Need for a Space Resource Legislation in India: A Legal Analysis from an Economic Lens

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Abstract

The space resource economy is under development as commercial space activities are expanding. Countries such as the United States, Luxembourg, Japan and the United Arab Emirates have taken a legislative approach to regulate space resource activities. In contrast, India is primarily relying on the Indian Space Policy instead of legislation. This study examines the need for space resource legislation in India from a legal and economic perspective by using a mixed-methods research design comprising legal analysis and descriptive analysis of investment data from the Space Capital Database for the United States and India. Furthermore, a comparative analysis of the different legislative approaches to rights over extracted space resources in the respective selected jurisdictions has been conducted in this research. The investment data has been analyzed using descriptive statistics to highlight the change in investment levels, volatility, and venture capital participation before and after regulatory interventions. It was observed that average annual investment rose in the United States post-legislative intervention, and consequently, for India, the venture capital share was lower post-policy intervention. The observations in this study are descriptive and associative, and finally, the study concludes by highlighting areas for development of the legislative framework in India for emerging commercial space activities.

Keywords: *Space Resource Legislation, Indian Space Policy, Space Economy, Property Rights.*

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1. Introduction

The Space economy is evolving from a scientific exploration into a commercial powerhouse with mining as a sub-sector. Nations such as the US, UAE, Luxembourg and Japan have enacted laws to secure property rights over extracted resources. This research undertakes a legal and economic analysis of India's current regulatory approach towards space resource activities. The current regulatory landscape of India is primarily composed of the Indian Space Policy, 2023 (Department of Space, 2023a), which allows NGEs ("Non-Governmental Entities") for the commercial recovery of asteroid and space resources. Jurisdictions like the United States, Luxembourg, Japan and the United Arab Emirates have legislation; however, India has not enacted legislation to clarify the property rights on space resources that have been extracted from the surface of a celestial body. The difference between a policy-based legal framework and a legislation-based legal framework is significant from both legal and economic perspectives. A policy instrument reflects governmental intent and direction for regulation; however, legislation provides for legal durability, institutional certainty, and enforceability for NGEs and investors who are operating in capital-intensive sectors.

The legal gap identified in this research is that India has not enacted a statutory framework that is capable of creating asset certainty for space resources that have been extracted by NGEs. For this study, the term "asset certainty" refers to the degree of predictability, enforceability, and institutional recognition of property rights over extracted space resources. In economic terms, asset certainty reduces the legal risk premium, which is incidental to high capital investments. By assuring NGEs that the extracted resources can be legally possessed, transferred, protected, and commercialized against regulatory unpredictability, legislation may enhance asset certainty. When there is an absence of such a high degree of certainty (i.e. asset certainty), then private entities are exposed to unresolved questions that are related to ownership, regulatory durability, investment recovery, and enforceability.

The study has employed a mixed methodology to synthesize findings and uses economic theories to argue for space resource legislation in India. This research is relevant for legislators, economists, legal professionals and academicians as it develops an argument for India to bring in space resource legislation and points out where India is losing out by not enacting legislation. This research is divided into 7 parts. The first part deals with the introduction, the second part discusses the research methodology, and the third part examines the literature review. The fourth part is an integrated analysis of the conceptual and legal framework relating to space resource governance, property rights, transaction costs and economic institutionalization. The

fifth part undertakes the descriptive contextual legal and economic analysis of investment behaviour in the space sector of the United States and India. The sixth part addresses the limitations of the study. The seventh part deals with the final conclusion of the study.

2. Research Methodology

This study has adopted a mixed-method research design in which the doctrinal analysis identified ambiguity in Article II of the OST, while the functional comparative method evaluates rights granted under the space resource laws of the US, Japan, UAE and Luxembourg. Functional comparative law holds that distinct legal systems may reach similar solutions to common societal problems despite doctrinal differences (Van Hoecke, 2015, pp. 9–11). The study identifies a common legislative function across all jurisdictions, i.e., the creation of asset certainty through the conversion of *res communis* resources into private assets upon extraction. Using "nature of right" as *tertium comparationis* (Michaels, 2006, pp. 367–369), the research compares functional outcomes rather than legal terminology. The researcher further employs micro-comparison on specific rights "*possess, own, transport, use and sell"* rather than entire legal systems (Bell, 2021). The legal transplant theory has been used, and the argument advanced is that the Indian Space Policy, 2023, substantially transplants provisions from the United States Commercial Space Launch Competitiveness Act, 2015 (USCSLCA, 2015), as identified through comparative analysis (Cohn, 2024). To avoid purely black-letter comparison, a law-in-context methodology situates Japanese and UAE legislation within the broader strategic and economic objectives (Ali, 2020, pp. 73–74).

