Competition, Quality Upgradation and Technology Frontier: Case of India

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Abstract

A central question in international trade and industrial organization is whether exposure to import competition induces domestic firms to upgrade product quality. Trade theory suggests competition drives efficiency and innovation, while Schumpeterian arguments highlight eroded post-innovation rents that discourage costly investments. Empirical evidence remains mixed, often varying by firm productivity and technological proximity. This paper investigates these dynamics in India's manufacturing sector (2000–2018), using industry-level data amid post-liberalization trade exposure. This paper examines the relationship across different technology intensity categories as defined by the OECD. Novel measures of import competition intensity and product quality upgrades are analyzed through panel fixed effects and random effects regressions. Striking heterogeneity emerges: increase in import competition significantly boost quality growth for frontier industries (+2.18pp at IDF=0, p=0.020), with effects turning negative and significant for backward industries (-20.2pp at IDF=1000, p=0.040). These patterns reconcile mixed trade literature by revealing developing-economy constraints: high-productivity industries upgrade to escape competition (Aghion et al., 2011), while technological laggards cut quality investments when protected markets shrink, challenging universal liberalization benefit.

Keywords: Quality Upgrading, Innovation, Import Competition, Schumpeterian hypothesis

Acknowledgments/Disclaimers

The arguments are authors' personal views and do not reflect those of IIFT.

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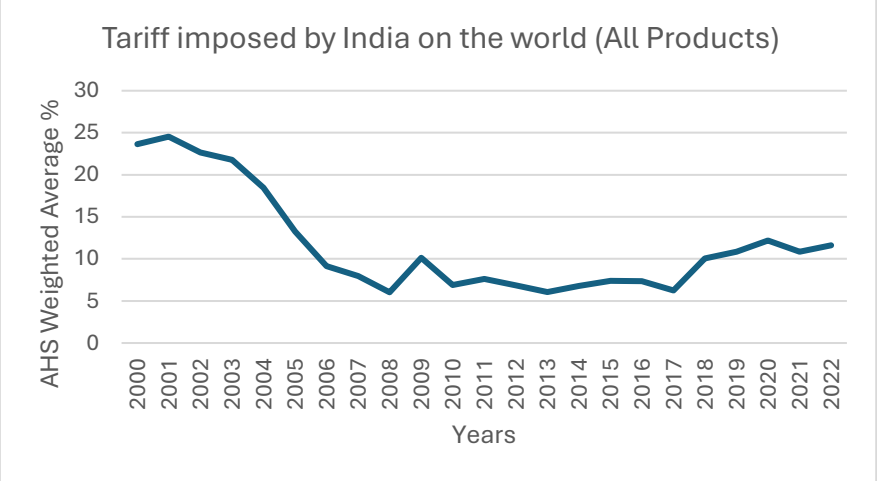
Competition, Quality Upgradation and Technology Frontier: Case of India

Introduction

A central question in international trade and industrial organization is whether exposure to import competition induces domestic firms to upgrade product quality. On the one hand, trade theory suggests that greater competition can force firms to adapt, improving efficiency and stimulating innovation. On the other hand, classic Schumpeterian arguments warn that heightened competition erodes post-innovation rents, thereby reducing the incentive to invest in costly upgrading. The empirical literature offers mixed evidence, with outcomes often depending on firms' productivity levels, absorptive capacity, and proximity to the technological frontier.

India's extensive trade liberalization of the early 1990s provides a natural experiment to study these mechanisms (Figure 1).

Figure 1: Tariff imposed by India on the world (All Products)



Source: WITS Database

The reforms generated sharp, heterogeneous, and largely exogenous tariff reductions across industries, offering a robust setting for causal analysis (Topalova, 2010; Goldberg, Khandelwal, Pavcnik & Topalova, 2010). Output tariff cuts increased competitive pressures by reducing protection for domestic producers, while input tariff cuts lowered production costs and expanded access to higher-quality imported intermediates. Together, these reforms exposed Indian firms to unprecedented levels of import competition.

