

INNOVATION CAPACITY AND REGIONAL INVESTMENT ATTRACTION IN UZBEKISTAN

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ABSTRACT	KEYWORDS
This study examines whether regional innovation-economy capacity is associated with stronger investment attraction across all fourteen first-level territories of Uzbekistan during 2017-2025. A balanced panel of 126 region-year observations is compiled from the National Statistics Committee’s SIAT system. Investment attractiveness is measured through revealed outcomes: fixed investment per capita and foreign investments and loans in fixed assets per capita. The Innovation Economy Capacity Index combines within-year standardized values of information and communication services per capita and gross regional product per capita. The empirical strategy distinguishes persistent between-region advantages from within-region changes using year effects, two-way fixed effects, and a correlated-random-effects (Mundlak) decomposition. Results show a strong and statistically significant between-region association: a one-standard-deviation higher long-run innovation capacity is associated with approximately 63% higher fixed investment per capita and 62% higher foreign investment per capita. Within-region improvement is also positively associated with fixed investment; the two-way fixed-effects coefficient is 0.751 (clustered standard error 0.232), with a wild-cluster-bootstrap p-value of 0.030. The corresponding foreign-investment coefficient is positive but imprecisely estimated. The findings indicate that investment attraction is not generated by isolated digital projects alone; it depends on cumulative productivity, connectivity, business capability, and credible project pipelines. Policy should therefore combine regional innovation infrastructure with investor facilitation, skills, supplier development, and transparent monitoring. The study provides a reproducible regional dataset and code, while explicitly treating 2025 observations as preliminary and avoiding causal claims.	Regional investment attractiveness; innovative economy; digital capacity; foreign investment; regional development; Uzbekistan JEL classification: F21; O30; R11; R58; C23

Introduction

Regional investment attractiveness has become a central policy concern in economies seeking to move from factor-driven growth toward productivity- and innovation-led development. The location decisions of domestic and foreign investors are shaped not only by tax preferences or the nominal cost of labor, but also by the capacity of a territory to absorb technology, coordinate suppliers, provide reliable digital and physical infrastructure, and convert public reforms into bankable projects. These conditions are spatially uneven. Consequently, national improvements in the aggregate investment climate may coexist with persistent regional concentration of capital, knowledge-intensive activity, and high-productivity employment. [1-4, 6, 8-10]

Uzbekistan offers a particularly useful setting for studying this issue. Since the liberalization phase that accelerated after 2017, the country has expanded investment activity, opened sectors to greater private participation, strengthened digital public services, and adopted a longer-term development agenda under the Uzbekistan-2030 Strategy. Yet national reform does not automatically produce uniform regional outcomes. Tashkent city has a deep service economy and concentration of institutions; Navoi benefits from a large industrial and mining base; several densely populated regions possess labor and market scale but lower measured productivity; and peripheral territories face distance, infrastructure, environmental, or skills constraints. A regional approach is therefore necessary to identify whether innovation-related capacity is connected to the actual geography of investment. [21, 25, 26]

The concept of investment attractiveness is multidimensional and cannot be observed directly. Survey-based rankings often mix policy inputs, perceptions, and outcomes, while one-time composite ratings may be difficult to reproduce. This paper adopts a revealed-preference approach. A region is treated as more successful in attracting investment when it records higher fixed investment per resident and, as an external validation, higher foreign investment and loans in fixed assets per resident. These indicators do not capture every qualitative aspect of investment, but they are transparent, annually available, and closely connected to realized capital formation.

Innovation capacity is also measured pragmatically. Regional research-and-development, patent, venture-finance, and high-skill employment series are not consistently available for all Uzbek territories over 2017-2025. The main Innovation Economy Capacity Index therefore combines two official indicators that are available on a balanced basis: information and communication services per capita and gross regional product per capita. The former reflects digital-service intensity and connectivity; the latter reflects productivity, market depth, and absorptive capacity. Enterprise density is used only in sensitivity analysis because the official series includes a register harmonization around 2022 that may not represent pure economic change. [12-16]

The paper makes four contributions. First, it assembles a reproducible balanced panel for all fourteen first-level territories of Uzbekistan through 2025. Second, it separates cross-sectional, between-region differences from within-region change. This distinction is essential: a strong correlation between innovative regions and investment does not establish that a short-term increase in one indicator will immediately cause investment inflows. Third, it evaluates both total and foreign investment outcomes. Fourth, it translates the empirical evidence into an implementable regional policy framework based on capability building, investor facilitation, supplier development, and transparent monitoring.

