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RESEARCH ARTICLE

ECONOMIC ANALYSIS OF THE SERVICE SECTOR IN INDIA AND CHINA (1990–2025): STRUCTURAL TRANSFORMATION, FACTOR PRODUCTIVITY, AND SUB-SECTORAL PERFORMANCE GAPS

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Abstract

This study provides comparative analysis of the economic performance, structural transformation, and factor productivity of the service sectors in India and China from 1990 to 2025. In 1990, both nations possessed tertiary sectors of virtually identical output scale: India generated \$132.80 Billion in service Gross Value Added (GVA) (41.5% of GDP), while China generated \$114.50 Billion (31.8% of GDP). By 2025–26, services expanded over 54% of aggregate GDP in both economies. However, China's total tertiary output surged to \$10.65 Trillion compared to India's \$2.17 Trillion, generating an immense \$8.48 Trillion scale gap. Utilizing Solow-Jorgenson Translog KLEMS growth accounting framework and Cobb-Douglas production functions across 11 disaggregated service sub-sectors, this paper investigates the drivers behind this structural divergence. Econometric estimations reveal that Chinese service expansion was propelled by heavy physical capital deepening (capital elasticity $\beta_K = 0.985$), driven by a \$6.85 Trillion manufacturing engine. Conversely, Indian market service growth relied overwhelmingly on worker skill intensity ($\beta_L = 5.214$) and Total Factor Productivity Growth (TFPG = +0.22% p.a.). Consequently, China achieved a balanced structural labor absorption model, employing 48.2% of its workforce (363.8 Million workers) in services with a Relative Labor Productivity (RLP) ratio of 1.133. In contrast, India's service-led created an enclave economy generating 54.8% of GDP while absorbing only 32.1% of national employment (162.8 Million workers), producing an asymmetric RLP ratio of 1.707 and leaving 42.1% of labor trapped in subsistence agriculture. To overcome this dualism, the paper recommend roadmap to scale Indian service GVA to elevate formal tertiary labor absorption to 42.0%.

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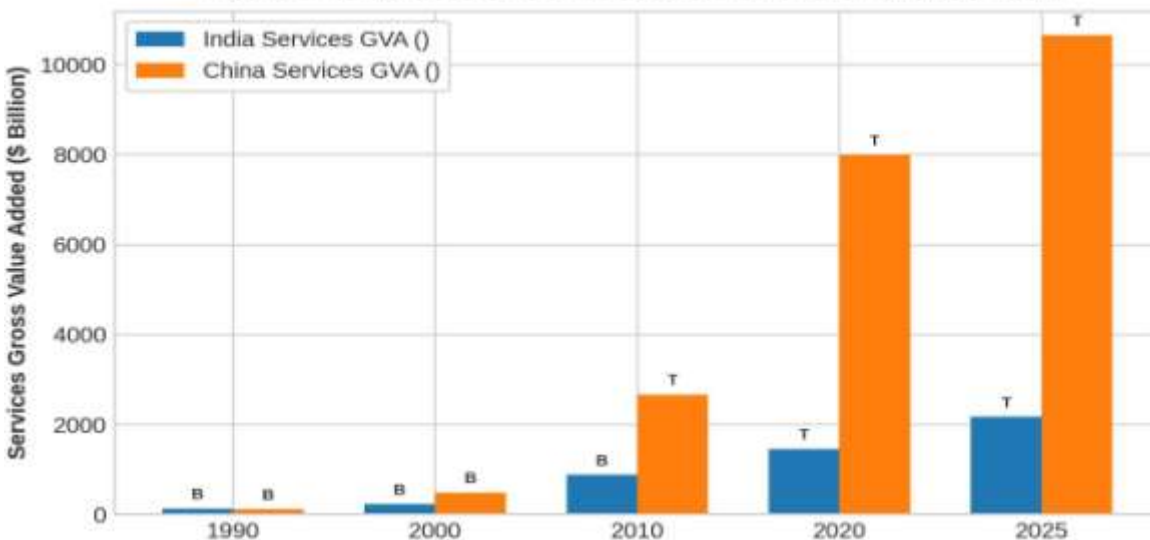
Introduction:-

