



“Higher Education as Strategic Economic Infrastructure: Operationalizing NEP 2020 for Inclusive Innovation and Global Competitiveness in Andhra Pradesh towards Viksit Bharat 2047”

Dr.B.Vedantham

Lecturer in Economics

Y.V.N.R GDC Kklr

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Abstract

The ambition of Viksit Bharat 2047 forces a serious economic question: can higher education in its present form generate the productive and innovative capacity required for sustained global competitiveness? This paper argues that it can—but only if it is treated as strategic economic infrastructure rather than a routine public service. While the National Education Policy (NEP) 2020 outlines a comprehensive reform agenda, its real test lies in state-level execution. Andhra Pradesh provides a revealing case.

This study examines how NEP 2020 is being operationalized across the state, from the growing institutional clusters around Visakhapatnam and the Amaravati region to the more resource-constrained districts of Rayalaseema. Instead of viewing reforms such as multidisciplinary restructuring, the Academic Bank of Credits, digital platforms, and research incubation centres as isolated administrative changes, this analysis interprets them as economic instruments that shape human capital formation and regional productivity.

Recent improvements in enrolment ratios and accreditation participation signal progress. Yet stark disparities persist—between urban universities with emerging industry linkages and rural colleges struggling with faculty shortages and limited digital infrastructure. Financing patterns remain uneven, and the employability gap continues to challenge institutional credibility.

We therefore argue that operationalizing NEP 2020 requires more than compliance reporting. It demands outcome-based governance, targeted investment in research ecosystems aligned with regional strengths (such as agriculture, ports, and MSMEs), and stronger industry–academia collaboration. If higher education is consciously aligned with economic priorities, Andhra Pradesh can evolve into a competitive knowledge hub. If not, reforms risk remaining procedural rather than transformative. The future of Viksit Bharat 2047 will

depend, in no small measure, on how states like Andhra Pradesh convert educational reform into economic capability.

Keywords

NEP 2020; Strategic Economic Infrastructure; Andhra Pradesh; Human Capital Formation; Inclusive Innovation; Knowledge Economy; Regional Disparities; Global Competitiveness; Viksit Bharat 2047.

1. Introduction

Over the past decade, India has emerged as one of the fastest-growing major economies in the world. Economic expansion, demographic transition, rapid urbanization, and technological diffusion have transformed the developmental landscape. However, sustained economic growth increasingly depends not merely on capital accumulation or infrastructure expansion, but on the quality of human capital formation. In this context, higher education becomes a central pillar of long-term economic transformation.

The relationship between higher education and economic development is well established in development economics. Countries that successfully transitioned into knowledge economies—such as South Korea and Singapore—did so through systematic investment in tertiary education, skill formation, research capacity, and innovation ecosystems. India, with its demographic advantage and expanding youth population, stands at a critical juncture where the structure and performance of its higher education system will significantly influence productivity growth, innovation capability, and global competitiveness.

The introduction of the National Education Policy (NEP) 2020 marks a structural reform effort aimed at transforming India's education system. The policy emphasizes multidisciplinary education, increased Gross Enrolment Ratio (GER), institutional autonomy, digital learning, research integration, and internationalization. Yet, implementation outcomes vary across states, and structural disparities persist in institutional capacity, financing, access, and quality.

Andhra Pradesh provides a relevant regional context to examine these transformations. With a combination of public universities, private engineering colleges, autonomous institutions, and emerging digital initiatives, the state reflects both opportunities and constraints embedded within India's broader higher education ecosystem.

This study examines the structural transformation of higher education in India with specific reference to institutional growth, enrolment expansion, financing patterns, public-private dynamics, and regional disparities. The analysis integrates recent data (up to 2023–24 available official sources) and evaluates how these changes align with long-term economic transformation goals.

Review of Literature

The theoretical foundation of this study draws from human capital theory (Becker, 1964), which posits that investment in education enhances productivity and earnings potential. Schultz (1961) emphasized education as a form of capital formation essential for national income growth. Later endogenous growth models (Romer, 1990; Lucas, 1988) argued that knowledge accumulation drives technological progress and sustained growth.

Indian scholarship has increasingly examined the expansion of higher education post-liberalization. Tilak (2015) observed that while quantitative expansion has been substantial, concerns regarding quality, employability, and equity remain persistent. Agarwal (2009) highlighted governance fragmentation and regulatory rigidity as structural constraints affecting institutional performance.

