

THE LITIGATION TRAP VS. THE INNOVATION ENGINE: A COMPARATIVE ANALYSIS OF PROFESSIONAL FORMATION DISPARITIES IN BRAZIL, SOUTH KOREA, CHINA, THE US, AND THE EU (2024-2025)

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ABSTRACT: This article examines the structural imbalance in the Brazilian higher education system during the 2024-2025 cycle, characterized by a disproportionate output of Law graduates (9.5%) relative to Engineering professionals (7.2%). Utilizing a comparative econometric framework, the study contrasts Brazil's "service-heavy" academic profile with the STEM-centric developmental models of South Korea and China, as well as the innovation-driven ecosystems of the United States and the European Union. The analysis identifies that while Asian economies maintain an "Engineer-to-Lawyer" ratio of up to 16:1 to fuel industrial sovereignty, Brazil operates at a deficit ratio of 0.7:1, favoring redistributive legal activities over productive technological creation. Furthermore, the paper investigates the systemic causes of the 50% attrition rate in Brazilian engineering programs, citing deficits in foundational mathematics and misaligned labor market incentives. The study concludes that Brazil's over-reliance on legal human capital acts as a non-tariff barrier to re-industrialization and proposes urgent policy interventions, including curricular modernization and fiscal incentives for technical fields, to escape the middle-income trap.

Keywords: Human capital misallocation. STEM education. Legal hypertrophy. Engineering attrition. Developmental economics. Brazil Cost. Comparative education policy

1. THE STRUCTURAL CRISIS OF PROFESSIONAL FORMATION IN BRASIL

1.1. *The Historical Persistence of the "Bacharelismo"*

The Brazilian higher education system is historically characterized by a phenomenon sociologists call "Bacharelismo" - a cultural and systemic preference for liberal arts

degrees, particularly Law, as a primary vehicle for social mobility and political power. As the country moves through the 2024-2025 academic cycle, this trend has not only persisted but solidified, creating a significant mismatch between the nation's educational output and the technical requirements of a modern, globalized economy.

According to the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (Inep, 2024), the number of Law graduates remains disproportionately high, accounting for approximately 9.5% of all degrees conferred in 2024. In absolute numbers, this translates to over 125,000 new legal professionals entering a market that is already saturated. In contrast, the engineering sector - a vital engine for industrialization and infrastructure - represents only 7.2% of graduates (approximately 93,000 professionals). This disparity is not merely a matter of student preference; it reflects deep-seated structural issues in the Brazilian secondary education system and the labor market's incentive structures.

1.2. The Quantitative Gap: 2024-2025 Estimates

Projections for 2025 suggest that the gap between Law and Engineering will remain stable or slightly widen. The Semesp (2024) report indicates that while interest in traditional engineering (Civil and Mechanical) has plateaued or declined, the legal field continues to expand through the proliferation of private higher education institutions.

Table 1: Estimated Graduates in Brazil (2024-2025 Cycle)

Field of Study	Estimated Graduates (2024)	% of Total Graduates	Projected Growth (2025)
Law	125,000	9.5%	+1.2%
Engineering (All)	93,000	7.2%	-0.5%
Other Fields	1,082,000	83.3%	Stable
<i>Note.</i> Data synthesized from Inep (2024) and Semesp (2024).			

This quantitative imbalance leads to a "brain drain" within the country. High-apptitude students, who in other jurisdictions would be funneled into STEM (Science, Technology, Engineering, and Mathematics) fields, are often lured by the perceived stability of "Concursos Públicos" (civil service examinations) in the legal sphere. This internal migration of talent deprives the industrial sector of the necessary cognitive capital for innovation.

1.3. The Economic "Deadweight" of Over-Litigation

The economic consequence of this surplus of lawyers is profound. Brazil currently holds the highest density of lawyers per inhabitant in the world, surpassing even the United States. This hyper-legalization of social and economic relations creates a "deadweight loss" for the economy.

As argued by the World Economic Forum (2023), countries that over-invest in distributive professions (like litigation-based law) at the expense of productive professions (like engineering) tend to suffer from lower Total Factor Productivity (TFP). In Brazil, the "Custo Brasil" (Brazil Cost) is exacerbated by legal uncertainty and a backlog of millions of lawsuits. When a society produces more individuals trained to dispute existing wealth than individuals trained to create new technological value, the result is economic stagnation.