Faced with such shocks, firms typically had three strategic options:

(i) reduce costs and prices, sometimes at the expense of quality in order to remain competitive;
(ii) upgrade quality and differentiate products to sustain or expand market share; or
(iii) exit the market if unable to adapt.

The balance among these responses depends critically on firm-level productivity and absorptive capacity, echoing the Melitz (2003) selection mechanism, where less efficient firms exit while more productive firms survive and potentially innovate.

Empirical evidence from India confirms significant pro-competitive effects. Studies exploiting tariff reductions such as Topalova and Khandelwal (2011) and Ahsan (2013) show gains in firm-level efficiency and Total Factor Productivity (TFP), alongside exit of the least efficient firms. Input tariff liberalization further boosted competitiveness by expanding the variety and lowering the cost of intermediate goods (Goldberg et al., 2010). Beyond India, Bustos (2011) finds that tariff reductions in Argentina led firms to adopt more advanced technologies, while Fieler and Harrison (2020) show that Chinese firms under competition pressure often pursue product differentiation as a survival strategy.

Competition, Innovation, and Quality Upgrading

Theoretical and empirical work emphasizes that the relationship between competition and innovation is not linear but often inverted-U shaped:

- Schumpeterian hypothesis (Schumpeter, 1943): More competition reduces monopoly rents, lowering innovation incentives.
- Pro-competition view (Blundell, Griffith & Van Reenen, 1999): Competition spurs firms to innovate and improve performance.
- Escape-competition effect (Aghion & Howitt, 2005): Firms close to the technological frontier innovate to "escape" rivals.
- Heterogeneous responses or non-monotonic relationship (Aghion et al., 2005; Vandenbussche, Aghion & Meghir, 2006; Aghion et al., 2009; Amiti & Khandelwal, 2013): Firms near the frontier are pushed to upgrade quality, while laggards may be discouraged due to limited absorptive capacity.

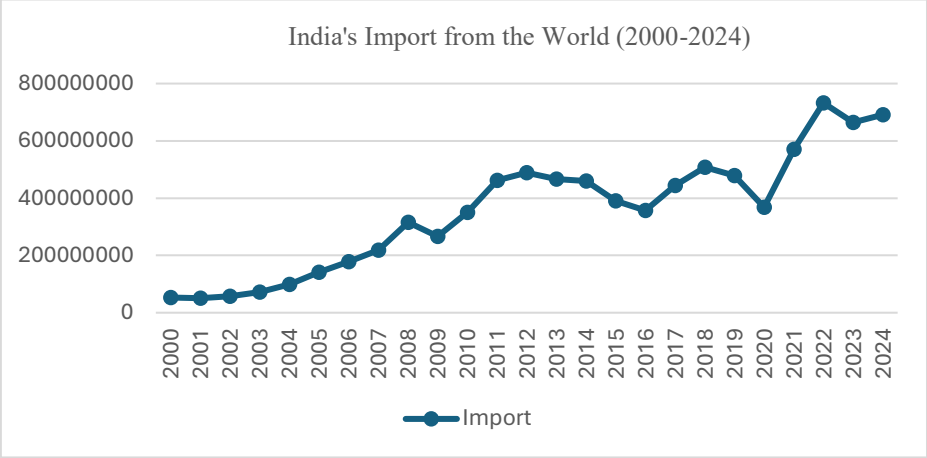
This inverted-U framework suggests that the effects of import competition on quality upgrading are conditional on firms' technological position.

Research Focus: India

Against this backdrop, India provides a compelling setting to examine whether liberalization-induced import competition promoted quality upgrading via the escape-competition channel (Aghion & Howitt, 2005), or whether competitive pressures constrained innovation, consistent with Schumpeterian predictions. The sharp increase in import penetration from 2000 to 2024 (Figure 2) underscores the magnitude of exposure.

