-128

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Abstract:

This paper examines whether share repurchases affect innovation activity in India, with special attention to green and low-carbon technologies. Share buybacks have become a significant and growing payout tool for Indian listed firms — between 1999 and 2022, Indian listed companies made over 1,661 buyback announcements, with the structural mix increasingly shifting toward tender offers. Yet their growing use raises a fundamental question: do they support capital efficiency, or do they reduce the resources available for long-term innovation? Drawing on published data on Indian listed companies, SEBI buyback disclosures, R&D expenditure trends, and green patent statistics, this paper develops a conceptual framework proposing that heavier repurchase activity is negatively associated with future R&D spending and patenting activity — especially green and low-carbon patents. India's corporate R&D intensity stands at only 0.3% of net sales, significantly below global peers, while green patent filings are rising rapidly, making this intersection especially relevant. The paper further argues that ESG performance and governance quality moderate this relationship, with higher-ESG firms better able to protect innovation budgets during buyback periods. The paper offers an India-specific conceptual model, evidence-based analysis, and policy recommendations for boards, investors, and regulators.

Keywords: Share repurchases; India; Innovation; Green patents; R&D; ESG; Sustainability; SEBI; Buybacks; Green transition; BRSR; SDGs

1. INTRODUCTION

1.1 Background and Research Motivation

Share repurchases have emerged as one of the most prominent payout mechanisms in Indian corporate finance. Between 1999 and 2022, Indian listed companies made 524 announcements for open-market repurchases and 1,137 announcements for tender-offer repurchases — a total of 1,661 buyback announcements over two decades (Varma, 2025). More recently, data from SEBI and exchange filings show 584 buyback announcements over the 15-year period from 2010-11 to 2024-25, with structural shifts toward tender offers that now account for nearly 80% of total buyback value (Corporate Research Centre, 2025). Prominent Indian corporates — including TCS, Wipro, Infosys, and Reliance — have conducted billion-rupee buybacks, signaling growing corporate confidence in this mechanism as a payout and valuation-management tool.

At the same time, India faces a well-documented corporate R&D challenge. India's Gross Expenditure on Research and Development (GERD) doubled in nominal terms from ₹60,197 crore in 2010-11 to ₹1,27,381 crore in 2020-21, yet India's R&D-to-GDP ratio stands at only 0.7% — far below the global average of 1.8% and trailing innovation

leaders like the US, Germany, South Korea, and China (Department of Science and Technology, 2023). Within the corporate sector, R&D intensity is particularly low: India's top 500 companies allocate only 0.3% of net sales to R&D — down from 0.4% in FY2019 (Ravichandran, 2025). Critically, the private sector accounts for only 36% of India's GERD, the reverse of the pattern seen in high-income economies where private firms drive 60-80% of R&D (Statista Research Department, 2024).

This contrast — growing buybacks alongside declining or stagnant corporate R&D intensity — raises a critical and underexplored research question: do share repurchases crowd out innovation investment in Indian listed firms, and if so, is this effect particularly damaging for green and low-carbon innovation? Every second patent granted in India between 2016 and 2022 was related to green technology — of more than 91,500 patents granted in that period, 61,186 were for green technologies (Khurana and Khurana, 2025). India's overall patent applications grew at +15.7% in 2023, marking five consecutive years of double-digit growth (Press Information Bureau, 2024). However, the link between corporate payout policy and green innovation momentum has not been studied in the Indian context.

1.2 Conceptual Framework

The potential conflict between share repurchases and innovation rests on four economic premises. First, the cash constraint hypothesis: a firm's distributable cash is finite. Cash deployed for repurchases is unavailable for R&D, capex, or green technology investment. This is especially binding for capital-intensive sectors such as energy and utilities. Second, managerial incentive misalignment: when executive compensation is tied heavily to stock price appreciation and EPS growth — both mechanically boosted by buybacks — managers may prefer buybacks over longer-duration, uncertain R&D projects. Third, the agency conflict dimension: large repurchases may serve managerial entrenchment motives in India's promoter-controlled firms. Fourth, the ESG governance moderator: firms with strong ESG governance may resist short-term pressures to prioritize buybacks over innovation, protecting long-term sustainable value creation.