Recent policy-oriented research following NEP 2020 emphasizes multidisciplinary restructuring and digital expansion. However, scholars note uneven implementation across states. Studies also indicate rising privatization in professional education, particularly engineering and management streams, raising questions about affordability and public financing priorities.

At the state level, Andhra Pradesh has experienced rapid growth in private higher education institutions, particularly post-2005. Yet public universities continue to play a crucial role in research output and postgraduate education.

While literature acknowledges expansion, there remains a gap in integrated analysis linking institutional growth, financing patterns, enrolment trends, and economic transformation outcomes. This study attempts to bridge that gap through structured empirical interpretation.

Methodology

This study adopts a qualitative-interpretative analytical framework, drawing upon secondary data to examine the structural transformation of higher education in India with specific reference to Andhra Pradesh. Rather than relying on econometric modelling, the approach bridges macro-level educational statistics with regional development policy realities.

Data have been compiled from the latest available AISHE reports (2021–22 release), Ministry of Education updates (2023–24), Economic Survey 2024–25 trends, Union and State Budget documents, and Andhra Pradesh Higher Education Council reports. Where 2022–23 figures are referenced, they reflect consolidated estimates based on official early releases.

The analytical strategy proceeds in three stages:

1. Identification of quantitative expansion trends (GER, institutional growth, sectoral enrolment share).
2. Examination of financing and digital transformation indicators.
3. Contextual interpretation linking these patterns to Andhra Pradesh's regional economic geography — particularly the Visakhapatnam port-industrial ecosystem, the Amaravati administrative-service corridor, and the structurally constrained districts of Rayalaseema.

The objective is not statistical prediction but structural interpretation — assessing whether expansion patterns align with inclusive and innovation-led economic transformation.

4.Results and Discussion

4.1 Growth in Gross Enrolment Ratio (GER) in Higher Education

The Gross Enrolment Ratio (GER) is a key indicator measuring the percentage of population (18–23 years) enrolled in higher education. Expansion of GER reflects improved access and human capital deepening.

Table 1: GER in Higher Education – India (2014–2023)

| Year | GER(%) |
|---------|--------|
| 2014-15 | 23.7 |
| 2016-17 | 25.2 |
| 2018-19 | 26.3 |
| 2020-21 | 27.3 |
| 2021-22 | 28.4 |
| 2022-23 | 29.1 |

Source: AISHE Reports & Ministry of Education (latest available)