This paper therefore asks: Did Indian firms respond to rising import-led competition by upgrading quality in line with frontier-based theories, or did structural constraints such as industrial heterogeneity, institutional capacity, and limited absorptive capabilities mute these effects?

Figure 2: India's Imports (2000-2024)



Source: WITS Database

Answering this question not only clarifies India's experience but also contributes to broader debates on the relationship between trade liberalization, innovation, and economic upgrading in middle-income economies.

Data Description

For this analysis we have used R. Rijesh (2015) classification of High-tech, Medium-tech, and Low-tech industries, which followed OECD (2011) classification scheme. This classification is done at the ISIC rev4 (which corresponds to NIC 2008). The relationship between import competition and quality upgradation depends on the technology intensity of that industry. This analysis will be done by taking one technology intensive category at a time (Table 1). Refer Annex 1 for details on industries.

Table 1: Technology Intensity Industries

Technology Intensity	No. of 2-digit Industries (NIC 2008)
High-Technology Industry (HT)	3
Medium High Technology Industry (MHT)	4
Medium Low-Tech Industry (MLT)	5
Low-Tech Industry (LT)	8
Total	20

Source: Author's calculation based on R. Rijesh (2015) and OECD (2011)

Table 2 reports the average annual growth rates of key industry-level variables over the period 2000 to 2018, disaggregated by technology intensity. IDF measures an industry's distance to the global technological frontier, with declining values indicating convergence toward frontier productivity or quality levels across most categories, most notably in High-Tech (HT) industries (-3.11%). Regarding the import penetration ratio (IMPnew), the metric remained relatively stagnant or slightly negative for some sectors; this indicates that despite liberalized

tariffs, net import penetration did not undergo aggressive expansion during this period. Conversely, Export Unit Values (UVexp) and Import Unit Values (UVimp) generally trended upward. A notable outlier is the Medium Low-Tech (MLT) sector, which saw an 8.97% growth in UVexp, potentially suggesting a substantial rise in the quality (and price) within these industries.

Table 2: Average Growth Rate of IMP, IDF, Tariffs, UVexp and UVimp from 2000-2018

Average Growth Rate	IDF	Tariff	UVexp	UVimp	IMPnew
	2000-2018	2000-2018	2000-2018	2000-2018	2000-2018
LT	-2.30	-5.54 (-4.08)	4.00 (3.96)	4.90	-0.32 (-0.41)
MLT	0.25	-6.24 (-4.84)	8.97 (8.89)	7.89	0.08 (-0.09)
MHT	-2.38	-2.30 (-1.85)	2.08 (1.46)	2.11	0.10 (-0.62)
HT	-3.11	-5.86 (-4.58)	2.31 (2.26)	2.28	-0.37 (-0.15)

Note: For Tariff, values in parentheses represent average growth rate of tariff from 2000 to 2023. For UVexp, values in parentheses represent average growth rate of UVexp from 2000-2019. For IMPnew, values in parentheses represent average growth rate of IMPnew from 2000 to 2022.
Source: Authors' calculations.

Finally, Tariff growth rates summarize the pace of trade liberalization, with Medium-Low Tech (MLT) industries experiencing the most significant contraction at an average annual rate of -6.24%.

Variable Construct-

1. Competition

A substantial body of empirical trade research has relied on import tariffs as a proxy for the degree of import competition. However, it is widely acknowledged that tariffs alone may not accurately capture the full extent of competitive pressures generated by foreign imports. Following the post-liberalization period, statutory tariffs have declined significantly worldwide, and this reduction has often coincided with a proliferation of non-tariff measures (NTMs) (Niu et al., 2022). Consequently, tariffs by themselves constitute an increasingly imperfect indicator of import competition. Niu et al. (2022) further argue that a comprehensive assessment of import competition should jointly account for both tariff and non-tariff trade barriers. Yet, in many cases, estimating tariff equivalents of NTMs remains methodologically challenging and data-intensive.