1.4. The Engineering Attrition Crisis

While Law degrees boast high completion rates, Engineering programs in Brazil face an existential crisis of attrition. Current data from Semesp (2024) indicates that the dropout rate in engineering fluctuates between 45% and 55% nationwide. This is primarily attributed to two factors:

1. Educational Deficit: The failure of the Brazilian secondary education system to provide adequate foundations in Mathematics and Physics.
2. Opportunity Cost: The length and rigor of the degree (5 years) versus the immediate entry-level salaries offered in the service or financial sectors, which do not require the same technical burden.

This creates a "leaky pipeline" where even the limited number of students who choose engineering often fail to reach graduation, further starving the industry of essential manpower.

2. THE DEVELOPMENT DIVERGENCE – BRAZIL VS. THE ASIAN STEM POWERHOUSES (SOUTH KOREA AND CHINA)

2.1. The Strategic Pivot: Engineering as an Engine for Sovereignty

The divergence between Brazil's educational output and that of the leading Asian economies - specifically South Korea and China - is not accidental but the result of divergent state-led industrial policies. While Brazil's higher education expansion in the 2010s and 2020s focused on democratizing access through low-cost social science

and legal programs, the Asian "miracle" economies prioritized STEM (Science, Technology, Engineering, and Mathematics) as a matter of national security and economic sovereignty.

According to World Economic Forum (2023) data, the structural composition of the workforce in these nations reflects a "production-first" mentality. In China, the proportion of engineering graduates reaches a staggering 33% of the total annual degree conferrals. In contrast, Brazil's 7.2% represents a "service-first" trap, where the majority of cognitive capital is funneled into redistributive rather than productive activities.

2.2. The South Korean "Miracle": From Agrarian to High-Tech

South Korea's trajectory serves as the most striking counter-example to the Brazilian "Bacharelismo." In the 1960s, both nations shared similar GDP-per-capita levels and agrarian-based economies. However, South Korea implemented a rigorous educational reform that decoupled social status from traditional liberal professions and re-anchored it in technical expertise.

By 2024, approximately 25% of all South Korean (KOR) university graduates are from engineering fields (OECD, 2023). This high density of technical talent allowed South Korea to dominate the semiconductor, automotive, and shipbuilding industries.

Table 2: Comparative Talent Density: Brazil vs. South Korea (2024)

Metric	Brazil	South Korea	Economic Impact
Engineering Grads (%)	7.2%	25.0%	Higher R&D Intensity in KOR
Law Grads (%)	9.5%	~3.0%	Lower Litigation Burden in KOR
R&D Investment (% GDP)	~1.2%	4.8%	KOR leads in global patents
Primary Export Type	Commodities	High-Tech Electronics	KOR has higher value-add

The OECD (2023) notes that South Korea's "Education Fever" is now pivoting toward AI and Green Energy, while Brazil remains entangled in a legalistic framework that prioritizes judicial stability over technological disruption.

2.3. The Chinese Model: The "Engineer-Statesman" Paradigm

China's approach to professional formation is uniquely characterized by the "Engineer-Statesman" model. A significant portion of the Chinese political and corporate elite possesses backgrounds in engineering or hard sciences. This cultural preference permeates down to the university level, where China produces over 1.4 million engineers annually (World Economic Forum, 2023).

For China, Law is viewed as a functional tool for administration rather than a primary field of academic competition. Consequently, Law graduates represent less than 2% of their total output. This creates a streamlined environment for infrastructure development and rapid industrial scaling. In Brazil, every infrastructure project - from hydroelectric dams to highway expansions - is subject to an average of 15 to 20 years of litigation and environmental-legal disputes, a direct byproduct of the country's legalistic hypertrophy.

2.4. Comparative Analysis: The "Lawyer-to-Engineer" Ratio

The "Lawyer-to-Engineer" ratio is a critical metric for understanding national productivity. In a healthy developing economy, this ratio should ideally favor technical creators.

- Brazil: For every 1 engineer graduated, approximately 1.35 lawyers are produced.
- China: For every 1 lawyer graduated, approximately 16 engineers are produced.
- South Korea: For every 1 lawyer, approximately 8 engineers are produced.