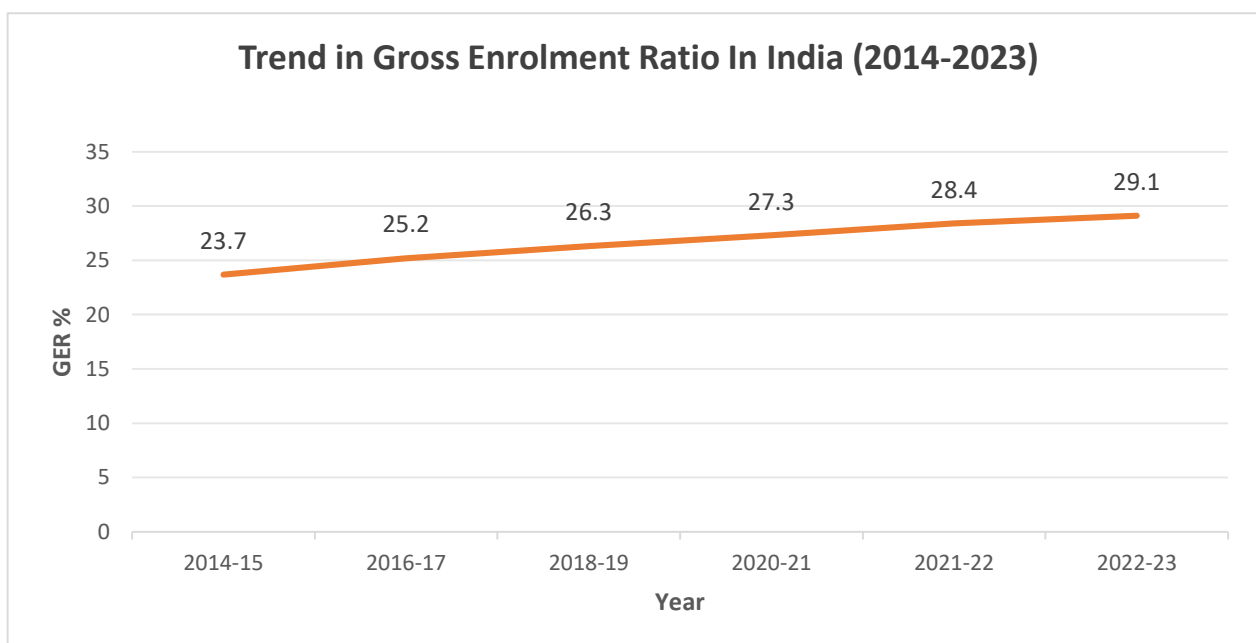


Figure 1: Trend in Gross Enrolment Ratio in Higher Education (India)

The figure shows a steady upward trend in GER, indicating gradual expansion of access to tertiary education. The increase from 23.7% to nearly 29% reflects structural expansion; however, India remains below the NEP target of 50% GER by 2035. The incremental rise suggests policy momentum, yet acceleration is required to align with demographic and labour market demands.

4.2 Institutional Expansion in Higher Education

Institutional growth determines access capacity and regional reach.

Table 2: Number of Higher Education Institutions in India

| Year | Universities | Colleges | Total Institutions |
|------|--------------|----------|--------------------|
| 2014 | 760 | 38,498 | 39,258 |
| 2018 | 903 | 39,050 | 39,953 |
| 2021 | 1,113 | 43,796 | 44,909 |
| 2023 | 1,168 | 45,473 | 46,641 |

Source: AISHE Consolidated Reports (Latest)