For these reasons, this study employs the import penetration ratio, which is widely regarded as a more robust proxy for trade liberalization and import competition (Levinsohn, 1993; Ding et al, 2016). The import penetration ratio is defined as:

$$IMP_{cjt} = \frac{Import_{cjt}}{Import_{cjt} + Output_{jt} - Export_{cjt}} \quad (1)$$

Where $Import_{cjt}$, $Export_{cjt}$ and $Output_{jt}$ are the total imports, exports, and outputs of industry j in country c at time t, respectively. Trade data are sourced from the WITS database, while industry output data are drawn from the EPWRF database.

To match industry-level output data with product-level trade data, we concord ISIC Revision 4 industry codes to HS 4-digit product codes. The concordance proceeds in two stages: first, ISIC Rev. 4 is mapped to ISIC Rev. 3, followed by a mapping from ISIC Rev. 3 to HS2012 6-digit codes (refer Annex 2).

2. Proximity to the Frontier

Industries operating closer to the frontier tend to experience stronger innovation and productivity responses to increased import competition, whereas industries further from the frontier may face weaker or even negative effects. In light of this, it is essential to assess the position of Indian industries relative to the world frontier.

To capture this technological distance, we adopt the measure of industry-distance-to-frontier (IDF) introduced by Aghion et al. (2009). In this framework, proximity to the frontier is assessed relative to the U.S. industry, which is commonly used as the benchmark for the world technological frontier in empirical growth and trade studies. The industry-distance-to-frontier is calculated as,

$$IDF_{jt} = \frac{LP_{jt}^{US}}{LP_{jt}} \qquad (2)$$

where IDF_{jpt} is the distance of industry j in India at time t relative to its technology frontier; LP_{jt} is the labour productivity (defined as the value added per worker) of industry j in India at time t; and LP_{jt}^{US} is the labour productivity of industry j at time t in the US.

$$LP = \frac{Q_t^{GVA}}{L_t} \qquad (3)$$

Where L is the total workers in an industry.

The industry-level production data for the US is calculated using the NBER manufacturing productivity database, and for India, the industry-level production data from the ASI database is used[3]. To proceed with the calculation, NAICS 2012 (US Industry code) is matched with ISIC Rev 4 (India Industry code)[4]. Before computing the final values of labour productivity, the US data are deflated by the PPI (total manufacturing industries), and the India data are deflated by WPI (all commodities) both at base 2011.

[3] NBER-CES manufacturing "value added" follows the U.S. National Accounts concept (industry value added at basis/producer prices), which is a gross measure; depreciation is treated separately and is not subtracted from value added. ASI manufacturing "Gross Value Added" is the Gross output – intermediate consumption with no deduction for depreciation.

[4] UNSD classification is used to concord the NAICS 2012 (US Industry code) with ISIC Rev 4 (India Industry code). Author has manually checked the concordance to avoid the problem of double counting.

3. Quality Measurement

Initially, export prices were widely employed as proxies for product quality in international trade analyses. However, challenges arise due to the unobservability of prices. Many economists, including Hansen & Nielsen (2011), argued that prices serve as a flawed indicator of quality. In response to these limitations, the literature increasingly relies on unit values defined as average trade prices computed at the product-country level, as observable proxies for product quality (Hallak, 2006; Hansen & Nielsen, 2011; Feenstra & Romalis, 2012; Henn et al., 2015). While unit values do not perfectly capture quality differences, a substantial body of empirical work shows a positive correlation between unit values and underlying quality attributes, consistent with the assumption that higher-quality varieties command higher prices on average. Consequently, this paper adopts unit values as the empirical proxy for product quality.

$$UV_{cpt} = \frac{Value_{cpt}}{Quantity_{cpt}} \qquad (4)$$

The unit value UV_{cpt} is employed as the proxy for the quality of product p in country c at time t. Industry-level unit value is calculated by mapping ISIC Revision 4 codes to HS 4-digit product data. The final unit value for each industry is the average of its corresponding product-level unit values. For robustness, unit values are computed using both import-side and export-side information.