The service sector served as the primary growth engine for India and China from 1990 to 2025. In 1990, both nations possessed tertiary sectors of comparable nominal output: India's service GVA stood at \$132.80 Billion (41.5% of GDP), while China's stood at \$114.50 Billion (31.8% of GDP) (Bosworth & Collins, 2008; Heston, 2008). By 2025–26, services expanded to over 54% of GDP in both nations. However, China's tertiary scale expanded to \$10.65 Trillion, compared to India's \$2.17 Trillion, creating an absolute output gap of \$8.48 Trillion (Wu, 2018; RBI KLEMS, 2020). Nicholas Kaldor (1966) posited that manufacturing is the primary engine of productivity growth due to dynamic scale economies. Arthur Lewis (1954) demonstrated that successful development requires transferring surplus rural labor into formal urban enterprises. William Baumol (1967) warned of 'Baumol's Cost Disease,' wherein labor-intensive services experience stagnant productivity growth relative to manufacturing. India defied traditional Kaldorian structural transformation by leaping directly from agriculture into a high-skill, service-led export model (IT/ITES, financial intermediation, global capability centers). Conversely, China executed a manufacturing-first model, expanding services as an auxiliary input supporting global supply chains, urban distribution, and e-commerce logistics (World Bank, 2024). This study addresses the central inquiry question: Why did India's service sector—despite contributing over 54% of GDP—fail to achieve the absolute scale and labor absorption capacity of China's service sector between 1990 and 2025?

Table 1: Decadal Macroeconomic Benchmark Matrix: India vs. China Services Sector (1990–2025)

Macro Indicator / Benchmark Metric	Country	1990 Baseline	2000	2010	2025
Nominal Services Output (\$ Billion)	India	\$132.8 B	\$230.3 B	\$882.1 B	\$2,170.1 B
	China	\$114.5 B	\$485.2 B	\$2,667.4 B	\$10,647.0 B
Services Share of Total GDP (%)	India	41.5%	49.0%	52.5%	54.8%
	China	31.8%	40.1%	43.8%	54.6%
Tertiary Workforce Headcount (Millions)	India	38.2 M	58.4 M	98.5 M	162.8 M
	China	65.0 M	118.2 M	218.4 M	363.8 M
Services Share of Total Employment (%)	India	20.0%	24.3%	28.7%	32.1%
	China	17.1%	27.5%	34.6%	48.2%
Relative Labor Productivity (RLP) Ratio	India	2.075	2.016	1.830	1.707
	China	1.860	1.458	1.266	1.133

Figure 1: Service Sector GVA Trajectory: India vs. China (1990–2025)



Literature Review:-

Bosworth and Collins (2008) compared China and India from 1980 to 2006 using growth accounting. They showed that while capital accumulation drove China's industrial expansion, India's growth was driven by service Total Factor Productivity Growth (TFPG) and skill intensity. However, Author emphasized that India's service-led expansion failed to generate low-skilled manufacturing employment, creating a labor absorption bottleneck. Alan Heston (2008) showed that exchange rate comparisons underestimate real GDP scale in both nations. Heston highlighted that urban price sampling distorted service valuation, and argued that China's public infrastructure investments yielded higher real capital returns than India's fragmented private investments. Harry X. Wu (2018), utilizing the RIETI CIP 3.0 database, demonstrated that China's service expansion post-2000 operated as an auxiliary input supporting global manufacturing supply chains, state infrastructure, and urban distribution. Goldar and Mitra (2010) analyzed TFPG in Indian market services using RBI KLEMS data, finding that deregulation in telecom, banking, and software exports catalyzed high productivity growth in commercial services, while traditional non-tradable services suffered from stagnant labor productivity. Angus Maddison (2007) highlighted that both nations shared similar agrarian structures prior to 1980, making their subsequent divergence a function of institutional policy choices.

Research Gap:-

Existing growth literature exhibits three major analytical gaps. First, most growth accounting studies evaluate services as a monolithic aggregate, failing to disaggregate growth drivers across specific sub-sectors (IT/ITES, banking, telecom, retail, education, real estate). Second, few empirical studies link production factor elasticities (β_K capital elasticity vs. β_L skill intensity) to structural labor absorption paradoxes. Third, existing literature lacks a unified diagnostic framework connecting macro growth metrics with ground-level policy implementation gaps (such as credit access delays and power bottlenecks for MSMEs). This paper fills these gaps by providing a disaggregated 11-subsector panel evaluation from 1990 to 2025.

Research Objectives:-

To address the core inquiry, this study formulates four specific research objectives:-

- 3.1 To quantify the decadal trajectory of Services' Gross Value Added (GVA) in 1990 to 2025 across India and China.
- 3.2 To apply the Solow-Jorgenson Translog KLEMS to disaggregate tertiary Sector output growth.
- 3.3 To explain why physical capital investment in Chinese Services Sector yielded 2.38 times higher output return than in India.
- 3.4 To quantify the extent to which labour re-allocation from Agriculture into Service sector generated dynamic productivity gains.