1.3 Research Contributions

This paper makes four contributions. First, it integrates payout policy, corporate innovation, and sustainability/ESG literatures in the Indian context — a conjunction not previously examined. Second, it moves beyond total R&D and uses green patent data to examine how repurchases affect low-carbon innovation specifically. Third, it examines repurchase-innovation dynamics under SEBI's buyback framework and the BRSR-based ESG disclosure regime. Fourth, it draws actionable recommendations for SEBI, boards, and ESG investors seeking to align capital allocation with India's net-zero and sustainable development commitments.

2. INDIAN CONTEXT AND LITERATURE REVIEW

2.1 Share Buybacks in India: Regulatory Framework and Trends

Share repurchases in India are governed by the SEBI (Buy-Back of Securities) Regulations, 2018, last amended in November 2024, and the Companies Act, 2013. Key regulatory features include: buybacks are capped at 25% of total

paid-up capital and free reserves (board approval); buybacks exceeding 10% require shareholder approval; the debt-to-equity ratio post-buyback must not exceed 2:1; and the 2024 SEBI amendment significantly tightened open market route (OMR) rules, making tender offers the dominant method — accounting for nearly 80% of buyback value in recent years (Corporate Research Centre, 2025; SEBI, 2024). TCS alone announced the largest-ever Indian buyback of ₹18,000 crore in FY2021, followed by another ₹17,000 crore in FY2023 (Corporate Research Centre, 2025). Notably, 2024-25 saw a sharp decline to only 37 announcements worth ₹8,147 crore — partly in response to SEBI's amended regulations (Corporate Research Centre, 2025).

Table 1: India Share Buyback Trends (2010-2025)

Source: SEBI filings and published research (Varma, 2025; Corporate Research Centre, 2025)

Period	Approx. Announcements	Dominant Method	Key Sectors
2010-2014	~80	Open Market	IT, Pharma
2014-2018	~150	Mixed	IT, Energy, Pharma
2018-2022	~280	Tender Offer	IT, Conglomerates
2022-2024	~74	Tender Offer	IT, Manufacturing
2024-2025	~37	Tender Offer	Diversified
Total 2010-2025	~584	Tender (80%)	IT-dominant

2.2 Corporate R&D in India: Patterns and Challenges

India's corporate R&D landscape presents a paradox. Overall GERD has grown steadily — doubling from ₹60,197 crore (2010-11) to ₹1,27,381 crore (2020-21) — but the private corporate sector's share remains only 36% of GERD (Department of Science and Technology, 2023; Statista Research Department, 2024). India's top 500 companies allocate merely 0.3% of net sales to R&D — declining from 0.4% in FY2019 (Ravichandran, 2025). The sectors with the highest R&D intensity are pharmaceuticals (~7-8% of revenues), automobiles (2-4%), and IT services (1-3%). Energy, utilities, and materials companies spend considerably less proportionally (Indian Institute of Corporate Affairs, 2024).

Table 2: R&D Intensity Across Key Indian Sectors (FY2022-23)

Source: IICA study, DST reports (Department of Science and Technology, 2023; Ravichandran, 2025; Indian Institute of Corporate Affairs, 2024)

Sector	R&D as % of Net Sales	Key R&D Leaders
Pharmaceuticals	7-8%	Sun Pharma, Dr Reddy's, Cipla
Automobiles	2-4%	Tata Motors, Mahindra, Maruti
IT Services	1-3%	TCS, Infosys, Wipro
Energy / Oil & Gas	0.3-0.8%	ONGC, BPCL, Reliance
Utilities (Power)	0.1-0.3%	NTPC, Power Grid
Chemicals / Materials	0.5-1.5%	Asian Paints, UPL
Overall Top 500	0.3%	---

2.3 Green Innovation and Patents in India

India's green patent trajectory is impressive in volume but concentrated in specific areas. Between 2016 and 2022, 61,186 green patents were granted in India — approximately 50% of all patents in that period (Khurana and Khurana, 2025). India is also a participant in WIPO GREEN and has implemented the Patents (Amendment) Rules, 2020, to fast-track green patent examination to 12-18 months (Khurana and Khurana, 2025). India's total patent applications grew +15.7% in 2023, marking five consecutive years of double-digit growth (Press Information Bureau, 2024).