The study also adopts 17 years of investment data. Only the US and India are examined because India's policy framework reflects transplantation from US legislation. Quantitative data spanning 17 years have been obtained from the Space Capital Database (Janikowski, 2025, p. 5) to analyse the investment patterns using descriptive statistics to evaluate whether regulatory intervention is coincidental with changes in stability and composition of investment in the space sectors of the United States and India. The descriptive statistics have been used to explore and observe changes in the investment trend and evaluate volatility before and after the 2015 legislation in the United States and the 2023 policy intervention in India. The descriptive statistics will be helpful in seeking redressal to the objective of the study, which is the evaluation of the relationship between regulatory certainty and investment behaviour. However, due to the limited observations of 17 years, the descriptive statistics are used only for analysis of the temporal patterns and associations instead of assessing causal effects, and

the quantitative evidence generated by descriptive statistics is only contextual evidence and not definitive empirical evidence.

3. Literature Review

The literature reflects persistent doctrinal disagreement regarding whether commercial exploitation of space resources violates Article II of the OST (Outer Space Treaty, 1967) and the CHM (Common Heritage of Mankind) under the Moon Agreement. One school supports domestic legislation recognizing ownership over extracted resources without constituting territorial appropriation (Blount & Robinson, 2016, pp. 173–176; De Azevedo, 2024, p. 386; Tronchetti, 2015, pp. 7–8), while others emphasize the absence of a universally accepted governance regime and enable a benefit-sharing framework (Su, 2017, pp. 1005–1006). Numerous scholars have further acknowledged that Article II lacks a settled legal-economic interpretation (Jakhu et al., 2017) that addresses the collective interest of all States (Von der Dunk, 2015). Although property rights are considered essential for economic development (Simberg, 2012, pp. 21, 24), India remains legally unprepared for space mining operations (Pandey, 2026b, p. 24).

Some legal scholars have argued that commercial Space Resource Utilization (SRU) cannot develop without legal clarity (McKeown et al., 2026, pp. 620–621), yet no study systematically examines the economic consequences of India's legislative vacuum. Simultaneously, scholarly literature recognizes the rapid expansion of the global space economy, driven by commercialization, infrastructure investment, and regulatory competition (Cross & Pekkanen, 2023, pp. 199–200; Goldman et al., 2025, p. 3; Graziola, 2018, p. 271; OECD, 2019, p. 30; Peter, 2023, pp. 305–306; Pietrzak, 2025, p. 2; Space Foundation, 2025). Space mining has emerged as a high-investment sub-sector dominated by jurisdictions possessing supportive legal frameworks (Capova, 2016, p. 308; Pandey, 2026a). India simultaneously seeks to expand its commercial space ecosystem through liberalised FDI norms, start-up promotion, IN-SPACe reforms and projected growth targets (BL Chennai Bureau, 2025; Department of Space, 2023b, 2024; Invest India, 2026; ISRO, 2024; Ministry of Commerce and Industry, 2024; Principal Scientific Advisor, 2025; Rangarajan & Ranjan, 2025; Sen, 2024).

The existing studies examine legal aspects of Article II of OST, but there is limited attention given to legal certainty from an economic perspective, especially in the case of India. This gap is relevant for the emerging space economy of India, as India is expanding its commercial space

sector through liberalisation of Foreign Direct Investment (FDI), promotion of start-ups and regulatory reforms.

4. Conceptual and Legal Analysis

4.1 Legal Ambiguity and Space Resource Governance under the Outer Space Treaty

India ratified the Outer Space Treaty on 18 January 1982 (UNTC, n.d.). Articles I and II designate outer space as the "province of all mankind" while prohibiting territorial national appropriation, though not expressly prohibiting ownership of extracted resources (Cheney, 2025, pp. 435–436; Su, 2025, p. 13). Contemporary interpretation increasingly distinguishes "territorial appropriation" from "resource appropriation", permitting post-extraction ownership after severance from celestial bodies (Blount & Robinson, 2016, p. 176; De Azevedo, 2024, p. 386). This ambiguity generates institutional uncertainty over enforceability, commercialisation, and investment recovery for private actors, producing a lack of "asset certainty" in space resources (Musole, 2009, pp. 46–47; North, 1986).

The evolving regime conceptualises extracted resources as usufructuary interests derived from global commons under State supervision (Kent, 2025, pp. 71–72). Simultaneously, the Artemis Accords, 2020, which have broader support compared to the Moon Agreement, 1979, are a set of best practices for space resource utilization (Meggiolaro, 2025, pp. 23–24). Although safety zones may function as "keep-out spheres" facilitating commercial extraction (Martin, 2025, p. 466), subsequent state practice increasingly accepts the legislation supporting unilateral space resource exploitation as compatible with Articles I and II of the Outer Space Treaty (Su, 2025, p. 13).

Thus, the first core proposition of this analysis is that legal ambiguity under Article II increases institutional uncertainty regarding property rights over extracted space resources, which may increase legal risk for private investors and commercial actors.

4.2 Comparative Legal Analysis of Nature of Rights over Space Resources

Major spacefaring jurisdictions have responded to this ambiguity of Article II of the Outer Space Treaty, 1967, through domestic legislation granting enforceable rights over extracted resources. The USCSLCA has adopted a recovery-based entitlement model granting rights to "possess, own, transport, use and sell" extracted resources (USCSLCA, 2015, § 51303). Analogically applied to high-seas fishing, the legislation creates "functional ownership" as a limited bundle of commercially transferable rights rather than sovereignty (Masson-Zwaan &

Palkovitz, 2017, para. 4(b); Stec, 2010, p. 386). In principle, the objective is investment attraction and industrial development (McKellar, 2017, p. 105; Richards, 2015).