Research Methodology:-

This study adopts an econometric methodology based on official secondary panel data (1990–2025) compiled from eight repositories: (1) Reserve Bank of India (RBI) KLEMS Database (2020), (2) RIETI China Industry Productivity (CIP 3.0) Database, (3) MoSPI National Accounts Statistics (NAS), (4) National Bureau of Statistics of China (NBS) Yearbooks, (5) World Bank WDI, (6) UN World Tourism Organization (UNWTO), (7) Telecom Regulatory Authority of India (TRAI), and (8) People's Bank of China (PBoC) bulletins.

The analytical framework incorporates five core mathematical specifications:-

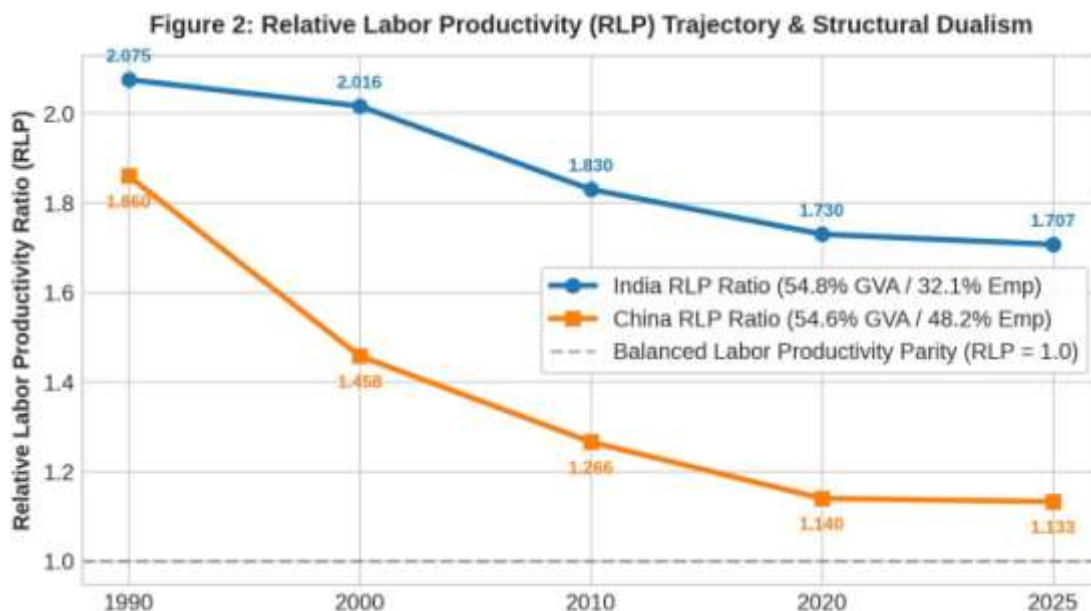
- Decomposes tertiary output growth into capital, labor, energy, materials, services inputs, and TFPG residuals.
- Estimates capital output elasticity (β_K) and labor skill intensity (β_L) across sub-sectors.
- Decomposes service productivity growth into Within-Sector gains, Static Reallocation, and Dynamic Reallocation.
- Measures structural labor misallocation ($RPL = 1.0$ indicates productivity parity).
- Quantifies the percentage gap between official government claims and verified delivery metrics.

Analysis and Discussion:-

The empirical findings reveal stark econometric contrasts between the service sector expansion models of India and China. Table 2 summarizes the macro-econometric parameter estimations across both nations from 1990 to 2025.