Import Unit Values (CIF-based):

Import unit values are calculated using the prices reported by selected partner countries/the world on their imports originating from India. Because these are CIF prices, they reflect how foreign markets value Indian products upon arrival.

Export Unit Values (FOB-based):

Export unit values are calculated using India's FOB prices of exported products. These measures capture the quality of goods that India ships to the rest of the world and serve as the primary proxy for the quality of domestically produced varieties entering international markets.

Model Specification-

$$\boldsymbol{lnUV_{jt} = \alpha_0 + \alpha_1 IMP_{jt} + \alpha_2 IMP_j * IDF_{jt} + \alpha_3 IDF_{jt} + \mu_{jt}} \qquad (5)$$

Where the dependent variable $\boldsymbol{lnUV_{jt}}$ captures the quality of product in industry j at time period t. $\boldsymbol{IMP_{jt}}$ is the import penetration ratio in the industry j at time t. $\boldsymbol{IDF_{jt}}$ is the industry-distance-to-the-frontier of industry j at time t.

The theoretical model by Aghion et al (2009) suggests that $\boldsymbol{\alpha_1 > 0}$ and $\boldsymbol{\alpha_2 < 0.}$ The increase in import penetration ratio indicated that a nation is highly dependent of its imports. When imports increase it exposes the domestic markets to m more competition further pushing the industry/firm to invest more in innovation and spur firm's productivity growth considering the industry/firm is close to the world technology frontier. If the industry/firm lies far from the frontier, the increased import competition disincentivises the industry/firm to innovate decreasing the productivity growth. Also, if the industry is far from the world technology

frontier, then catching up in innovation and quality upgrading will be higher, this is depicted from $\boldsymbol{\alpha_3 < 0}$ by Aghion et al (2009). It's important to note here that industry-distance to the frontier is defined differently in this paper. As $IDF_{jt} = \frac{LP_{jt}^{US}}{LP_{jt}}$ increases, it indicates that the gap between US industries' labour productivity and India industries' labour productivity is widening, i.e., India's industries are moving far from the global technology frontier.

Table 3: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
imp	418	34.91916	382.4962	-4658.14	4418.5
idf	418	50.92007	143.5877	6.82	1425.47
tariff	418	17.75844	12.852	1.54	110.15
lnUVexp	418	4.460144	3.351718	-1.01	15.32
lnUVimp	418	3.274976	3.408431	-6.33	14.44
impnew	418	24.92964	26.32515	.3	99.04

23 Indian industries (Annex 1) are analysed to understand the relationship between import competition and quality upgrading. Table 3 presents the summary statistics of the variables in the model. The variable IMP (import penetration ratio) ranges from a minimum value of -4658.14 to a maximum value of 4418.5. The values are dominated by negative values, which means that these industries have $X_{it} > M_{it} + P_{it}$, so $M_{it} + P_{it} - X_{it} < 0$. These multiple negative or extreme IMP values are economically meaningless and make the variable unusable in regressions. Hence, to deal with this issue, we adopted $IMPnew_{cjt} = \frac{Import_{cjt}}{Import_{cjt} + Output_{jt}}$, which is share of imports in total demand of one industry (domestic demand of industry j's + foreign demand of industry j). This helps us to deal with the negative and extreme values in case of dealing with export-dominated industries, without disrupting the interpretable index of foreign competition pressure. After correction, the new variable IMPnew value ranges from a minimum of 0.3 to a maximum of 99.04. For robustness check, variables tariff and lnUVexp are also computed for each industry. Tariff ranges from a minimum value of 1.54 to a maximum value of 110.15.