Luxembourg adopted a declaratory property-rights model through the Law of July 20th 2017, on the Exploration and Use of Space Resources by recognising that "space resources are capable of being owned" (Ünüvar, 2025, p. 274). Unlike the U.S. activity-based approach, Luxembourg treats extracted resources as private property itself (Guyomarc'h, 2023, p. 85). However, the legislation remains largely declaratory, ambiguously defining "use" and failing to distinguish primary resources from by-products (Declaration, 2026, para. B(4); Ferreira-Snyman, 2021, pp. 21–22). The economic rationale is industrial competitiveness, investment attraction and technological development (Vylegzhanin & Krokhina, 2025, p. 474).

Japan adopts a conditional civil-law *occupatio* model under the Act on the Promotion of Business Activities Related to the Exploration and Development of Space Resources, 2021. Grounded in Article 239 of the Japanese Civil Code, ownership accrues through possession with intent to own, construing extracted resources as *res nullius* (Snyder, 1992, p. 1876). Unlike the U.S. entitlement model, rights arise only pursuant to an approved business activity plan, making them conditional and administratively controlled (Levin, 1989, pp. 212–213). The framework cautiously reconciles domestic property doctrine with Articles I and II of the Outer Space Treaty.

UAE adopts a permit-based constitutive model under Cabinet Resolution No. 28 of 2023 and Federal Law No. 12 of 2019. The UAE combines commercial flexibility (seen in the US) and administrative control (seen in Japan and Luxembourg) while extending rights to logistics and orbital services (Aldabousi, 2025, p. 429; Giannoni-Crystal, 2025; Jeong, 2026). Rights arise only "as authorized by agency" transforming extraction from a freedom into a state-conferred statutory privilege (Mitnick, 2000, pp. 198–200). By recognizing transactional rights over transport, storage and orbital services, the UAE expands commercial legality beyond extraction itself (Chernykh & Gugunskiy, 2022, pp. 171–173; Risse, 2013, p. 3). Simultaneously, subordination to international obligations preserves treaty compliance through "constructive ambiguity".

Feature	United States	Luxembourg	Japan	UAE
Legal Basis	Right is accrued upon successful physical recovery	Right is attaching being *res nullis*	Right is attaching via application of civil law (*occupatio)*	Right is accrued because of the government permit
Nature	Focused on the freedom of the private actor	Focused on the status of the object	Focused on the mental intent and physical control	Focused on state-granted access
Restrictions on the exercise of the right	International obligations of the United States	Must have a mission licence	Mining should be according to the field plan.	International obligations of the UAE
Distinguishing Feature	"Right to exclude" is substituted with "freedom from interference"	Enforces asset certainty to make resource "bankable" assets	Space mining is tied to domestic property law (Art. 239, Japanese Civil Code)	Grants rights for logistics and services as well

Table 1: Nature of Rights Over Space Resources

Source: Author's own construction

The second proposition of this analysis is that domestic legislation is intended to operationalise asset certainty by transforming extracted space resources into legally recognizable and commercially transferable assets through enforceable property-right structures (Michaels, 2006, pp. 367–369; Van Hoecke, 2015, pp. 9–11).

4.3 Analysis of India's Regulatory Position: Policy-Based Rights without Legislative Durability

India's space resource legal governance is policy-driven instead of being legislative; clause 4(13) of the Indian Space Policy, 2023, allows NGEs the right to "possess, own, transport, use and sell" extracted space resources, effectively transplanting § 51303 of USCSLCA without defining the legal status of the resources themselves. Unlike the US, Luxembourg, Japan and UAE, India has not enacted legislation despite adopting an individualistic and commercially oriented approach influenced by these jurisdictions and Artemis Accords (Bhat B., 2025, p. 4). India's reliance on policy, contractual arrangements and sectoral laws creates uncertainty regarding ownership, enforceability, transparency, accountability, regulatory continuity and state responsibility in commercial space activities (Bhat B. & Variath, 2024).

Kaul (2025, p. 132) argues that dependence on contractual and sectoral laws without any dedicated legislation creates a breeding ground for future disputes. The Indian Space Policy seeks to improve the ease of doing business and encourage MSMEs and startups to enter the

space sector (Singh & Gupta, 2023), but the absence of statutory certainty and increasing private investment intensifies the legal disputes and commercial risk, making dedicated space resource legislation economically and institutionally indispensable (Bhat B. & Variath, 2024; Kumar, 2024).

Thus, the third proposition of this analysis is that India's model as a chattel-based post-recovery ownership framework, lacking a statutory framework and policy-based rights, lacks the institutional durability and enforceability necessary for long-term capital-intensive investment because markets may assign lower credibility to policy assurance than to statutory property rights (Bhat B. & Variath, 2024; North, 1986).