This ratio explains why Brazil struggles to innovate in complex sectors. When the "best and brightest" minds are incentivized to pursue Law (often aiming for high-paying, stable government positions in the judiciary), the private industrial sector is left with a talent deficit. As Semesp (2024) points out, Brazilian industry frequently reports a shortage of qualified engineers despite the absolute number of graduates, largely because the quality and specialization of those graduates are often diluted by high attrition rates and outdated curricula.

2.5. Section Summary: The Cost of Choice

The comparison with Asia reveals that Brazil's educational landscape is a reflection of its economic choices. South Korea and China chose to "build" their way into the first world, requiring a massive army of engineers. Brazil has chosen to "litigate" its way

through development, resulting in a society that is expert at debating rights but increasingly incapable of manufacturing the tools of the 21st century.

3. THE WESTERN PARADIGM – SERVICE ECONOMIES, INNOVATION, AND THE LEGAL INHERITANCE (US AN EU)

3.1. The "Society of Lawyers": Comparing the Brazilian and American Models

While the Asian model presents a stark contrast to Brazil, the United States offers a more nuanced comparison. Both nations share a historical and cultural "legalistic" DNA, where Law is viewed as a primary gateway to political leadership and corporate governance. In the United States, approximately 10% of graduates are in legal or law-related fields (OECD, 2023), a figure remarkably similar to Brazil's 9.5%.

However, the economic outcomes differ drastically due to the STEM integration in the U.S. economy. Although the U.S. produces a high volume of lawyers, it also maintains a robust output of approximately 238,000 engineers annually (8% of the total). Unlike Brazil, the U.S. compensates for its high legal density with a massive influx of global technical talent and a venture capital ecosystem that rewards engineering-driven disruption. In Brazil, the legal surplus is not counterbalanced by a comparable innovation engine, leading to a "litigation trap" where legal disputes stifle small and medium enterprises (SMEs).

3.2. The European Model: Technical Specialization vs. Humanist Tradition

The European Union (EU) presents a heterogenous landscape, yet the average formation in STEM fields remains significantly higher than in Brazil. According to Eurostat (2024), the EU average for engineering and technical graduates is approximately 16.5%, more than double the Brazilian rate.

Table 3: The Western Balance: Engineering vs. Law (2024)

Region	% Engineering	% Law/Business*	Core Economic Driver
Brazil	7.2%	9.5%	Commodities/Services
United States	8.0%	10.0%	High-Tech/Finance
Germany (EU)	24.0%	12.0%	Advanced Manufacturing
France (EU)	15.0%	14.0%	Aerospace/Luxury

Note: European data often clusters Law with Public Administration and Business. Sources: Eurostat (2024), OECD (2023).

In nations like Germany, the "Dual Education System" ensures that engineering is not just an academic pursuit but a vocational pillar, with 24% of graduates in technical fields. Brazil's model, conversely, suffers from a "Generalist Bias," where the degree in Law is often used as a "placeholder" for students undecided on a career path, further inflating the surplus of non-practicing legal professionals.

3.3. Institutional Quality and the "Rule of Law" Paradox

A critical point of divergence is the efficiency of the judicial system. In the U.S. and the EU, high legal density often correlates with institutional strength and the protection of intellectual property - factors that support engineering and innovation.

In Brazil, as noted by Inep (2024) and the CFOAB (2024), the surplus of lawyers has not translated into judicial speed. Instead, it has fostered a culture of procedural formalization. For an engineer in Brazil, the primary challenge is often not the technical complexity of a project but navigating the 1,500+ legal norms and environmental regulations that can delay a factory's opening for a decade. "Regulatory Friction" results from a society prioritizing lawyers over technical experts with knowledge of physical systems.

3.4. Brain Drain and Global Mobility

While European and American engineers are highly mobile and sought after by global firms, Brazilian engineers face a "de-skilling" crisis. Due to the lack of high-tech industrial demand, many Brazilian engineers end up working in the financial sector or as "Uber-drivers" (a phenomenon documented by Semesp, 2024).

Meanwhile, the legal profession in Brazil is "geographically locked" to the national territory due to the specificity of Brazilian Law. This creates a trap of human capital: the country is over-producing professionals who cannot export their services (Lawyers) and under-producing those who are the currency of the global economy (Engineers).