The industry-distance to the frontier (IDF) ranges from the minimum value of -81.11 to a maximum value of 1425.47. The negative value of IDF is because of a single negative value of GVA for the industry 'Manufacturing of buildings of ships and boats' (ISIC Rev4 301) for the year 2015. As there is no calculation error, but using this value may compromise the result. Hence, the industry ISIC 301 is dropped from our analysis. After correction, the IDF ranges from the minimum of 6.82 to a maximum of 1425.47. The higher the value of industry distance to the frontier, the higher is the distance of India's industry to the world technology frontier.

Empirical Result and Conclusion

Equation (5) is estimated using both fixed effects (FE) and random effects (RE) model. The Hausman test rejected the null hypothesis, indicating the random effect is preferred over fixed effects. Table 4 presents the random effects estimates of equation (5), the baseline specification in column (1) and (2); and the interaction model in column (3) and (4), where the dependent

variable measures the log of import unit values ($lnUVimp_{jt}$) serving as a proxy for quality upgrading among Indian industries.

Table 4: Regression result with dependent variable lnUVimp

Dep: lnUVimp	(1)	(2)	(3)	(4)
Impnew	0.273 (0.052)		0.2102 (0.358)	
tariff		0.0315 (0.001)		0.03148 (0.007)
Idf			-0.0015 (0.065)	0.00127 (0.768)
Impnew_idf			0.00016 (0.658)	
tariff_idf				-0.00006 (0.638)
Constant	2.613 (0.001)	2.218 (0.005)	2.748 (0.00)	2.288 (0.006)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
R^2	0.13	0.15	0.14	0.15
Observation	418	418	418	418

Note: The values in the parentheses are the p-values.

Column (1) and Column (2) captures different proxies of import competition i.e., *tariff* and *Impnew*. Both the results shows that an increase in import penetration ration and tariffs significantly increases the quality of good produced in each industry. With a one-unit increase in *Impnew,* the log unit value of import increases by 27.3% points (p-value 0.052); and a one-unit increase in *tariff* lead to an increase in log of unit value by 3.15% points (p-value 0.001) validating the Aghion hypothesis, which states that competition induces innovation.

Table 5: Regression result with dependent variable lnUVexp

Dep: lnUVexp	(5)	(6)	(7)	(8)
Impnew	0.0176 (0.089)		0.0115 (0.300)	
tariff		0.0123 (0.320)		0.0218 (0.020)
Idf			-0.00019 (0.690)	0.0082 (0.027)
Impnew_idf			0.000234 (0.086)	
tariff_idf				-0.00022 (0.028)
Constant	3.363 (0.00)	3.399 (0.00)	3.319 (0.000)	3.068 (0.000)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
R^2	0.22	0.22	0.22	0.23
Observation	418	418	418	418

Note: The values in the parentheses are the p-values

For Robustness, the same equation (5) is estimated by considering log of export unit value as the dependent variable (table 5). If we analyse the results of table (3) and table (4), an increase in *impnew* and *tariffs* have a positive impact on growth in unit value, indicating that when import competition increases the industries are incentivised to upgrade the quality of it's products i.e., undergo an innovation or invest in R&D. This is the Aghion's escape competition effect.

There is no robust evidence supporting the presence of convergence effect i.e., firms far from the frontier have a positive rate of growth which indicates catching up mechanism. The interaction term also can't be clearing explained but if we proceed with the significant result, as the firms moves closer to the frontier there is an increase in log of export unit value. This is the Escape competition effect, whereas firm further away from the frontier are disincentivised to innovate which supports the discouragement effect.

The marginal effects indicate that at IDF = 0 (industries on the frontier), a one-unit increase in tariff increases the log of export unit value by 2.18% percentage points ($p<0.02$); this declines to 1.06% percentage points when industry starts moving further away from the frontier (IDF = 50, $p=0.217$ not significant). When IDF reached significant away from the frontier (IDF =650) the impacts starts to decline i.e., -12.37% ($p=0.049$ significant). These patterns reveal that tariffs exerts stronger positive pressure on quality growth among frontier-proximate Indian industries (escape-competition effect), while more backward sectors exhibit negative responses to foreign competition over this horizon, discouragement effect (Aghion et al., 2005).