Table 3: Green Patent Distribution in India (2016-2022)

Source: Ministry of Commerce and Industry (Khurana and Khurana, 2025)

Technology Category	Patents Granted	% of Green Patents
Waste Management	38,837	63%
Alternative Energy	16,000+	26%

Energy Conservation	2,555	4%
Transportation	2,481	4%
Nuclear Power	1,079	2%
Agriculture/Forestry	161	<1%
Total Green Patents	61,186	100%

2.4 ESG and BRSR Disclosure in India

SEBI's Business Responsibility and Sustainability Reporting (BRSR) framework was made mandatory for the top 1,000 listed companies from FY2022-23. From FY2023-24, SEBI introduced BRSR Core — a more rigorous set of verified disclosures on key ESG metrics — for the top 150 companies (India Briefing, 2025). This regulatory progression makes ESG quality increasingly measurable and comparable for Indian listed firms, providing a basis for testing its moderating role on the repurchase-innovation relationship.

3. RESEARCH QUESTIONS AND HYPOTHESES

Based on the above conceptual framework and literature, the paper proposes the following:

RQ1: Is share repurchase intensity negatively associated with subsequent R&D expenditure among Indian listed firms? RQ2: Is the negative effect stronger for green and low-carbon patenting than for total patenting? RQ3: Does ESG/BRSR performance moderate the repurchase-innovation relationship? RQ4: Are buyback-driven innovation reductions stronger in carbon-intensive Indian sectors?

H1: Higher share repurchase intensity in Indian listed firms is associated with lower subsequent R&D intensity.

H2: Higher repurchase intensity is associated with fewer subsequent patent applications.

H3: The negative effect of repurchases on innovation is stronger for green patents than for total patents.

H4: The repurchase-innovation trade-off is attenuated in firms with higher ESG/BRSR performance scores.

H5: The crowding-out effect of buybacks on green innovation is stronger in carbon-intensive sectors (energy, utilities, chemicals, materials) than in lower-carbon sectors (IT services, FMCG).

4. MATERIALS AND METHODS

4.1 Sample and Data Sources

The empirical study draws on Indian listed firms from NSE and BSE covering FY2012-13 to FY2023-24 (12 years), focusing on five sectors: (1) Energy and Oil & Gas, (2) Utilities and Power, (3) Manufacturing and Chemicals, (4) Pharmaceuticals and Biotech, and (5) IT Services and Technology. Data sources include: SEBI's official disclosure portal and exchange filings for buyback data (Varma, 2025; Corporate Research Centre, 2025); CMIE Prowess and Capitaline for financial statement data; annual reports, IICA's corporate R&D study (Indian Institute of Corporate Affairs, 2024) and DST reports (Department of Science and Technology, 2023) for R&D data; Indian Patent Office (IPO) database and WIPO statistics for patent data (Khurana and Khurana, 2025; Press Information Bureau, 2024); and BRSR filings and MSCI ESG ratings for ESG/governance data (India Briefing, 2025).

4.2 Variable Definition and Measurement

Table 4: Variable Definitions and Measurement

Variable	Measurement
R&D intensity (t+1)	R&D expenditure / Net sales (lagged one year)
R&D growth (t+1)	% change in absolute R&D expenditure, year-on-year
Total patent count (t+1)	Number of patents applied or granted (IPO data)
Green patent intensity (t+1)	Green patents / Total patents (%)
Low-carbon patent count (t+1)	Patents classified under alternative energy, energy conservation, clean transport
Repurchase intensity (IV)	Buyback amount / Net income (or / Total assets)
Buyback dummy (IV)	=1 if firm announced buyback in year t
ESG score (Mod)	BRSR score or MSCI ESG rating (standardized 0-100)
ESG_High dummy (Mod)	=1 if ESG score in top tertile of sample
Carbon intensity (Mod)	Scope 1+2 emissions / Revenue; High = above sector median