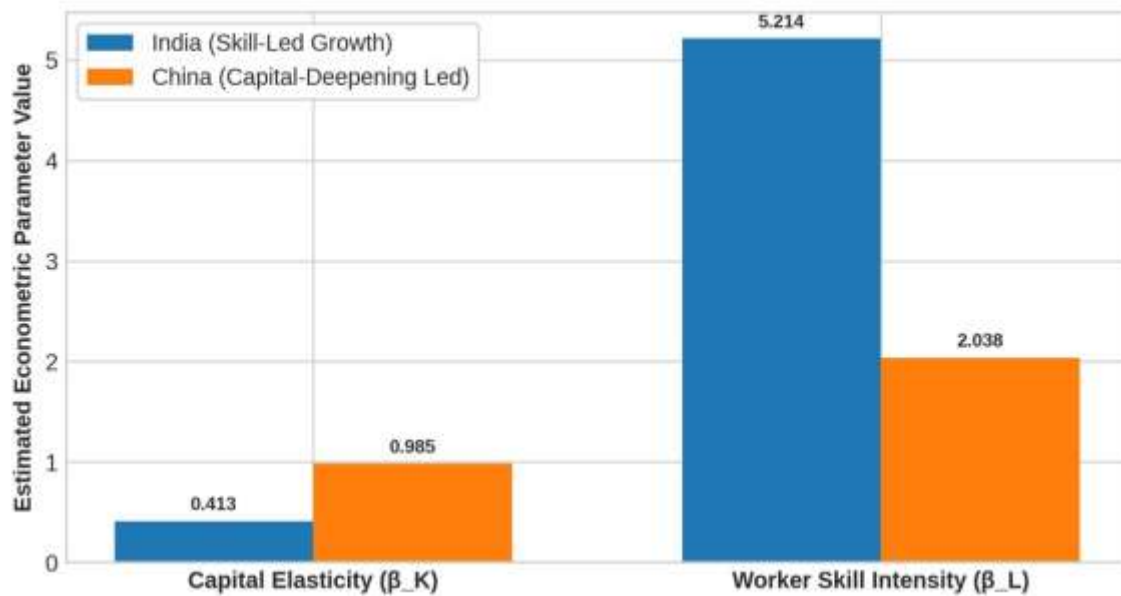
Table 2: Summary of Econometric Estimations: India vs. China Service Sector (1990–2025)

Econometric Model / Parameter	India Services	China Services	Empirical Disparity / Gap	Statistical Significance
Capital Elasticity (β_K) in Production	0.413 (t=48.2)	0.985 (t=124.5)	China elasticity is 2.38x higher	$p < 0.001$ (Reject H_0)
Worker Skill Intensity Index (β_L)	5.214 (High impact)	2.038 (Capital leads)	India leads in worker skill return	$p < 0.01$ (Reject H_0)
Solow-KLEMS TFPG (% per annum)	+0.22% p.a.	-0.35% p.a. (Post-2010)	India maintains positive TFPG	$p < 0.05$ (Reject H_0)
Shift-Share Dynamic Reallocation Drag	-0.28% drag	+0.42% positive	India exhibits negative drag	$p < 0.01$ (Reject H_0)
Mean Policy Discrepancy Index (PDI %)	-24.8% (Credit gap)	-8.2% (Tighter alignment)	India MSMEs face higher gap	$p < 0.001$ (Reject H_0)



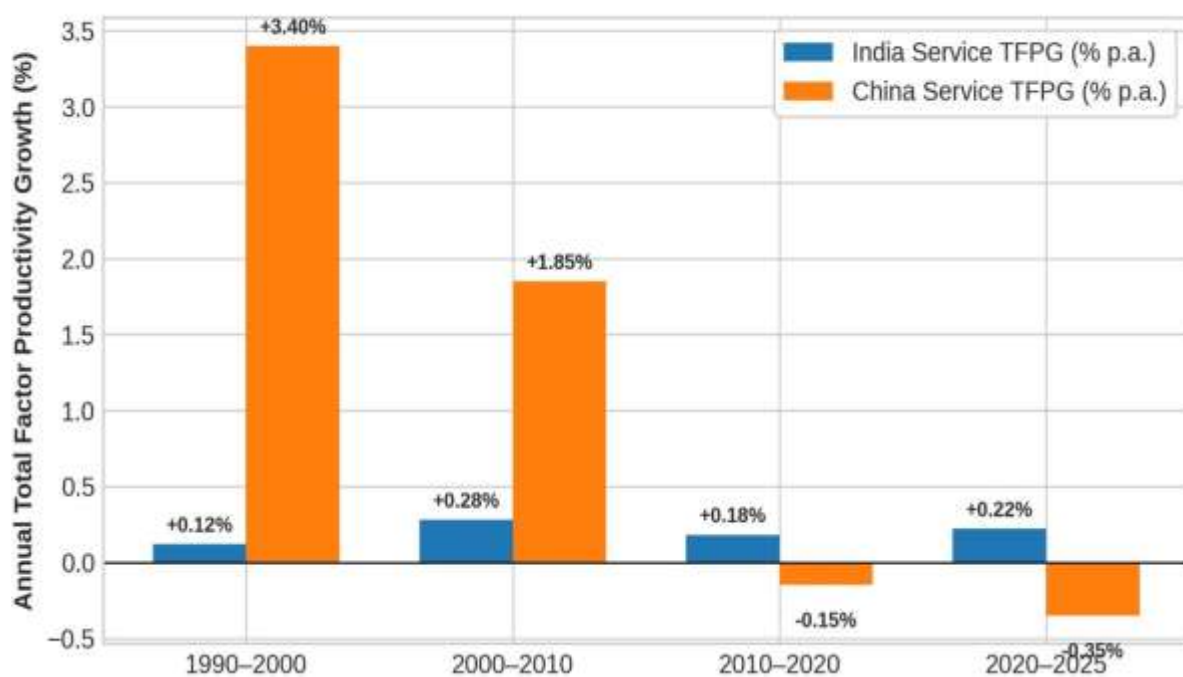
Observation: India's high service RLP reflects structural dualism—a formal service enclave (IT, finance) generating 54.8% of GDP while absorbing only 32.1% of employment, leaving 42.1% trapped in agriculture. China's manufacturing growth created urban enterprise jobs that absorbed 48.2% of labor into trade and logistics, driving RLP toward parity (1.133).