The main results reveal both promise and caution. Persistent regional innovation capacity is strongly associated with higher investment outcomes. Within-region gains in the main index are significantly related to total fixed investment per capita, including under small-cluster wild-bootstrap inference, but

the foreign-investment relationship is positive and statistically imprecise. The interpretation is that innovation capacity is a necessary component of attractiveness, but foreign capital also responds to project scale, natural resources, sector-specific policy, financing structures, and discrete large projects. The rest of the paper develops this argument and presents the data, methods, findings, and policy implications.

Methodology

The dataset covers the Republic of Karakalpakstan, twelve regions, and Tashkent city from 2017 through 2025, producing 126 observations. All raw series come from the National Statistics Committee of the Republic of Uzbekistan through the SIAT integrated information system. The replication workbook records indicator codes, units, source URLs, and transformation formulas. Data were accessed on 23 July 2026. [12-16]

The primary outcome is fixed investment per capita in thousand Uzbek soums. Annual data are used for 2017-2024; the cumulative fourth-quarter observation is used for 2025 because the annual table had not yet incorporated the newest value when the dataset was assembled. The second outcome is foreign investments and loans in fixed assets per capita, constructed from the official regional volume divided by inferred population. The 2025 value is the cumulative fourth-quarter observation and is explicitly treated as preliminary. [14, 15]

Literature review

The relationship between innovation and investment location can be understood by combining the eclectic paradigm of international production, new economic geography, institutional economics, and regional innovation systems. Dunning's ownership-location-internalization framework emphasizes that investors choose locations offering advantages that complement firm-specific assets. Such advantages include market access, infrastructure, labor quality, policy stability, supplier networks, and the capacity to use knowledge efficiently. Innovation capacity strengthens several of these advantages simultaneously. [2, 6, 7, 18]

New economic geography highlights cumulative causation. Once a territory develops a concentration of skilled labor, specialized services, infrastructure, and customers, additional firms may locate there to benefit from lower transaction costs and thicker markets. Agglomeration can improve matching between firms and workers, facilitate supplier specialization, and accelerate knowledge diffusion. However, concentration can also widen regional disparities if lagging territories lack connectivity and absorptive capacity. The relevant policy question is therefore not whether every region should replicate the capital city, but which complementary capabilities allow each territory to convert its own sectoral assets into investable opportunities. [3, 4, 8, 9, 20]

Regional innovation-system theory views innovation as an interactive process involving firms, universities, public agencies, financial institutions, and intermediaries. The quantity of formal research is only one element. Adoption, engineering, workforce learning, software use, logistics, and organizational change also matter. The Oslo Manual similarly treats innovation activities broadly, including software, databases, training, design, and acquisition of tangible assets. This broader perspective is appropriate for emerging regional economies where technology adoption and diffusion may generate larger short-run productivity gains than frontier research. [2, 6, 10, 17, 19]

Digital and information services reduce search, coordination, and monitoring costs. They can make a region more visible to investors, improve communication with public authorities, support remote professional services, and enhance the operation of logistics and production networks. Digitalization also increases the value of complementary infrastructure and skills. Nevertheless, ICT activity by itself may be concentrated in consumer services and may not generate industrial investment unless it connects to productive firms, public data systems, and qualified labor. [23, 26]

Regional productivity and income per capita proxy for market depth, workforce capability, infrastructure quality, and the accumulated result of institutions. A productive territory is generally better able to absorb advanced equipment and managerial practices. Yet a high level of GRP per capita may also reflect resource endowments or capital-intensive industries, so empirical results must be interpreted as associations rather than direct effects of innovation policy. [7, 20, 25]

The analysis therefore distinguishes two hypotheses. H1 states that regions with persistently higher innovation-economy capacity attract more total and foreign investment per capita. H2 states that improvements in innovation capacity within a region are followed by stronger investment outcomes. H1 is fundamentally a between-region proposition about accumulated capabilities. H2 is a more demanding within-region proposition and may be weakened by implementation lags, large discrete projects, measurement error, and the short nine-year observation period.