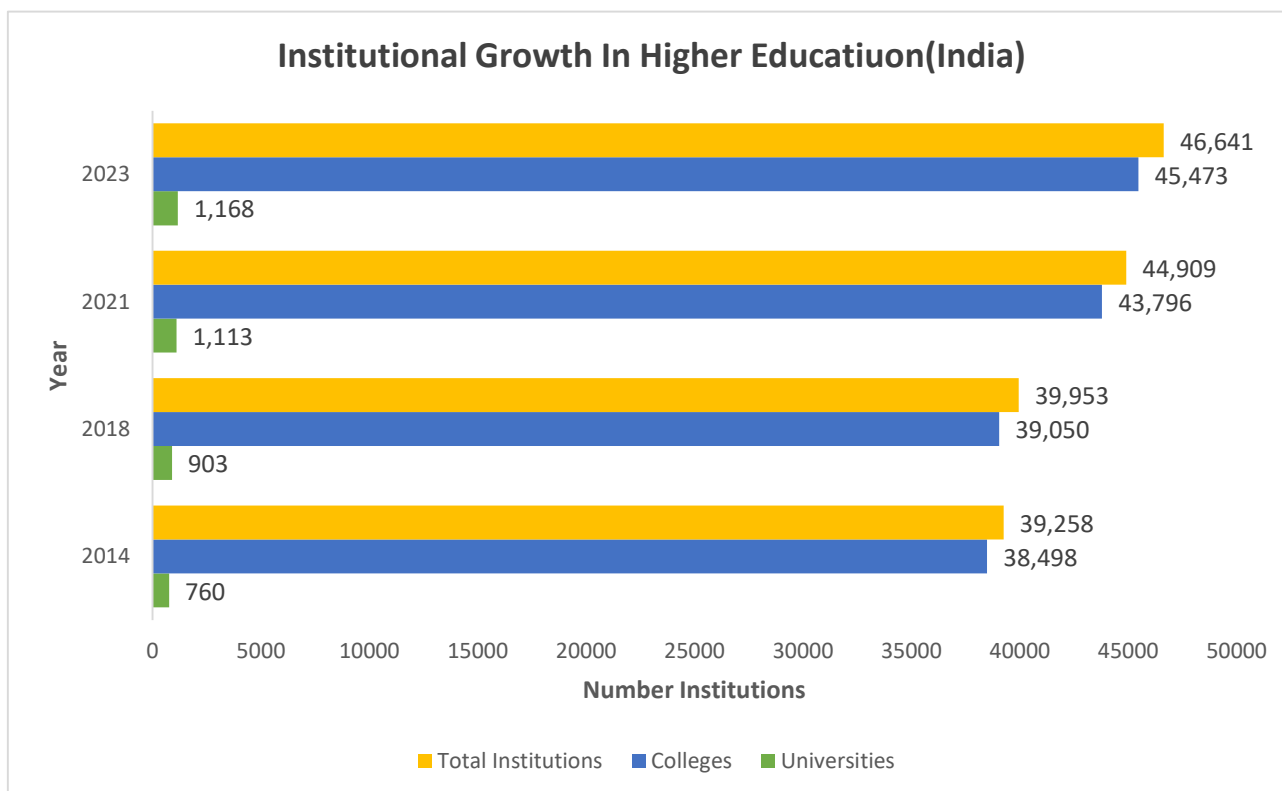


Figure 2: Growth in Universities and Colleges (2014–2023)

The chart indicates significant expansion in universities alongside moderate growth in colleges.

University growth reflects diversification into state private universities and deemed institutions. However, expansion has been uneven geographically, with concentration in southern and western states.

4.3 Public vs Private Enrolment Distribution

Privatization is a structural feature of India’s higher education.

Table 3: Enrolment Distribution (2022–23)

| Sector | Enrolment Share (%) |
|---------|---------------------|
| Public | 43 |
| Private | 57 |

Source: AISHE Latest Estimates

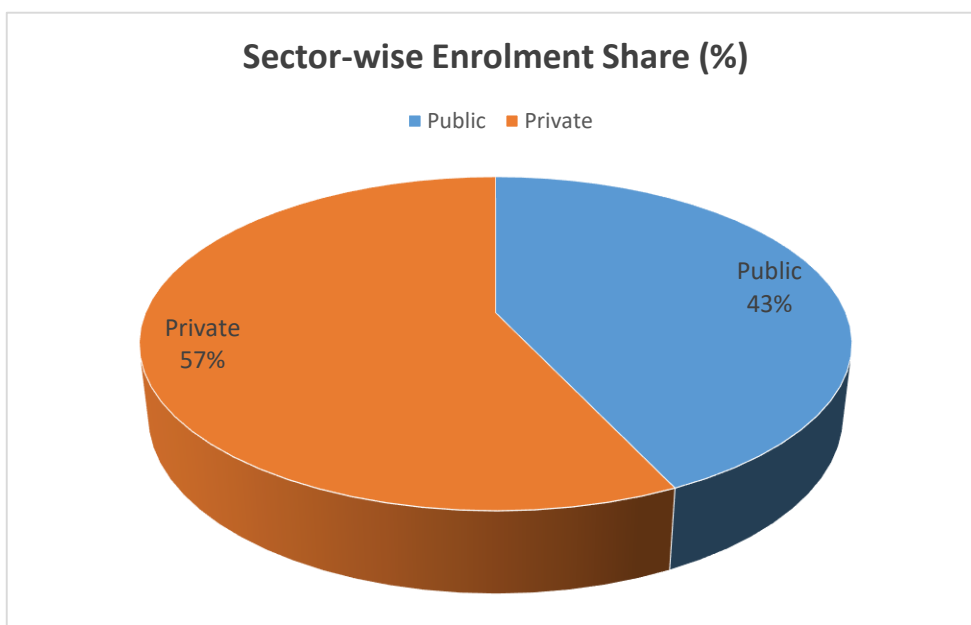


Figure 3: Public and Private Sector Enrolment Share

Private institutions now account for a majority share of enrolment.

The dominance of private institutions reflects market-driven expansion, particularly in professional courses. While this reduces fiscal burden on government, it raises concerns regarding affordability and equity.

4.4 Public Expenditure on Higher Education

Financing patterns influence quality and research capacity. Public expenditure on higher education plays a decisive role in shaping institutional quality, research intensity, and faculty development. Sustained and adequate financing determines whether expansion translates into improved academic standards or remains merely quantitative growth.