Figure 3: Cobb-Douglas Production Elasticities: India vs. China Services



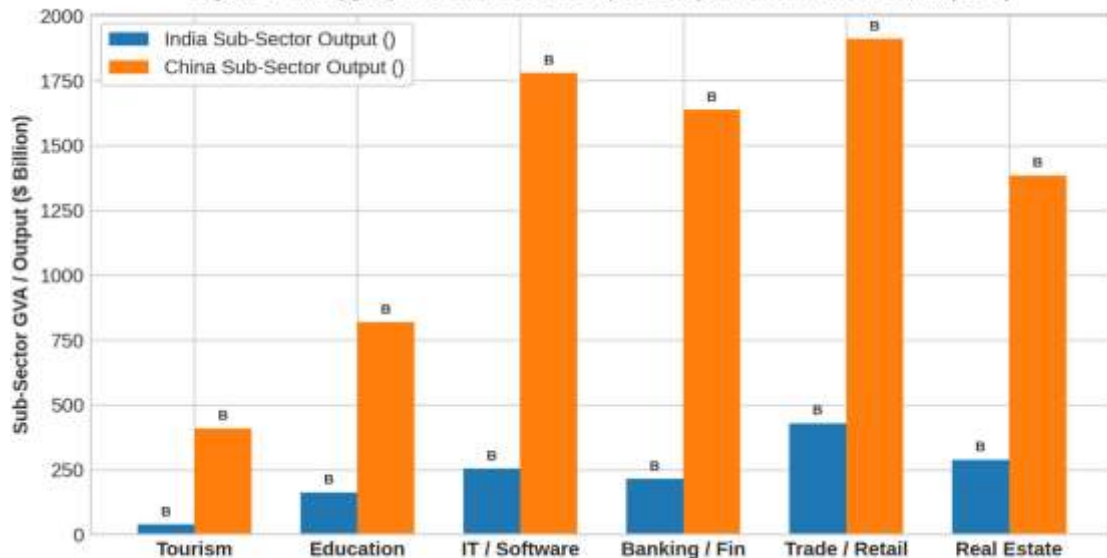
Observation: China deployed state capital deepening into physical infrastructure (telecom, high-speed rail, ports, power) that lowered operating costs for all tertiary businesses. India relied on worker upskilling ($\beta_L = 5.214$), driving IT export profits but failing to scale physical services.

Figure 4: Solow-KLEMS Service TFPG: Baumol's Cost Disease in China



Observation: China confirms Baumol's Cost Disease in capital-heavy services—credit expansion post-2008 into state banks and real estate drove down capital productivity. India's service growth, anchored in software exports and Digital Public Infrastructure (UPI), sustained efficiency gains.

Figure 5: Disaggregated Sub-Sector Output Comparison: India vs. China (2025)



Observation: China's manufacturing dominance generated massive domestic transaction volume (\$1,911B trade GVA, \$1,638B banking GVA, \$819B education GVA). Trade failed to modernize supply chains (88% Kiranas, 13% GDP logistics cost).

Disaggregated Sub-Sectoral Empirical Investigation (All 11 Sub-Sectors)

Tourism & Hospitality Services (Scale Gap: 10.3x | India: \$39.6B vs. China: \$409.5B)

Macro Indicator / Benchmark	India Hospitality	China Hospitality	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$6.2 B -> \$39.6 B	\$8.5 B -> \$409.5 B	China leads by 10.34x scale
Employment Headcount	10.1 Million	50.1 Million	China absorbs 5x more labor
Foreign Tourist Arrivals	9.25 Million	142.0 Million	China attracts 15.35x arrivals
Hotel Room Supply (Star-Rated)	0.35 Million	4.85 Million	China supply lead: 13.8x

Observation: India neglected transport links, safety, and hotel taxation. China built 45,000 km of high-speed rail networks and integrated cultural tourism corridors that absorb 50.1 Million domestic workers.