4.4 Economic Theory Integration: Property Rights and Internalization of Externalities

The Property Right Paradigm developed by Alchian and Demsetz (1973), explains that property rights emerge when the benefits of internalizing externalities in response to scarcity, transaction costs, technological change and resource value (Demsetz, 1967, pp. 347–349, 358–359). Applied to space resources, legally uncertain extraction rights prevent private actors from appropriating economic returns and discourage investment, with the Indian Space Policy, 2023, which recognises rights that internalize extraction externalities and aligns private incentives with economic efficiency.

The investment logic that a rational NGE might follow is conceptualized as follows:

$$E[R_{private}] > I + \sigma$$

Here (I) represents the investment required for extraction, $E[R_{private}]$ represents the expected private return, and (σ) is the risk premium associated with legal uncertainty. In the absence of enforceable property rights, the expected private returns approach zero because the resource retains the characteristics of a public good, resulting in market failure and underinvestment. Therefore, the fourth proposition of this analysis is that Space Resource legislation reduces legal uncertainty, lowers σ and enables private actors to appropriate extraction benefits, thereby internalizing economic externalities and improving investment viability (Andersen & Sørensen, 2023).

4.5 Transaction-Cost Economics and Reduction of Institutional Friction

The Outer Space Treaty, 1967, Art. II ambiguity increases transaction costs by creating uncertainty over ownership, enforceability, financing, licensing, contracting and commercialization of extracted resources (Coase, 1981; Farrell, 1987, p. 114). Under New

Institutional Economics ("NIE"), institutions are operating as the "rules of the game" governing economic behaviour and transaction costs (Musole, 2009, pp. 46–47; North, 1986). The Indian Space Policy, 2023, is a soft institutional constraint vulnerable to executive moderation, whereas legislation provides durable and enforceable legal certainty preferred by investors in capital-intensive space mining sectors. As trade expands beyond personal exchange, transaction costs intensify (Ménard & Shirley, 2022, pp. 21–22). In the international space economy, the absence of standardised proprietary rights increases bargaining, verification and enforcement costs. Legislation defining "space resources" and proprietary entitlements would reduce measurement and contractual costs through legal taxonomy and standardized exchange mechanisms (Almlöf & Bjuggren, 2019, pp. 415–416; Verschuuren & Van Gestel, 2009). Since state-backed enforcement is cheaper and more efficient than private enforcement (Garoupa, 1997, pp. 271–272), the absence of legislation externalizes prohibitive enforcement onto Indian NGEs, undermining commercial viability. The Glorious Revolution illustrates that credible legal commitments protecting property rights reduce borrowing and investment risk (North & Weingast, 1989, pp. 831–832). India's dual role through IN-SPACe as regulator and ISRO and NSIL as market participants creates dynamic inconsistency risks and fears of regulatory favouritism. Statutory recognition of NGEs right to "possess, own, transport, use and sell" extracted resources would constitute a credible commitment, reducing regulatory uncertainty and investment risk.

Thus, the fifth proposition of this analysis is that where a policy-only regime increases risk, legislation is expected to lower institutional uncertainty, stabilizes expectations, facilitate market coordination and reduce transaction costs through enforceable and durable rules governing ownership, transferability and commercialisation of extracted space resources (Coase, 1981; North, 1986).

4.6 Schumpeterian Innovation Theory and Capital Formation

Schumpeterian innovation theory argues that radical, high-risk industries require temporary monopoly-profit incentives to stimulate innovation (Aghion, 2018, p. 696; Schumpeter, 2013; Uctu et al., 2024, p. 298). Applying this to space mining, Gupta et al. (2024) contend that NGEs require legally protected commercialization incentives due to extremely high entry barriers, irreversible infrastructure costs, technological uncertainty and massive capital expenditure.

Therefore, the sixth proposition of this analysis is space resource legislation may facilitate economically viable exploration into calculable investment opportunities while bypassing Art. II ambiguity (Schumpeter, 2013).

The integrated analytical framework establishes the chain of ambiguity in Article II of Outer Space Treaty, 1967; the absence of enforceable domestic property rights and lack of asset certainty lead to high transaction costs and legal risk premiums with unstable venture capital and institutional fragility. There is reduced long-term investment confidence and underdevelopment of the space economy. Therefore, it is conceptualized that space resource legislation is not merely a legal reform, but it is an economic institution which is necessary for transforming extracted space resources into commercially tradeable and investable assets within India's emerging space economy.

5. Descriptive Investment Evidence: A Contextual Legal and Economic Analysis

The data extracted from the Space Capital Database is about the whole space sector of the United States and India; therefore, the data provides only contextual evidence about the investment conditions in the broader space sector and does not exactly show that space resource legislation caused investment growth. The descriptive statistics for India and the United States only highlight the investment pattern consistent with the hypothesis that greater legal certainty is associated with greater investment stability. The USCSLCA is plausibly associated with the transformation of the economic environment for space resource activities because the legislation awarded legal recognition of rights post-recovery of space resources and at the same time avoided asserting sovereignty over a celestial body, consistent with the Outer Space Treaty, 1967.