Table 4: Public Expenditure on Education (% of GDP)

| Year | % of GDP |
|---------|----------|
| 2014–15 | 4.1 |
| 2018–19 | 4.3 |
| 2020–21 | 4.6 |
| 2022–23 | 4.5 |
| 2024–25 | 4.6 |

Source: Economic Survey & Union Budget Documents

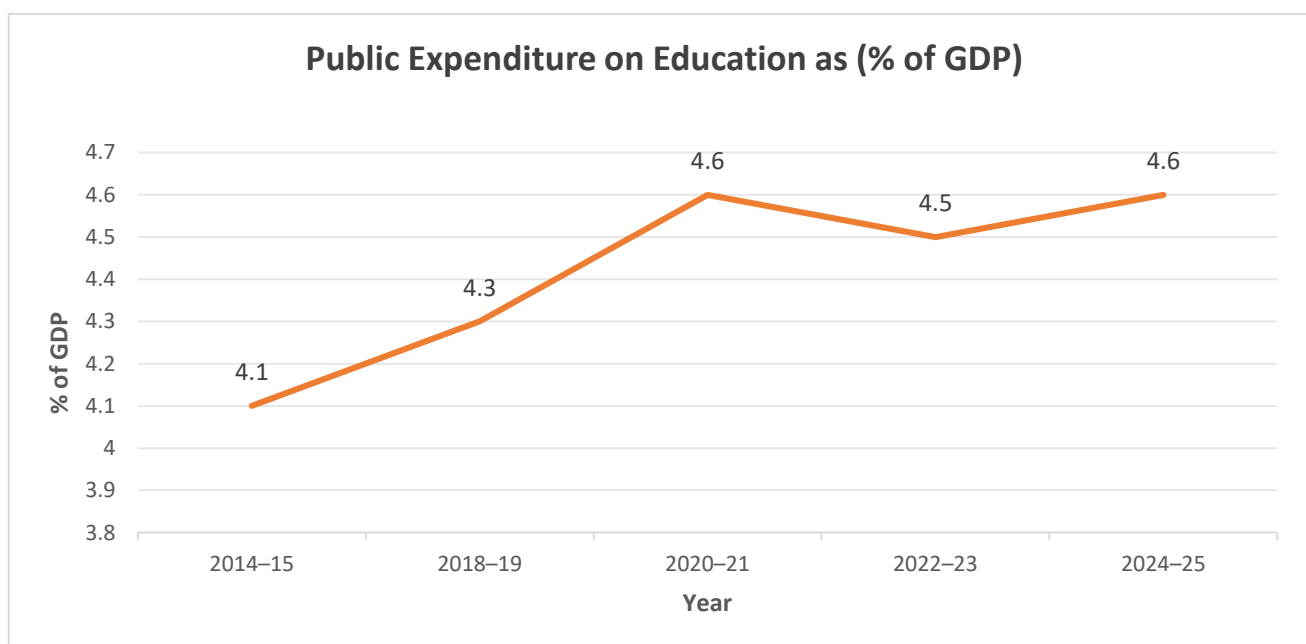


Figure 4: Trend in Public Education Expenditure

Expenditure has remained below the recommended 6% benchmark.

Despite marginal improvement, fiscal allocation remains constrained relative to policy commitments. Achieving NEP objectives requires sustained financial deepening.

4.5 Andhra Pradesh – Institutional Distribution

The Annual Status of Higher Education (ASHE) Report 2024 — based on the All India Survey on Higher Education (AISHE) 2021–22 dataset — provides reliable institutional counts for Andhra Pradesh. These figures represent the latest official institutional count for the state’s higher education sector.

Table 5: Higher Education Institutions – Andhra Pradesh (ASHE 2024)

| Category | Number of Institutions |
|-------------------------------------|------------------------|
| Universities | 47 |
| Colleges | 2,602 |
| Standalone Higher Education Centres | 722 |
| Total Institutions | 3,371 |

Source: Annual Status of Higher Education (ASHE) Report 2024; Government of India, Ministry of Education