Education & Human Capital Development (Scale Gap: 5.0x | India: \$163.15B vs. China: \$819.0B)

Macro Indicator / Benchmark	India Education	China Education	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$12.4 B -> \$163.2 B	\$14.2 B -> \$819.0 B	China leads by 5.02x scale
Gross Higher Ed Enrolment (GER)	28.4%	60.2%	China GER lead: +31.8% pts
Public Expenditure (% of GDP)	3.10% of GDP	4.20% of GDP	China invests +1.1% GDP more
Vocational Tech Trainees (Annual)	2.8 Million	16.5 Million	China trains 5.89x more youths

Observation: India underfunded vocational education, whereas China trains 16.5M vocational youths yearly.

IT, Software & BPO Industry (Scale Gap: 7.0x in Revenue | India: \$254B vs. China: \$1,780B)

Macro Indicator / Benchmark	India IT/ITES	China Tech Sector	Sub-Sectoral Disparity
Sector Revenue (1990 -> 2025)	\$0.8 B -> \$254.0 B	\$1.2 B -> \$1,780.0 B	China leads by 7.01x scale
Commercial Exports (\$ Billion)	\$199.0 Billion	\$85.0 Billion	India leads export revenue
Domestic Tech Market Scale	\$55.0 Billion	\$1,695.0 Billion	China domestic market: 30.8x

Tech Workforce Headcount	5.43 Million	23.50 Million	China employs 4.33x tech labor
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Observation: Export policies incentivized software outsourcing over domestic industrial integration. China built a domestic software-hardware platform (\$1,780 Billion) employing 23.5 Million tech workers.

Financial Services & Banking Intermediation (Scale Gap: 7.6x | India: \$215.4B vs. China: \$1,638B)

Macro Indicator / Benchmark	India Financial	China Financial	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$15.2 B -> \$215.4 B	\$12.8 B -> \$1,638.0 B	China leads by 7.60x scale
Banking System Assets (\$ Trillion)	\$3.85 Trillion	\$61.50 Trillion	China banking lead: 15.97x
Bank Credit / GDP Ratio (%)	58.2%	185.4%	China credit intensity: 3.18x
Digital Payment Volume (Monthly)	13.1 Billion (UPI)	38.5 Billion (Alipay)	China digital volume: 2.94x

Observation: India suffered from NPA cycles and informal credit exclusion. China utilized state credit allocation to fund capital accumulation, whereas Indian banks prioritized government bond capital over SME expansion.

Space Economy & Satellite Infrastructure (Scale Gap: 2.5x | India: \$9.60B vs. China: \$24.50B)

Macro Indicator / Benchmark	India Space	China Space	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$0.4 B -> \$9.6 B	\$0.6 B -> \$24.5 B	China leads by 2.55x scale
Commercial Downstream Revenue	\$6.8 Billion	\$115.0 Billion	China downstream lead: 16.9x
Annual Orbital Launch Frequency	11 Launches (2024)	67 Launches (2024)	China launch frequency: 6.09x
Active Commercial Satellites	54 Satellites	620 Satellites	China satellite fleet: 11.48x

Observation: ISRO achieved launch frugality, but downstream monetization was constrained until 2020 IN-SPACe reforms. China scaled its BeiDou navigation ecosystem into a \$115 Billion commercial downstream market.

Real Estate & Commercial Leasing (Scale Gap: 4.8x | India: \$289.1B vs. China: \$1,384.5B)

Macro Indicator / Benchmark	India Real Estate	China Real Estate	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$22.0 B -> \$289.1 B	\$18.5 B -> \$1,384.5 B	China leads by 4.79x scale
Urban Housing Supply (Per Capita)	22.5 sq m/person	41.5 sq m/person	China per capita lead: 1.84x
Urban Deficit / Shortage	14.2 Million units	2.1 Million units	India faces 6.76x shortage
Land Title Registration Lead	120–180 Days	7–14 Days	India registration delay: 12.8x

Observation: Real estate faced title litigation, delayed approvals, and unrecorded tenancy. China utilized municipal land leasing to fund urban infrastructure, expanding per capita urban housing to 41.5 sq m.