A conceptual implication follows. Regional investment attraction should be modeled as a system rather than a single incentive. Innovation capacity influences information costs, productivity, supplier depth, and project execution. Regional conditions such as infrastructure, institutions, and skills moderate these channels. Investment then feeds back through technology transfer, demand for services, and fiscal resources. Figure 1 summarizes this framework. [2, 6, 22]

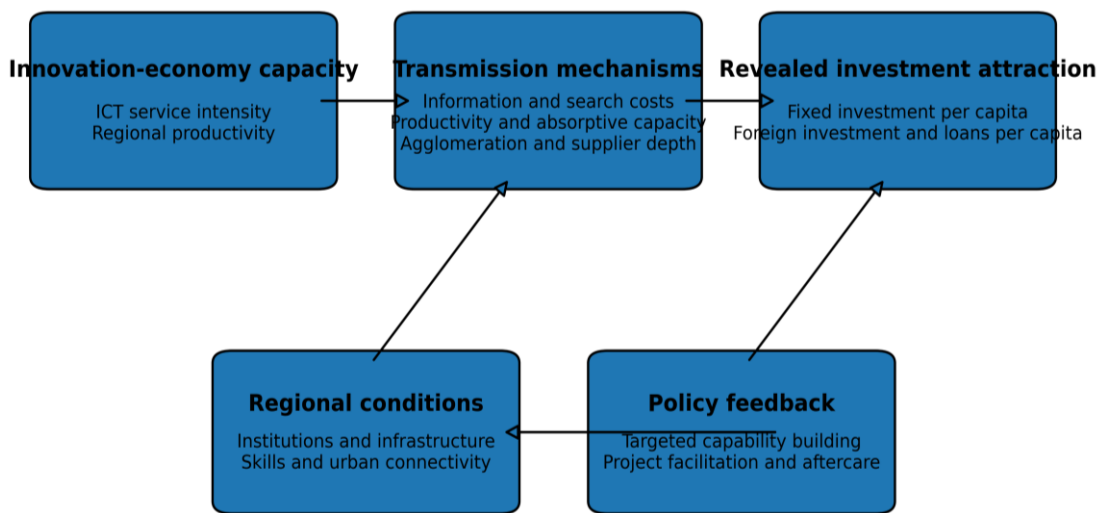


Figure 1. Conceptual framework linking innovation-economy capacity to regional investment attraction.

Results and analysis

Uzbekistan's regional economy combines marked diversity with a common national policy framework. Tashkent city is the country's largest administrative, financial, educational, and service center. Navoi has high output per capita associated with mining, metallurgy, and large industrial assets. Tashkent region benefits from proximity to the capital and a diversified industrial base. Bukhara, Kashkadarya, and several other territories host important energy, resource, agricultural, and tourism activities. The Fergana Valley regions combine high population density, manufacturing traditions, entrepreneurship, and strong domestic market potential. Karakalpakstan and more remote territories confront distinctive environmental and connectivity challenges.

The national reform agenda creates common opportunities, but regional implementation capacity determines how quickly they become investable projects. The World Bank's recent assessment of Uzbekistan emphasizes private-sector-led growth, stronger competition, market integration, infrastructure quality, and improved allocation of finance. UNCTAD's analysis of the digital economy similarly argues that digital infrastructure, skills, and regulatory frameworks shape the ability of countries and regions to attract modern investment. These observations support a focus on productive capability rather than stand-alone promotional campaigns. [23, 25, 26]

Official data also show rapid nominal growth in investment and regional output over the study period, alongside substantial dispersion. In 2025, the presentation-scale innovation index ranges from 0 for the lowest-scoring territory to 100 for Tashkent city. Navoi combines the highest foreign investment per capita with high productivity, while Namangan records very strong foreign-investment performance despite a lower innovation-index rank, illustrating the role of discrete projects and sector-specific factors. The regional ranking should therefore be used diagnostically, not as a definitive league table. [12-15]

The 2017-2025 period includes major structural reforms, the COVID-19 shock, changes in global financing conditions, and accelerated investment after 2022. Year fixed effects are included to absorb national shocks common to all regions. Region fixed effects absorb time-invariant characteristics such as geography, long-standing industrial structure, and persistent natural-resource endowments.

Population is inferred consistently as nominal GRP in billion soums divided by GRP per capita in thousand soums, yielding population in millions. This approach aligns the denominator with the regional national-accounts series and produces values close to official population totals. ICT services per capita are calculated as communication and information services in billion soums divided by population in millions. Enterprise density is the number of operating enterprises and organizations divided by population in thousands. [12, 13, 16]

The main Innovation Economy Capacity Index, IECI, is the equal-weighted mean of two components: the natural logarithm of ICT services per capita and the natural logarithm of GRP per capita. Each component is standardized within each year across the fourteen territories. Annual standardization removes common nominal inflation and national trends and measures each region's relative capacity in a given year. The resulting index has mean zero within each year. A 0-100 min-max transformation is used only in the regional ranking and figures; regressions use the standardized index. Table 1 summarizes the variables, transformations, and official data sources used in the analysis. [12, 13, 19]