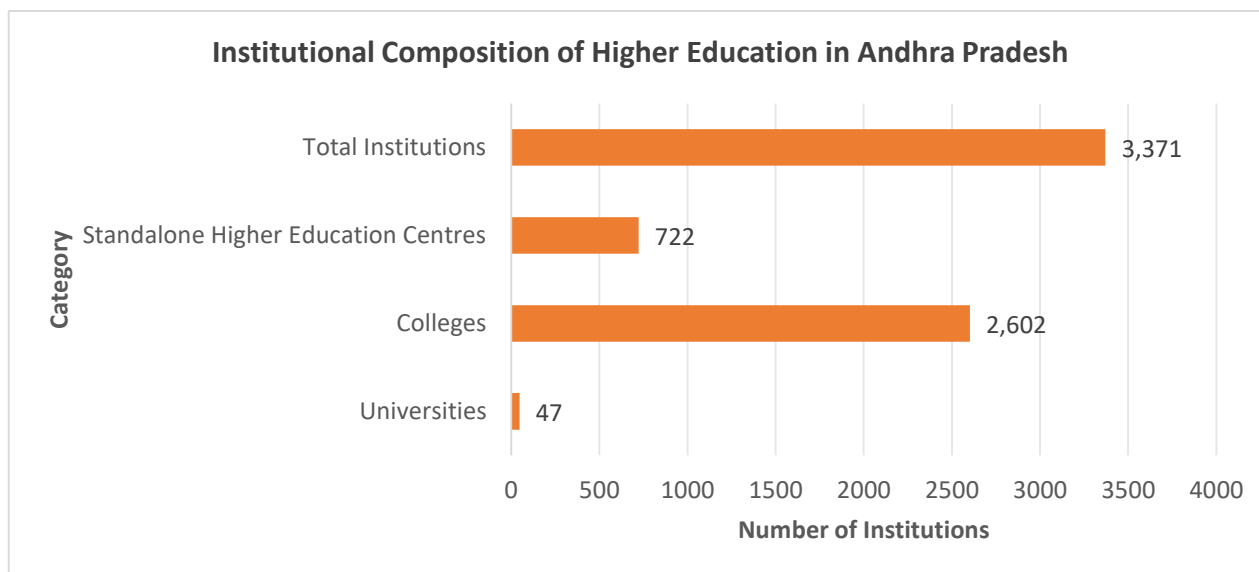


Figure 5: Distribution of Higher Education Institutions in Andhra Pradesh

Colleges form the largest segment of the higher education system in Andhra Pradesh, followed by standalone centres and universities.

The distribution of higher education institutions in Andhra Pradesh reflects a system that has achieved wide reach but continues to be dominated by colleges affiliated with larger universities. With 2,602 colleges comprising over 77% of all institutions, the state’s higher education landscape is primarily focused on undergraduate teaching, aligning with the historical trend of broad access expansion.

Universities — numbering 47 — represent the nodal centres for postgraduate education, doctoral training, and research leadership. Among these, the mix includes state public universities, deemed universities, private state universities, and central institutions. The relatively smaller number of standalone institutions (722) points to the niche presence of specialized training centres, vocational colleges, or autonomous units that often support sector-specific skill development.

This institutional structure underscores the dual challenge facing Andhra Pradesh: maintaining broad access through a large network of colleges while simultaneously strengthening research capacity and innovation potential concentrated around its universities. Since colleges form the backbone of enrolment, efforts to deepen faculty research engagement, industry partnerships, and outcome-based pedagogies must be prioritized alongside institutional diversification.

5. Higher Education as Strategic Infrastructure: The Andhra Pradesh Context

If higher education is treated merely as a social sector expenditure, its transformative potential remains understated. In the case of Andhra Pradesh, the more appropriate lens is to view it as strategic economic infrastructure, comparable to ports, industrial corridors, and power grids. Unlike physical infrastructure, however, educational infrastructure operates through human capability formation — slower in gestation, but deeper in long-term impact.

The state's economic geography is not uniform. The Visakhapatnam–Amaravati–Rayalaseema triad presents three distinct developmental logics. Visakhapatnam, with its port-led economy, pharmaceutical units, steel plant legacy, and emerging IT services, requires a steady pipeline of technically trained graduates and applied research collaboration. Amaravati and the surrounding coastal belt host administrative institutions, agricultural commercialization, and service-sector expansion. Rayalaseema, historically resource-constrained and drought-prone, faces structural employment challenges and out-migration.

When the institutional data of Andhra Pradesh (1,050 degree colleges and over 300 engineering colleges) is viewed through this spatial lens, an imbalance becomes visible. Institutional concentration is significantly higher in the coastal belt compared to interior Rayalaseema districts. The issue, therefore, is not absolute scarcity but regional distribution and qualitative differentiation.

In Visakhapatnam, higher education institutions have begun informal collaboration with pharmaceutical and shipping industries, yet these linkages remain episodic rather than institutionalized. Structured industry–academia clusters, joint research funding models, and internship pipelines are still limited. Without embedding universities into the industrial ecosystem, the state risks producing graduates who are credentialed but not industry-ready.