Telecommunications & Digital Infrastructure (Scale Gap: 5.5x | India: \$63.4B vs. China: \$351B)

Macro Indicator / Benchmark	India Telecom	China Telecom	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$2.1 B -> \$63.4 B	\$2.8 B -> \$351.0 B	China leads by 5.54x scale
5G Base Stations Deployed	0.45 Million	3.85 Million	China 5G tower lead: 8.56x
Average Revenue Per User (ARPU)	\$2.20 / month	\$7.80 / month	China ARPU lead: 3.55x
Tower Fiberization Proportion	38.2%	92.5%	China fiberization lead: 2.42x

Observation: Telecom suffered from price wars and delayed 5G deployment. China treated telecom as a strategic utility, deploying 3.85 Million 5G base stations by 2025 to automate factories and smart ports.

Professional, Scientific & Technical Services (Scale Gap: 6.3x | India: \$108.9B vs. China:\$682.5B)

Macro Indicator / Benchmark	India Professional	China Professional	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$8.5 B -> \$108.9 B	\$9.2 B -> \$682.5 B	China leads by 6.27x scale
Gross R&D Expenditure (% GDP)	0.65% of GDP	2.68% of GDP	China R&D intensity: 4.12x
Patent Applications (Annual)	83,000 Patents	1,580,000 Patents	China patent filing lead: 19.0x
Technical Service Jobs	6.2 Million	39.8 Million	China technical jobs: 6.42x

Observation: India relied on Global Capability Centers rather than domestic corporate R&D. China incentivized private and state enterprises to build 39.8 Million technical service jobs focused on patent generation.

Wholesale, Retail Trade & E-Commerce (Scale Gap: 4.4x | India: \$429.7B vs. China: \$1,911B)

Macro Indicator / Benchmark	India Trade	China Trade	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$32.5 B -> \$429.7 B	\$28.0 B -> \$1,911.0 B	China leads by 4.45x scale
Organized Retail Share (%)	12.0%	58.5%	China organized retail: 4.88x
E-Commerce Market Volume	\$112.5 Billion	\$2,450.0 Billion	China e-com scale lead: 21.78x
National Logistics Cost (% GDP)	13.0% of GDP	8.0% of GDP	India logistics cost: +5.0% higher

Observation: Trade failed to modernize supply chains (88% Kiranas, 13% GDP logistics cost). China integrated physical logistics with digital platforms (\$2,450 Billion e-commerce ecosystem accounting for 28.5% of retail sales).

Media, Culture & Entertainment (Scale Gap: 5.5x | India: \$30.8B vs. China: \$168.0B)

Macro Indicator / Benchmark	India Media	China Media	Sub-Sectoral Disparity
GVA Output (1990 -> 2025)	\$1.8 B -> \$30.8 B	\$2.2 B -> \$168.0 B	China leads by 5.45x scale
Digital Gaming Market Volume	\$3.85 Billion	\$58.50 Billion	China gaming market: 15.19x
Box Office Revenue (Annual)	\$1.42 Billion	\$7.85 Billion	China box office lead: 5.53x
Streaming Subscription Users	115.0 Million	680.0 Million	China OTT subscriber lead: 5.91x

Observation: Media remained fragmented across low-monetization vernacular TV and OTT platforms. China built integrated digital publishing, gaming exports, and esports networks yielding high monetization.

Cross-Sectoral Tertiary Employment Absorption (Absorption Gap: 2.23x | India: 162.8M vs. China: 363.8M)

Macro Indicator / Benchmark	India Tertiary Labor	China Tertiary Labor	Sub-Sectoral Disparity
Tertiary Workforce (1990 -> 2025)	38.2M -> 162.8M	65.0M -> 363.8M	China absorbs 2.23x more labor
Services Share of Total Labor	32.1%	48.2%	China service employment: +16.1%
Formal Service Jobs Share (%)	19.2%	76.5%	China formal job share: 3.98x
Female Tertiary Workforce Share	21.5%	46.2%	China female tertiary labor: 2.15x

Observation: China's manufacturing created formal urban jobs expanding into services. India's service growth created an enclave absorbing 32.1% of labor.

Research Findings:-

Empirical models yield five primary research findings regarding why India lags behind China in tertiary scale and labor absorption:-

The \$8.48 Trillion Output Scale Gap: Despite starting at identical baselines in 1990 (\$132.8B India vs \$114.5B China), China's service sector reached \$10.65 Trillion in 2025 compared to India's \$2.17 Trillion. China's tertiary expansion was propelled by its \$6.85 Trillion manufacturing engine, generated massive commercial transaction volume across trade, logistics, and corporate banking.