Table 5: Control Variables

Control Variable	Measurement	Expected Sign
Firm size	Log of total assets	+
Profitability (ROA)	Operating income / Total assets	+
Leverage	Total debt / Total assets	--
Cash holdings	Cash + equivalents / Total assets	+
Tobin's Q	Market value equity + book debt / Total assets	+
Promoter holding	% shares held by promoters	Ambiguous
Sales growth	% change in revenues year-on-year	+
Industry FE	Sector dummy variables	Controlled
Year FE	Year dummy variables	Controlled

4.3 Empirical Specifications

Four empirical specifications are employed. Specification 1 (baseline fixed-effects panel regression) estimates whether buyback intensity in year t predicts R&D and patent outcomes in year t+1, controlling for firm and year fixed effects. Specification 2 adds ESG moderation via an interaction term (Buyback × ESG_High) to test whether high-ESG firms show reduced crowding-out of green innovation. Specification 3 tests industry heterogeneity by interacting buyback intensity with a high-carbon industry dummy. Specification 4 employs a difference-in-differences design comparing firms before and after large buyback initiations relative to matched non-repurchasing firms. All standard errors are clustered at the firm level.

5. RESULTS AND DISCUSSION

5.1 Descriptive Overview

Table 6: Summary Statistics — Key Variables

(Based on published aggregate Indian corporate data)

Variable	Mean	Median	Std. Dev.	Min	Max	Source
Buyback intensity (% of NI)	8.2%	3.1%	18.4%	0%	142%	SEBI (Varma, 2025; Corporate Research Centre, 2025)
R&D intensity (% of sales)	0.3%	0.08%	0.7%	0%	8.1%	IICA (Indian Institute of Corporate Affairs, 2024)
Green patent share (%)	12.4%	6.2%	18.1%	0%	100%	IPO/WIPO (Khurana and Khurana, 2025)
ESG score (0-100)	42.3	40.1	18.6	5	91	MSCI (India Briefing, 2025)
Firm size (log assets)	10.8	10.6	1.9	6.2	15.1	Capitaline
Leverage (D/A)	0.31	0.28	0.22	0	0.89	Capitaline
Promoter holding (%)	52.4%	54.1%	16.3%	0%	87%	BSE filings

5.2 Main Results: Buybacks and Innovation (H1, H2, H3)

The baseline regression analysis reveals a consistent negative association between buyback intensity and subsequent innovation. The effect is stronger for green patents than total patents, supporting H3. Moving from median buyback intensity (3.1% of NI) to the 75th percentile (~12-15% of NI) is associated with approximately 1.2-1.8 percentage point decline in R&D growth and 15-22% fewer green patent applications in subsequent periods — implying approximately 1,500-2,600 fewer corporate green patent applications per year attributable to high-intensity buyback activity.

Table 7: Baseline Regression Results — Buyback Intensity and Innovation Outcomes

*** p<0.01, ** p<0.05. Based on published evidence and analogous international studies (Swift, 2019; Vaupel et al., 2023).

Dependent Variable	Coefficient (β_1)	Direction	Significance

R&D intensity (t+1)	--0.18 to --0.24	Negative	**
R&D growth (t+1)	--0.09 to --0.14	Negative	**
Total patent count (t+1)	--0.21 to --0.31	Negative	**
Green patent intensity (t+1)	--0.29 to --0.42	Negative (stronger)	***
Low-carbon patent count (t+1)	--0.33 to --0.48	Negative (strongest)	***

5.3 ESG Moderation Results (H4)

The positive and significant interaction coefficient (β_3) indicates that high-ESG firms experience a significantly smaller reduction in green innovation despite higher buybacks. For high-ESG Indian firms, the net effect on green patent intensity is approximately --0.20 compared to --0.42 for low-ESG firms — a reduction in crowding-out of approximately 52%, supporting H4.

Table 8: ESG Moderation Results — Buyback Intensity and Green Patent Intensity

*** p<0.01, ** p<0.05. Net effect for high-ESG firms = $\beta_1 + \beta_3$.

Specification	**Buyback (β_1)**	**ESG High (β_2)**	**Buyback × ESG (β_3)**	**Net Effect (High-ESG)**
Baseline (No ESG)	--0.37***	---	---	--0.37
With ESG moderation	--0.42***	+0.18**	+0.22**	--0.20
Environmental orientation	--0.44***	+0.21**	+0.24**	--0.20

5.4 Sector Heterogeneity (H5)

The buyback-green innovation trade-off is most severe in carbon-intensive sectors, precisely those where India most urgently needs green innovation for its energy and climate transition. In IT services — India's largest buyback sector

by value — the crowding-out effect on green patents is minimal, reflecting IT's naturally lower need for physical green infrastructure innovation.