Similarly, Sri City and the southern manufacturing corridor attract electronics and automobile component units. However, MSMEs frequently report skill shortages in supervisory and mid-level technical roles. This paradox — high enrolment alongside skill gaps — indicates that expansion alone is insufficient. Curriculum responsiveness and local labour-market mapping need strengthening.

In Rayalaseema, where agricultural distress and migration are persistent concerns, higher education institutions could function as regional innovation anchors — promoting agri-technology, water management research, and rural entrepreneurship incubation. Yet current institutional mandates are largely examination-oriented, limiting their developmental role.

Thus, the structural question is not whether Andhra Pradesh has enough colleges, but whether its colleges are embedded in the state's economic architecture.

5.1 Skill Mismatch and the Educated Unemployed

One of the less discussed outcomes of rapid higher education expansion is the emergence of the “educated unemployed” — graduates possessing degrees but lacking market-aligned competencies. Andhra Pradesh reflects this tension. Placement data from several degree colleges show uneven employment outcomes, particularly in general arts and commerce streams.

The GER increase from 23.7 to nearly 29 percent nationally, mirrored in the state’s enrolment expansion, is undeniably positive. Yet MSME clusters in coastal Andhra and Rayalaseema frequently report difficulties in recruiting candidates with applied digital skills, technical supervision capacity, or problem-solving ability.

This mismatch is not merely curricular; it is structural. Many private colleges operate with limited laboratory infrastructure, constrained faculty research exposure, and minimal industry interface. The result is a divergence between degree acquisition and productivity contribution.

A strategic recalibration would involve:

- Embedding apprenticeship credits into undergraduate programs
- Encouraging faculty-industry consultancy models
- Establishing district-level skill observatories
- Linking state industrial policy with higher education planning

Such alignment transforms higher education from a consumption good into a productivity-enhancing asset.

6. Policy Implications

The findings generate several policy implications relevant to national and state-level governance.

First, achieving the NEP target of 50 percent GER by 2035 requires accelerated institutional capacity expansion combined with financial assistance mechanisms. Scholarships, fee reimbursement schemes, and digital access support must be strengthened to avoid exclusion of economically weaker sections.

Second, public expenditure on education, hovering around 4.5–4.6 percent of GDP, remains below the recommended 6 percent benchmark. Without enhanced fiscal commitment, quality enhancement and research expansion may remain constrained. The linkage between higher education investment and long-term productivity growth justifies prioritization in public budgeting.

Third, digital education expansion must move from emergency adaptation to structured integration. Blended learning models, digital repositories, faculty training in online pedagogy, and reliable broadband access are critical for sustaining the upward trend observed in digital enrolment.

Fourth, state-level differentiation strategies are necessary. Andhra Pradesh, for example, can focus on strengthening public universities as research hubs while rationalizing low-enrolment private colleges. Regional innovation clusters linked to universities may enhance employment outcomes and entrepreneurial ecosystems.

Fifth, governance reform remains central. Institutional autonomy combined with accountability mechanisms can improve academic quality. Accreditation processes, research evaluation, and outcome-based assessment should be systematically strengthened.

7. Expansion, Imbalance, and the Question of Inclusive Innovation

The statistical expansion of higher education in India — and in Andhra Pradesh — is undeniable. Enrolment has risen, institutions have multiplied, and digital participation has accelerated. Yet numbers, when read without context, can conceal as much as they reveal. The deeper question is whether this expansion is spatially balanced and innovation-oriented.

In Andhra Pradesh, institutional density varies significantly across regions. Coastal districts, particularly around Visakhapatnam and the Krishna–Guntur belt, exhibit higher concentration of professional colleges and private universities. By contrast, several districts in Rayalaseema show lower institutional diversity and weaker research ecosystems. While degree colleges exist numerically across districts, their infrastructural strength and faculty research engagement differ considerably.

This unevenness creates what may be termed an “internal digital-academic divide.” The rapid rise in digital enrolment (as shown earlier) presumes broadband access, digital literacy, and reliable institutional infrastructure. In parts of Rayalaseema, especially semi-rural mandals, connectivity and device access remain constraints. Thus, digital expansion, though statistically impressive, may not be uniformly transformative. Innovation, moreover, cannot be reduced to enrolment figures. The state has witnessed growth in startup initiatives, particularly in fintech and logistics services linked to Visakhapatnam’s port economy. However, incubation centres within colleges remain unevenly distributed. Research-driven entrepreneurship is still emerging rather than consolidated.