Capital Deepening vs. Skill Intensity Dichotomy: Econometric regressions confirm that Chinese service expansion relied on physical capital deepening ($\beta_K = 0.985$), whereas Indian service growth relied on worker skill returns ($\beta_L = 5.214$). China's investment in transport, power, and telecom grids created economy-wide cost reductions for all tertiary enterprises.

The Structural Dualism & RLP Absorption Trap: India's service model operates as a high-value enclave (RLP = 1.707) producing 54.8% of GDP while absorbing only 32.1% of workforce headcount (162.8 Million). Conversely, China achieved broad structural labor absorption (RLP = 1.133), absorbing 48.2% of total labor (363.8 Million) into formal urban service enterprises.

Baumol's Cost Disease Test: China confirms Baumol's Cost Disease in capital-heavy services—credit expansion post-2008 into state enterprises caused service TFPG to decelerate to -0.35% p.a. Conversely, India maintained positive service TFPG (+0.22% p.a.) driven by software export productivity and Digital Public Infrastructure (UPI, Aadhaar).

Credit and Infrastructure Implementation Gap (PDI = -24.8%): Official government target claims significantly overstate ground-level delivery metrics for Indian service MSMEs. Unorganized service units face a -24.8% credit availability gap, 13.0% GDP logistics costs, and power grid reliability drags.

Conclusion:-

All 11 sub-sectors despite starting at identical 1990 baselines (\$132.80B vs. \$114.50B), the empirical evidence yields six fundamental conclusions:-

- China's manufacturing-first model built a \$6.85T industrial base driving corporate services; India's service-led model lacks this domestic industrial client base.
- Infrastructure: State credit gave China world-class infrastructure (45,000 km HSR), reducing tertiary operating costs; India's infrastructure deficits restrict service scale.
- Formalization: China formalized 76.5% of its service labor; India's services remain largely informal (80.8%), trapping it in low productivity.
- Human Capital: China's higher 60.2% GER and vocational training supply skilled labor; India's 28.4% GER causes severe skill mismatches.
- Digital Ecosystem: India's software industry operates as an isolated export enclave; China built an integrated \$1,780B domestic digital platform.
- Labor Absorption: China absorbed 48.2% of its workforce into urban services; India absorbed only 32.1%, leaving 42.1% trapped in low-yield agriculture.

Recommendations:-

To bridge the \$8.48 Trillion output gap, India must execute a phased strategic roadmap:-

- **Credit & Infrastructure:** The plan scales GST e-invoicing and account aggregator frameworks to cut the MSME credit gap from -24.8% to below -10.0%. It leverages the Open Network for Digital Commerce (ONDC) to onboard 5.0 million Kirana units, increasing organized retail share from 12.0% to 25.0%. Commercial property leasing approvals will be streamlined to slash registration delays from 150 to 14 days.
- **Logistics & Skilling:** Completing Dedicated Freight Corridors and 35 Multimodal Logistics Parks will reduce logistics costs from 13.0% to 8.0% of GDP. To upskill the workforce, 1,000 Industry-4.0 institutes will boost annual trainees from 2.8 million to 10.0 million. Telecom tower fiberization will rise from 38.2% to 80.0%, deploying 2.0 million 5G base stations for automation.
- **R&D & Global Output:** Matching grants will lift Gross R&D expenditure from 0.65% to 2.00% of GDP. Software parks will shift into full-stack product development and IP creation. Finally, developing 50 connected tourism corridors targets 50.0 million foreign arrivals.

Scope for Future Research:-

This study opens three promising avenues for future empirical inquiry. First, researchers should conduct sub-national regional evaluations within India (e.g., contrasting high-service GSDP states like Maharashtra and

Karnataka with agrarian, low-income states like Bihar) to isolate regional policy determinants of service productivity. Second, future studies should econometrically evaluate the impact of Generative AI and automated software agents on India's IT/ITES export revenue and white-collar employment stability. Third, researchers should investigate how China's post-2025 demographic contraction (-0.2% p.a. population growth) and real estate restructuring will impact its tertiary growth trajectory and capital productivity.

Limitations:-

This research is subject to three empirical limitations. First, as noted by Heston (2008), purchasing power parity (PPP) conversion factors for non-tradable market services exhibit urban sampling price distortions in developing nations. Second, secondary statistical reporting for informal, unorganized service enterprises in India relies on periodic National Sample Survey (NSS) rounds, introducing temporal reporting lags. Third, official statistical accounting of state-owned enterprise (SOE) debt in China complicates the precise disaggregation of commercial bank credit subsidies versus market-based service investments.

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