Table 5: Marginal effect (interaction term)

tariff_at idf:	dy/dx	Std. Err.	z	p-value
0	0.021808	0.009382	2.32	0.02
50	0.010608	0.008586	1.24	0.217
100	-0.00059	0.010562	-0.06	0.955
150	-0.01179	0.014195	-0.83	0.406
200	-0.02299	0.018536	-1.24	0.215
250	-0.03419	0.02319	-1.47	0.14
300	-0.04539	0.028002	-1.62	0.105
350	-0.05659	0.032903	-1.72	0.085
400	-0.06779	0.037857	-1.79	0.073
450	-0.07899	0.042847	-1.84	0.065
500	-0.09019	0.047862	-1.88	0.06
550	-0.10139	0.052893	-1.92	0.055
600	-0.11258	0.057938	-1.94	0.052
650	-0.12378	0.062992	-1.97	0.049
700	-0.13498	0.068054	-1.98	0.047
750	-0.14618	0.073122	-2	0.046
800	-0.15738	0.078195	-2.01	0.044
850	-0.16858	0.083272	-2.02	0.043
900	-0.17978	0.088352	-2.03	0.042
950	-0.19098	0.093435	-2.04	0.041
1000	-0.20218	0.09852	-2.05	0.04

Our results align with established trade theories emphasizing escape-competition effects (Amiti and Khandelwal, 2013; Fernandes and Paunov, 2009), where import competition drives quality upgrading particularly among frontier industries facing stronger disciplining pressures. This is consistent with Melitz (2003) heterogeneous firms framework, where more productive (frontier-proximate) firms respond to competition by upgrading quality to escape price-based rivalry, while less productive (backward) firms survive through cost-cutting or market niching.

Conclusion

This study demonstrates that import competition exerts differentiated effects on product quality upgrading across India's manufacturing productivity distribution, revealing critical developing-economy constraints absent from standard trade models. Consistent with escape-competition theory (Aghion et al., 2011), frontier-proximate industries respond to an increase in import competition by accelerating quality growth (+2.18pp at IDF=0, p=0.02 at the frontier), validating the prediction that high-productivity firms invest in innovation to escape price competition. However, the striking inversion for technological laggards where restriction liberalization significantly discourages quality upgrading (-20.2pp at IDF=1000) documents Schumpeterian discouragement effects dominating in backward sectors lacking absorptive capacity.

These findings reconcile mixed empirical evidence by highlighting context-specific limits to trade liberalization benefits: universal escape-competition predictions hold only for productivity leaders, while developing-country laggards face intensified selection pressures without quality upgrading capacity. Policy implications are clear, targeted industrial support for technology catch-up is essential before broad tariff reductions, challenging one-size-fits-all liberalization agendas in emerging markets.

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Annex 1: Classification of Industries based on Technology Intensity

Technology Intensity	ISIC Rev4	Industry Description	Exclude Industry
High-Technology Industry (HT)	ISIC 20	Manufacture of chemicals and chemical products	ISIC 2011 Manufacture of basic chemicals
	ISIC 21	Manufacture of pharmaceutical, medical and botanical products	
	ISIC 26	Manufacture of computer, electronic and optical products	
	ISIC 303	Manufacture of air and spacecraft and related products	
Medium High Technology Industry (MHT)	ISIC 27	Manufacture of Electrical Equipment	ISIC 301 Building of ships and boats; ISIC 303 Manufacture of air and spacecraft and related machinery
	ISIC 28	Manufacture of Machinery and equipment n.e.c	
	ISIC 29	Manufacture of Motor Vehicles, Trailers and Semi-trailers	
	ISIC 30	Manufacture of other transport equipment	
Medium Low-Tech Industry (MLT)	ISIC 19	Manufacture of coke and refined petroleum products	
	ISIC 2011	Manufacture of basic chemicals	
	ISIC 22	Manufacture of rubber and plastics products	
	ISIC 23	Manufacture of other non-metallic mineral products	
	ISIC 24	Manufacture of basic metals	
	ISIC 25	Manufacture of fabricated metal products	
	ISIC 301	Building of ships and boats	
Low-Tech Industry (LT)	ISIC 10	Manufacture of Food products	
	ISIC 12	Manufacture of tobacco products	
	ISIC 13	Manufacture of Textiles	
	ISIC 14	Manufacture of wearing apparel	
	ISIC 15	Manufacture of Processing of leather and related products	
	ISIC 16	Manufacture of wood products except furniture	
	ISIC 17	Manufacture of paper and paper products	
	ISIC 18	Printing and reproduction of recorded media	