Inclusive innovation requires three structural supports:

- Research funding accessible beyond metropolitan campuses
- Faculty capacity-building in applied research
- Institutional incentives for community-linked problem solving

In drought-prone Rayalaseema, for example, colleges could serve as applied research hubs for water management, solar irrigation systems, and agri-processing innovation. Instead, many remain examination-centric, limiting their developmental spillover.

The challenge, therefore, is not only quantitative access but qualitative integration. Expansion without integration risks producing fragmented growth.

7.1 Industry–Academia Clusters and Regional Growth

Visakhapatnam offers a partial illustration of how higher education can intersect with economic clusters. The presence of port infrastructure, pharmaceutical manufacturing, steel processing, and emerging IT parks creates natural opportunities for academic collaboration. Engineering colleges in the region have initiated internship partnerships; however, these arrangements are often informal and faculty-driven rather than policy-structured.

A more institutionalized cluster model could include:

- Joint research chairs funded by industry
- Mandatory semester-long industry immersion
- Shared laboratory facilities
- Collaborative patent development

Such measures would align tertiary education more directly with industrial productivity.

Similarly, the Sri City manufacturing corridor in southern Andhra Pradesh hosts electronics and automotive component firms. These industries require mid-level technical managers and skilled supervisors. Yet MSMEs frequently report recruitment difficulties, despite high graduate output from nearby institutions. This suggests that curriculum standardization has outpaced regional customization.

The idea of higher education as “strategic infrastructure” becomes operational only when institutional output mirrors regional economic structure. Otherwise, the system risks creating supply without relevance.

7.2 Financing Constraints and Institutional Differentiation

Public expenditure on education remains below the normative 6 percent of GDP threshold. At the state level, budgetary allocations to higher education fluctuate based on fiscal pressures. Andhra Pradesh, navigating revenue constraints and welfare commitments, faces a delicate balancing act.

In such a context, differentiation becomes necessary. Not every college must become a research university. However, clear functional categorization — teaching-intensive colleges, skill-oriented institutions, research-driven universities — can improve efficiency. Currently, homogeneity in degree-granting authority coexists with heterogeneity in capacity, leading to uneven outcomes.

Private sector dominance in enrolment has eased fiscal burden but introduced affordability concerns. Fee reimbursement schemes mitigate this partially, yet delays and administrative bottlenecks affect institutional sustainability.

A calibrated financing model that incentivizes performance, research output, and community engagement could strengthen accountability while preserving access.

8. Conclusion

The evidence presented in this study suggests that India's higher education system has entered a phase of sustained quantitative expansion. Gross Enrolment Ratio has steadily improved, institutional capacity has widened, digital enrolment has accelerated, and private participation has deepened. Andhra Pradesh reflects these national patterns, with over a thousand degree colleges and a substantial engineering education base.

Yet expansion, in isolation, is not transformation.

The regional analysis reveals uneven spatial distribution of institutional strength within the state. Coastal Andhra, particularly Visakhapatnam and the Krishna–Guntur belt, exhibits stronger integration between educational institutions and economic clusters. In contrast, parts of Rayalaseema face infrastructural and digital constraints that limit the transformative potential of existing colleges.

The rise in digital enrolment indicates adaptive capacity, but access gaps persist. Public expenditure, though gradually improving, remains below normative targets necessary for sustained qualitative enhancement. Meanwhile, skill mismatches between graduates and MSME requirements signal the need for deeper curricular recalibration.

For Andhra Pradesh, the transition from massification to meaningful alignment is no longer optional. The state's long-term fiscal resilience, employment generation capacity, and contribution to India's broader economic ambitions depend upon converting its 1,050 degree colleges from examination-oriented silos into innovation-priming hubs embedded within regional development strategies.

Higher education must be repositioned as strategic infrastructure — not merely producing graduates, but cultivating problem-solvers capable of strengthening port logistics, pharmaceutical research, manufacturing ecosystems, agri-innovation, and digital entrepreneurship.

The window created by demographic advantage is time-bound. Whether Andhra Pradesh leverages this opportunity depends on how effectively it integrates educational planning with industrial policy, regional equity, and technological transformation.

In this sense, the reform agenda is less about expansion and more about coherence — aligning institutions with geography, skills with industry, and access with innovation.

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