The legislative intervention in 2015 is economically efficient and significant because there has been a conversion from an uncertain economic right to mine space resources into a legally protected right, and the use of the word "use, sell, own, transport" within the legislation changes space resources into an asset which can be transferred commercially. The property rights theory by Alchian and Demsetz (1973) states that protected rights allow internalization of the economic returns from the extraction of space resources and convert the capability of technology into an economic benefit which can be appropriated.

Even the Coase theorem supports that defined property rights which can be enforced will help in the reduction of transaction costs and allow efficient bargaining (Coase, 1981). When this is applied to space resources, then the grant of legal certainty over the resources will help in the

creation of private investment and commercialization. Under New Institutional Economics, the USCSLCA is functioning as an institution with credibility that is able to stabilise expectations and reduce the legal risk premium, which is connected with long-term capital investment.

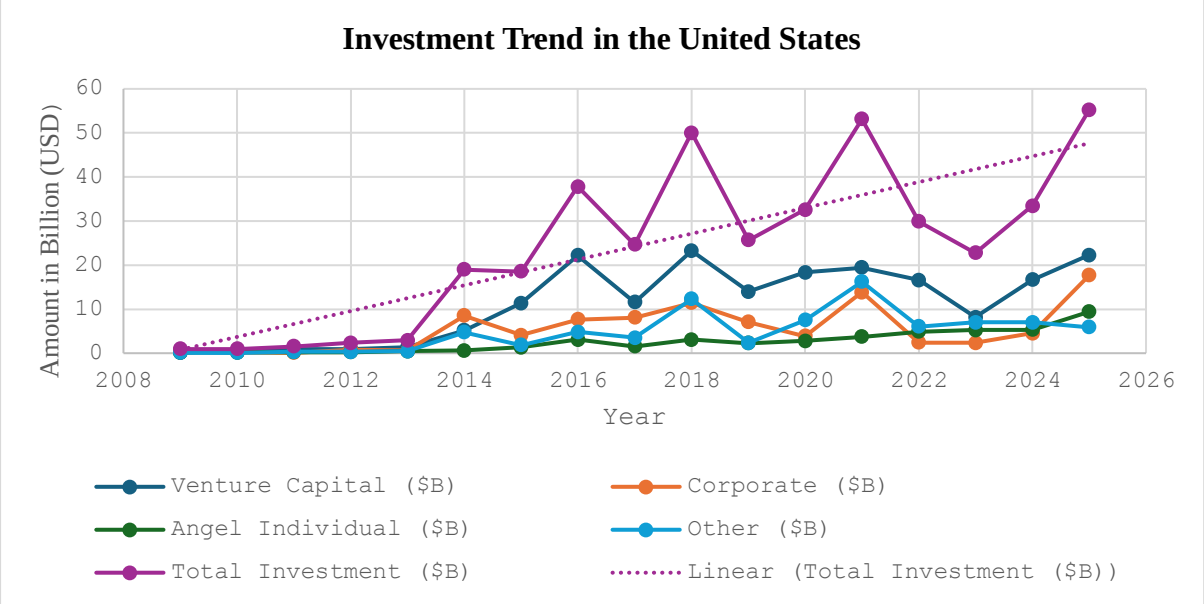


Figure 1: Investment Trend in the United States Space Sector

Source: Author's own Construction after collecting and analyzing data present in Annexure I

Metric	Pre-2015 (2009–2014)	Post-2015 (2015–2025)
Number of observations (n)	6	11
Mean Total Investment	$4.62B	$34.89B
Median Total Investment	$1.94B	$32.55B
Standard Deviation	$7.10B	$12.73B
Coefficient of Variation (CV)	153.5%	36.5%
Minimum	$0.93B (2010)	$18.55B (2015)
Maximum	$19.02B (2014)	$55.25B (2025)
Total Investment (Sum)	$27.74B	$383.77B
Venture Capital (VC) Share	32.5%	47.9%
Corporate Share	38.8%	21.6%
Change in VC Share	-	+15.4 pp
Change in Corporate Share	-	−17.2 pp

Table 2: Descriptive Statistics for the United States

Source: Author's own construction of Comparative Descriptive Statistics based on Space Capital Investment Data before and after Legislative Intervention in the United States

The Schumpeterian Innovation theory also supports the USCSLCA because private companies engaging in space resource activities in an arena of technological uncertainty, high failure risk

and huge capital expenditure require that returns should be appropriated from a successful venture; therefore, ownership created by the USCSLCA and commercialization rights are giving an incentive for linking innovation to capital formation. The investment data is consistent with the above theories and legal analysis because the average investment has increased from $4.6B to $34.89B and total investment from $27.74B to $383.77B, with volatility decreasing from 153.5% to 36.5%, and the VC share has increased from 32.5% to 47.9% after 2015.