4. ECONOMETRIC IMPACTS, STRUCTURAL BOTTLENECKS, AND STRATEGIC RECOMMENDATIONS FOR BRAZIL'S RE-INDUSTRIALIZATION

4.1. Econometric Analysis: The Correlation Between STEM and GDP Growth

The relationship between the composition of human capital and economic growth is well-documented in endogenous growth theories. For the Brazilian case (2024-2025), the data suggests a negative correlation between the over-concentration of legal professionals and the growth of Total Factor Productivity (TFP). According to World Economic Forum (2023) models, a 1% increase in the proportion of engineering graduates in a developing economy typically correlates with a 0.5% to 0.8% increase in GDP growth over a decade, due to the "innovation multiplier" effect.

In Brazil, the opposite is observed. The high density of lawyers (9.5% of graduates) contributes to an "Allocation Inefficiency." When the most talented individuals in society gravitate toward distributive activities (litigation, tax law, public sector legal careers) rather than productive ones (engineering, biotechnology, software development), the economy experiences a "brain drain" into the bureaucracy. This results in what economists call the "Middle-Income Trap," where Brazil remains stuck as a commodity exporter because it lacks the technical density to move up the value chain.

4.2. Comparative Summary: Brazil vs. The World

The following table consolidates the global disparity analyzed throughout this article, highlighting the "Litigation vs. Production" ratio.

Table 4: Summary of Professional Output and Economic Orientation (2024)

Country/Region	Eng./Law Ratio	Primary Economic Driver	Developmental Outcome
China	16:1	Advanced Manufacturing	Global Hegemony
South Korea	8:1	High-Tech Innovation	High-Income Status
European Union	~1:1.2	Diversified Industry	Stability/Slow Growth
United States	~1:1.3	Finance/Tech/Innovation	Global Leadership
Brazil	0.7:1	Commodities/Services	Middle-Income Stagnation
Note. Data extrapolated from <i>OECD (2023)</i> and <i>Inep (2024)</i> .			

4.3. The Engineering "Leaky Pipeline" and Attrition

The crisis in Brazilian engineering is not just a problem of entry, but of retention. As noted by Semesp (2024), the 50% attrition rate in engineering programs is a symptom of a deeper educational failure. The mismatch between the low mathematical proficiency of high school graduates and the rigor of university calculus creates a bottleneck. Consequently, Brazil is "wasting" half of its potential technical talent before they even reach the job market.

4.4. Strategic Recommendations for Brazilian Development

To reverse this trend by 2030, the following policy interventions are recommended:

1. Fiscal Decoupling for STEM: Implement "Tax-for-Talent" programs where companies receive tax credits for every engineering student they sponsor through a "dual-education" model (similar to Germany).
2. Legal De-judicialization: Reform the Brazilian Code of Civil Procedure to make mediation and arbitration mandatory for corporate disputes, thereby reducing the demand for litigation-heavy legal services.
3. STEM-focused Basic Education: Integrate coding, advanced mathematics, and robotics into the "Novo Ensino Médio" to prepare students for the technical rigors of engineering, reducing university attrition.
4. Public Sector Reform: Realign the incentives of Concursos Públicos. Currently, legal careers in the public sector offer salaries far above the market rate for engineers. Capping these salaries or creating "Public Engineering Corps" with competitive benefits would rebalance the talent pool.

4.5. Conclusion

The comparison with South Korea, China, the US, and Europe demonstrates that Brazil's current educational profile is unsustainable for a country that seeks to be a global player in the 21st century. While Law is essential for a democracy, its hypertrophy in Brazil has become an obstacle to progress. **Without a deliberate shift toward an "Engineering-Centric" academic model, Brazil will continue to be a nation that "knows its rights" but lacks the "know-how" to build its future.**

5. AI USE DECLARATION

The authors declare that artificial intelligence (AI) tools were used in the preparation of this manuscript to support language refinement, structural organization, and editing

of the text. Specifically, generative AI was employed to assist in improving clarity, coherence, and academic writing style.

All substantive intellectual contributions - including research design, theoretical framing, data selection, analysis, interpretation of results, and conclusions - are the sole responsibility of the authors. The authors critically reviewed, validated, and edited all AI-assisted outputs to ensure accuracy, originality, and alignment with academic standards.

No AI tool was used to generate empirical data, fabricate results, or replace scholarly judgment. All references were selected, verified, and formatted by the authors in accordance with APA 7 guidelines.

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