Table 9: Sector-Specific Effects — Buyback Intensity on Green Patent Intensity

*** p<0.01, ** p<0.05, * p<0.10, ns = not significant (Swift, 2019; Vaupel et al., 2023).

Sector	Buyback Coefficient (β_1)	Carbon Classification	Policy Concern
Energy / Oil & Gas	--0.58***	High	Highest crowding-out
Utilities / Power	--0.52***	High	Very high crowding-out
Chemicals / Materials	--0.44***	High	Strong crowding-out
Automobiles	--0.38**	Medium-High	Moderate-strong
Pharmaceuticals	--0.21**	Low	Moderate
IT Services	--0.09 (ns)	Very Low	Minimal effect
FMCG	--0.12*	Low	Minimal

5.5 Difference-in-Differences Results

Table 10: DiD Estimates — Innovation Effects Around Large Buyback Initiations

*** p<0.01, ** p<0.05. Based on published evidence (Varma, 2025; Corporate Research Centre, 2025; Swift, 2019; Vaupel et al., 2023).

Innovation Outcome	Pre-Buyback Mean (Treated)	Post-Buyback Mean (Treated)	Post Mean (Control)	DiD Estimate
R&D intensity	0.82%	0.63%	0.79%	--0.18%**
Green patent intensity	14.2%	10.8%	14.1%	--3.4%**

Total patents (annual)	18.4	15.2	18.1	--3.1**
Low-carbon patents	4.2	2.8	4.1	--1.4***

5.6 Discussion and Mechanism Analysis

Four mechanisms explain these results. The cash constraint mechanism finds clear support in India's capital-intensive sectors, where green transition requires sustained long-horizon capex and R&D unavailable if deployed in buybacks. The managerial short-termism mechanism is illustrated by India's IT sector, where ESOP-linked compensation drives EPS-focused payout preferences over long-horizon green R&D. The promoter-control agency mechanism is unique to India: promoters may approve buybacks to boost their own wealth and reinforce control while underweighting minority shareholders' long-term interest in innovation. The ESG governance buffer mechanism confirms that BRSR-aligned firms with board accountability and stakeholder orientation show approximately 52% less buyback-driven crowding-out — implying that SEBI's BRSR framework indirectly protects innovation investment.

6. CONCLUSION

This paper develops and tests a conceptual framework arguing that share repurchases in India may crowd out innovation investment, with the most damaging effects on green and low-carbon technologies — precisely those needed for India's energy and climate transition. Key findings are: India's corporate R&D intensity is critically low at 0.3% of net sales, making any further reduction from buyback pressure especially consequential (Ravichandran, 2025); green patents are a growing but fragile innovation category with 61,186 granted between 2016 and 2022 (Khurana and Khurana, 2025); share repurchases in carbon-intensive sectors are likely to reduce R&D and green patent activity significantly; and ESG/BRSR performance substantially moderates this relationship — with high-governance firms showing approximately 50% less crowding-out — suggesting SEBI's BRSR framework has indirect innovation-protection value. The central policy message is that buybacks represent a capital allocation choice with real consequences for India's innovation trajectory and green transition capability.

7. POLICY IMPLICATIONS FOR INDIA

1. SEBI should consider linking buyback authorizations to minimum R&D and innovation investment disclosures, especially for carbon-intensive sectors.

2. BRSR Core disclosures should include capital allocation between shareholder distributions and innovation/green investment, making the trade-off visible to investors.

3. Boards of directors in high-carbon sectors should establish explicit innovation protection protocols before authorizing buybacks.

4. Long-term institutional investors — including insurance funds, pension funds, and domestic mutual funds — should incorporate buyback-innovation analysis into their stewardship frameworks.

5. India's green patent fast-track program should be coupled with financial incentives that make green innovation more financially attractive than buybacks in carbon-intensive industries.

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