The increase in investment in the United States is also supported by Akerlof's asymmetric information theory, which states that when there is legal uncertainty over ownership, this reduces the ability of the investor to determine the true value of and quality of the asset (Akerlof, 1970). In the United States, the statutory clarification of property rights is observed to coincide with the rise of investment from $4.6 B to $34.89B is in convergence with Akerlof (1970). The Space Capital dataset captures a broader space sector instead of space resource investment specifically, and there is the presence of technological and macroeconomic developments as well; thus, the changes in investment behaviour cannot be directly attributed to USCSLCA alone.

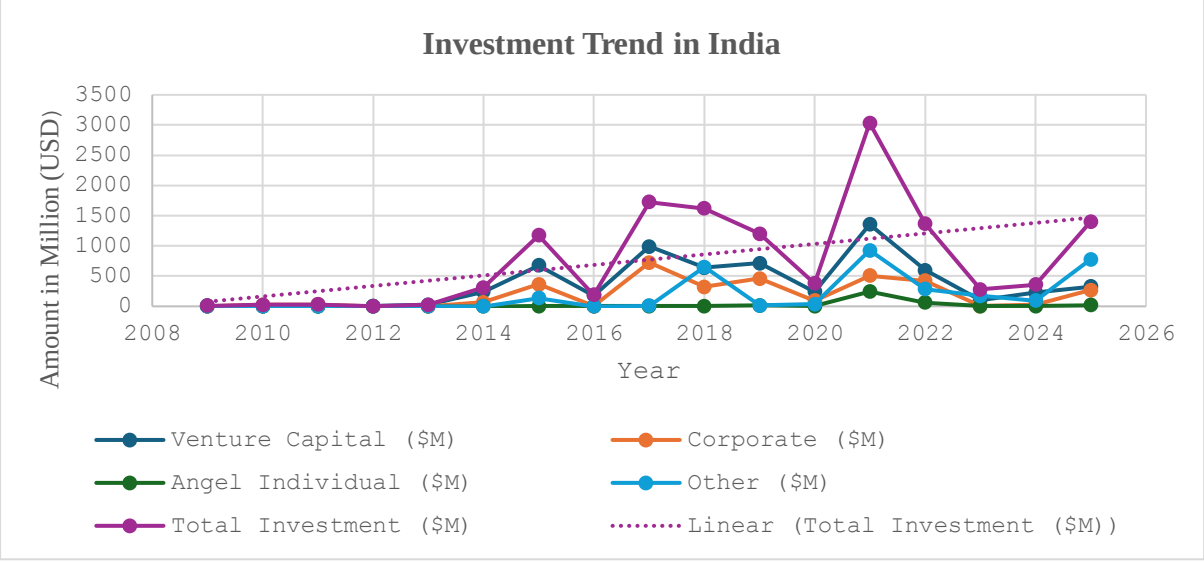


Figure 2: Investment Trend in India

Source: Author's own Construction after collecting and analysing the trend present in Annexure I

Metric	Pre-2023 (2009–2022)	Post-2023 (2023–2025)
Number of observations (n)	14	3
Mean Total Investment	$792.3M	$679.2M
Median Total Investment	$347.3M	$356.4M
Standard Deviation	$918.6M	$625.4M
Coefficient of Variation (CV)	115.9%	92.1%
Minimum	$3.0M (2012)	$281.2M (2023)
Maximum	$3.03B (2021)	$1.40B (2025)
Total Investment (Sum)	$11.09B	$2.04B
Venture Capital (VC) Share	51.2%	32.3%
Other Funding Share	18.5%	51.5%
Change in VC Share	-	−18.9 pp
Change in Other Funding Share	-	+33.0 pp

Table 3: Descriptive Statistics for India

Source: Author's own construction of Comparative Descriptive Statistics based on Space Capital Investment Data before and after Policy Intervention for India

The pre-2023 intervention for India has 14 years of observational data, and post-intervention has only 3 observations; thus, observations for India are only a preliminary descriptive observation. The post-2023 investment trend as observed in India shows a gap between policy recognition and effective legal certainty granted by a statute. The mean annual investment has declined from $792.3 million to $ 679.2 million.

The venture capital funding decreased by 18.9% and "other funding" increased by 33%. From a legal and economic perspective, there is an observed consistency because the Indian Space Policy, 2023, is observed to create an approval for space resource activities without having a statute in place; thus, the space resource activities in India are still shrouded in uncertainty until legislation is enacted.

As argued by Demsetz (1967), incomplete rights weaken the appropriation of returns; Coase (1981) and North (1986) have argued that legal uncertainty increases transaction and enforcement costs, and Akerlof (1970) states that when there is uncertainty over the quality and value of an underlying asset, then it increases information asymmetry and risk premiums.

The observed fall in the share of VC is an important observation because venture capital is dependent on predictable ownership, valuation, and exit rights. The policy and regulatory position of India on space resource activities post-2023 indicates that policy reform has supposedly not been able to create certainty, as observed in the scale of investment and VC participation.