Source: Based on R. Rijesh (2015) and OECD (2011)
Note: The author has considered ISIC 182 under the Low-tech Industry due to data issue.

Annex 2: Concordance table

Technological Intensity	ISIC Rev4	Detail (ISIC Rev 4)	ISIC Rev3.1	Detail (ISIC Rev 3.1)	ISIC Rev3
LT	10	Manufacture of Food products	15	Manufacture of Food Products and Beveragers	15
	12	Manufacture of tobacco products	16	Manufacture of tobacco products	16
	13	Manufacture of Textiles	17	Manufacture of Textiles	17
	14	Manufacture of wearing apparel	18	Manufacture of Wearing Apparel; Dressing and Dyeing of Fur	18
	15	Manufacture of leather and related products	19	Tanning and dressing of leather, manufacture of luggage, handbags saddlery, harness and footwear	19
	16	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	20	Manufacture of wood and of products of wood and cork, except furniture; Manufacture of articles of straw and plating materials	20
	17	Manufacture of paper and paper products	21	Manufacture of paper and paper products	21
	18	Printing and reproduction of recorded media	22	Publishing, Printing, Reproduction of recorded media	22
MLT	19	Manufacture of coke and refined petroleum products	23	MANUFACTURE OF COKE, REFINED PETROLEUM PRODUCTS AND NUCLEAR FUEL	23
	2011	Manufacture of basic chemicals	241	Manufacture of basic chemicals	241
	22	Manufacture of rubber and plastics products	25	MANUFACTURE OF RUBBER AND PLASTIC PRODUCTS	25
	23	Manufacture of other non-metallic mineral products	26	Manufacture of other non-metallic mineral products	26
	24	Manufacture of basic metals	27	MANUFACTURE OF BASIC METALS	27
	25	Manufacture of fabricated metal products, except machinery and equipment	28	MANUFACTURE OF FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENTS	28
	301	building of ships and boats	351	Building and repair of ships & boats	351
MHT	27	Manufacture of electrical equipment	31	MANUFACTURE OF ELECTRICAL MACHINERY AND APPARATUS N.E.C.	31
	28	Manufacture of machinery and equipment n.e.c.	29	MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.	29
	29	Manufacture of motor vehicles, trailers and semi-trailers	34	MANUFACTURE OF MOTOR VEHICLES, TRAILERS AND SEMI-TRAILERS	34
	30 (minus 301, 303)	Manufacture of other transport equipment	352, 359	MANUFACTURE OF OTHER TRANSPORT EQUIPMENT	352, 359
HT	20 (minus 2011)	Manufacture of chemicals and chemical products	2421, 2422, 2424, 2429, 243	Manufacture of chemicals and chemical products	2421, 2422, 2424, 2429, 243
	21	Manufacture of pharmaceuticals, medicinal chemical and botanical products	2423	Manufacture of chemicals and chemical products	2423
	26	Manufacture of computer, electronic and optical products	30	MANUFACTURE OF OFFICE, ACCOUNTING AND COMPUTING MACHINERY	30
	303	Manufacture of air and spacecraft and related machinery	353	Manufacture of aircraft and spacecraft	353

Source: Author's Calculation

Note: One-to-one mapping is done manually.