Legal Position	Economic Theory	Quantitative Evidence: Contextual Corroboration	Bounded Finding from the Analysis
Article II of the Outer Space Treaty leaves uncertainty regarding the legal status of extracted space resources.	Property-rights theory and asymmetric-information theory: uncertainty over proprietary rights may weaken appropriation incentives and increase valuation and information risk.	India: mean annual investment declined from $792.3M to $679.2M; VC share declined from 51.2% to 32.3% after 2023.	The Indian investment pattern is directionally consistent with the proposition that unresolved legal certainty may constrain investment conditions; however, the evidence is descriptive and not causal.
The USCSLCA 2015 provides statutory recognition of rights to possess, own, transport, use and sell recovered space resources.	Property-rights theory: legally recognised rights can strengthen appropriability and expected returns, thereby improving incentives for private investment.	US: mean annual investment increased from $4.62B to $34.89B; VC share increased from 32.5% to 47.9% after 2015.	The post-2015 US investment pattern is consistent with the proposition that statutory recognition may support investment incentives, but the observed increase cannot be attributed to the USCSLCA alone.
The US, Luxembourg, Japan and UAE have adopted statutory frameworks addressing space-resource activities.	Coase and New Institutional Economics: clear and durable institutions may reduce transaction, bargaining, verification and enforcement costs.	US: coefficient of variation declined from 153.5% to 36.5%, indicating lower relative investment volatility in the post-2015 period.	The decline in relative volatility is consistent with greater investment stability following statutory intervention, although other institutional and market factors may also explain the pattern.
India relies primarily on the Indian Space Policy, 2023, rather than dedicated space-resource legislation.	New Institutional Economics and Akerlof: policy-based recognition may provide less durable institutional assurance and may leave uncertainty regarding ownership, valuation and enforceability.	India: VC share declined by 18.9 percentage points, from 51.2% to 32.3%, during 2023–2025.	The decline in VC participation does not establish that the policy caused weaker investment; it indicates that policy recognition has not, in the observed period, been accompanied by comparable VC deepening.
Space-resource activities involve high technological, financial and commercial risks and require appropriable returns.	Schumpeterian innovation theory: secure appropriation of returns can strengthen incentives for innovation and capital formation in high-risk sectors.	US: total investment increased from $27.74B to $383.77B between the pre- and post-2015 periods.	The substantial expansion of US investment is compatible with the proposed relationship between secure commercial rights and capital formation, but the broader dataset does not isolate space-resource investment.
India's principal regulatory gap is the absence of a dedicated statutory framework providing durable post-extraction asset certainty.	Clearer rights may reduce legal uncertainty, transaction costs and risk premiums and improve conditions for long-term investment.	US and India exhibit contrasting post-intervention patterns, but the datasets measure the broader space sector, not space-resource activity specifically.	The legal and theoretical analysis provides the principal basis for the normative case for legislation; the quantitative evidence provides contextual corroboration only and does not establish causation.

Table 4: Researcher Analysis and Observation

Source: Author's own Construction

6. Limitations

In the United States, the minimum investment rose after the 2015 Act, and Indian data show high volatility and capital withdrawal. Descriptive statistics cannot prove causality; the observed correlation between the 2015 legislation and the investment spike could be confounded by variables such as technological maturity or other macroeconomic conditions. Since the data available in the Space Capital Database is subject to change over time when previously undisclosed financial deals come is a limitation of the data collected from the Space Capital Database (Janikowski, 2025, p. 5). However, Adam Janikowski has also argued that reliance on the Space Capital database may cause concern regarding the quality of data, but since Space Capital is the leading firm in the space investment community and has a long history of tracking space economy investments, there is no better database available than this to study the impact of enacting space property rights legislation (Janikowski, 2025, p. 6).

Thus, the researcher, while acknowledging the limitation, is also placing reliance on the Space Capital Database and also echoes the same belief as Adam Janikowski. The use of Akerlof theory and NIE relies upon the assumption of rational actors, where a presumption is being drawn that the Indian State is acting to maximise economic welfare and strategic pay-off. Functional comparative methodology has the limitation that law is stripped of its cultural and economic context, and the research is not looking into the structural differences between space resource legislations of different jurisdictions.

There are some macroeconomic factors like global investment cycles, interest rates, GDP growth and inflation which may affect investment in the space sector of India and the United States; however, these factors have been excluded as formal covariates because of the limited sample size. The most significant limitation has been observed in India's case, where there are three post 2023 observations present; therefore, the findings indicate only association and not causation.

Country	Pre-intervention	Post-intervention
United States	6 years	11 years
India	14 years	3 years

Table 5: Observational Asymmetry Limitation

Source: Author's own Construction

The descriptive statistics only establish a preliminary descriptive observation; however, no causal result is established because there is significant asymmetry between the observation data.

7. Conclusion

The regulatory issue with India lies in the absence of legislation that provides enforceability and predictable asset certainty for NGEs to engage in space resource activities. The Indian Space Policy, 2023 permits space resource activities; however, this is merely a policy recognition and does not clarify enforceability, permissive commercialisation, transferability and ownership of resources extracted by the NGEs. The comparative analysis of the US, Luxembourg, Japan and UAE revealed that, though the legal framework adopted by these countries is different, legislation performs an important function: the legislative recognition of rights and entitlement over space resources without territorial appropriation.

India has adopted a policy without laying down a legislative foundation. The legal and economic analysis reveals that uncertain property rights can increase transaction and enforcement costs, increase information asymmetry in the market and raise the risk of investment. Property rights theories, transaction cost economics, NIE, Akerlof's asymmetric information framework and Schumpeter's innovation theory converge into a clear normative proposition that clear and enforceable rights can reduce institutional friction and improve the economic conditions for investment.

The quantitative evidence is aligned with this normative proposition because after the 2015 legislation, the annual space sector investment and VC share increased, and the coefficient of variation also declined. In India, after the 2023 policy intervention, the annual investment declined, and the VC share also declined. The findings from descriptive statistics are only contextually associative and corroborative and not causal because the data is reflective of the broader space sector and India has only three post-intervention observations.

There are also macroeconomic and technological influences which have not been controlled in the analysis. The observed investment patterns are directionally consistent with the legal and economic analysis advanced by the researcher, i.e. statutory enactment is associated with greater investment and market stability, and policy recognition has not been accompanied by capital stability in India.

Through this study, the researcher is advancing a bounded observed conclusion with policy recommendations, way forward and scope for further research:

a. India should establish a statutory framework by defining space resources and provide legislative clarification of the rights over space resources after extraction by NGEs. Create asset certainty by replacing policy with legislation so that rights over space

resources are enforceable and capable of reducing the legal transaction and economic costs with capital-intensive space resource activities.

b. The legislation drafted should be consistent with the international obligations of India without implying any territorial appropriation by NGEs.
c. The legislation should incorporate provisions for transparent licensing, clearly allocated institutional regulatory responsibilities and clear enforcement responsibilities for reduction of administrative friction.
d. India may draw on the functional comparative legal provisions of the US, Japan, Luxembourg, and the UAE for developing a legal framework suited to its domestic requirements.
e. Future studies can use longer post-2023 datasets and space resource-specific investment measures and controls for macroeconomic and technological factors can be envisaged.
f. The investor behaviour examination can take place at a firm-level and research can assess venture capital participation, financing costs and commercial responses to statutory rights.

India can progress towards a statutory institutionalisation by enacting legislation which is legally and economically justified and tailored to the domestic needs of India.

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Annexure

i. Raw Data for the United States of America

FY	Venture Capital ($)	Corporate ($)	Angel Individual ($)	Other ($)	Total Investment ($)
2009	164806214	540958333	167825450	90290000	963879997
2010	429431500	208181833	187711177	101367793	926692303
2011	904288245	67331667	251758513	317537850	1540916275
2012	940141504	824039552	267872113	300357920	2332411089
2013	1425047769	615456441	429582505	484924526	2955011241
2014	5166669118	8507747955	629250705	4720801320	19024469098
2015	11331330892	4061273389	1301080627	1856109676	18549794584
2016	22196696169	7646500038	3092862995	4846789855	37782849057
2017	11568260548	8066970632	1515457599	3482358996	24633047775
2018	23238654929	11436566009	3092761980	12279956366	50047939284
2019	13985928274	7067493609	2277570939	2363462159	25694454981
2020	18355815121	3901034485	2805171766	7488239781	32550261153
2021	19388154114	13809268640	3726176534	16204664908	53128264196
2022	16557661941	2388376109	4876410233	6044453621	29866901904
2023	8136033121	2366212878	5242616374	7031481020	22776343393
2024	16655596387	4515460225	5327840668	6985950940	33484848220
2025	22272678461	17680824072	9413090215	5888178080	55254770828

Source: Data has been extracted from the Space Capital Database for the United States on 8th January 2026

ii. Raw Data for India

FY	Venture Capital ($)	Corporate ($)	Angel Individual ($)	Other ($)	Total Investment ($)
2009	9000000	0	0	0	9000000
2010	0	25000000	0	0	25000000
2011	0	30000000	350000	0	30350000
2012	3000000	0	0	0	3000000
2013	27199999	0	50000	0	27249999
2014	241767200	69300000	780000	210000	312057200
2015	676923706	362302211	1463332	135564077	1176253326
2016	177584191	5904640	3042667	788500	187319998
2017	987419201	725063800	1710000	9100000	1723293001
2018	641929118	323923500	3550000	647856050	1617258668
2019	715176202	458205000	13582968	12433334	1199397504
2020	243866405	96501764	5530475	36591343	382489987
2021	1355640516	507263416	243946967	927037069	3033887968
2022	597013483	425128010	59714102	283334395	1365189990
2023	101245000	2500000	2805000	174640000	281190000

FY	Venture Capital ($)	Corporate ($)	Angel Individual ($)	Other ($)	Total Investment ($)
2024	228277164	30865833	3085833	94201166	356429996
2025	329591514	270369632	20367800	779761038	1400089984

Source: Data has been extracted from the Space Capital Database for India on 19th January 2026