Table 1. Variable definitions and official data sources

Variable	Construction	Role	Source
Fixed investment per capita	Investment in fixed assets divided by regional population; thousand UZS.	Primary revealed-investment-attraction outcome.	NSC/SIAT codes and 1.04.01.0006 and 1.04.01.0007
Foreign investment and loans per capita	Foreign investments and loans in fixed assets divided by regional population; thousand UZS.	External-capital attraction outcome.	NSC/SIAT codes and 1.04.01.0025 and 1.04.01.0026
ICT services per capita	Communication and information services volume divided by population; thousand UZS.	Digital and knowledge-service capacity.	NSC/SIAT code 1.05.01.0019
GRP per capita	Gross regional product per resident; thousand UZS.	Productivity, market depth and absorptive capacity.	NSC/SIAT code 1.01.03.0003
Innovation Economy Capacity Index (IECI)	Equal-weight mean of within-year z-scores of log ICT services per capita and log GRP per capita.	Main explanatory variable; 0-100 rescaling used only for presentation.	Authors calculation
Enterprise density	Operating enterprises and organizations per 1,000 residents.	Sensitivity-test business ecosystem measure.	NSC/SIAT code 1.09.01.0023

Notes: NSC denotes the National Statistics Committee of the Republic of Uzbekistan. All transformations are reproduced in the accompanying workbook and code.

The baseline year-effects model estimates the association between IECI and investment after controlling for national year shocks. The two-way fixed-effects model adds region fixed effects and therefore identifies the coefficient from changes within a region relative to the national annual distribution. Standard errors are clustered by region. Because the number of clusters is only fourteen, the primary fixed-effects result is also evaluated with a Rademacher wild-cluster-bootstrap procedure using 999 replications. [5, 24]

The correlated-random-effects, or Mundlak, specification decomposes IECI into the region's 2017-2025 mean and the annual deviation from that mean. The between coefficient captures whether regions with persistently stronger innovation capacity also have higher investment outcomes. The within coefficient is algebraically related to fixed-effects identification and captures whether a region performs better in years when its relative innovation capacity is above its own long-run mean. [11, 24] Robustness checks use a one-year lag of IECI, exclude Tashkent city and Navoi as influential high-capacity territories, estimate models with the two index components separately, and introduce an alternative three-component index that includes enterprise density. The latter is deliberately classified as a sensitivity test because the official enterprise series notes database harmonization around 2022. No result is interpreted as causal. Investment can itself raise productivity and demand for ICT services, and omitted project-level conditions may influence both sides of the relationship. [16, 24]

The model can be written as $\ln(I_{it}) = \beta IECI_{it} + \alpha_i + \gamma_t + \epsilon_{it}$, where I_{it} is investment per capita in region i and year t , α_i are region effects, and γ_t are year effects. For the Mundlak decomposition, $IECI_{it}$ is replaced by its region mean and within-region deviation. Log outcomes make coefficients interpretable as approximate percentage differences, with exact semi-elasticities calculated as $100[\exp(\beta)-1]$. [11, 24]

Descriptive statistics confirm large regional variation. Average fixed investment per capita is approximately 8.8 million soums over the full panel, while average foreign investment and loans per capita is approximately 5.0 million soums. The distributions are right-skewed because of high-

investment observations in Navoi, Tashkent city, Tashkent region, Bukhara, and selected project years elsewhere. The unconditional correlation between log fixed investment per capita and log GRP per capita is high, but this correlation combines persistent regional structure, common nominal growth, and within-region change. Table 2 reports descriptive statistics for the full regional panel. [12-15]

Table 2. Descriptive statistics, 2017-2025 (N = 126)

Variable	Mean	SD	Min	P25	Median	P75	Max
Fixed investment pc	8,768.03	7,510.43	822.40	3,818.75	6,089.75	10,882.95	39,076.60
Foreign investment pc	5,001.42	5,627.54	33.04	1,292.39	3,024.25	6,858.26	32,061.51
ICT services pc	783.50	2,234.32	87.23	192.28	273.53	454.42	18,365.95
GRP pc	25,725.51	23,192.87	6,954.20	12,684.17	19,422.50	27,390.88	152,238.20
Enterprise density	12.46	6.45	5.23	8.28	10.82	14.16	39.29
IECI (z-score)	0.00	0.91	-0.80	-0.47	-0.36	0.02	2.94

Notes: Monetary per-capita variables are in thousand UZS. IECI is standardized within year.

The year-effects specifications show that IECI is positively associated with both investment measures. The more demanding two-way fixed-effects result is strongest for total fixed investment. The coefficient of 0.751, with a clustered standard error of 0.232, is statistically significant at the one-percent level under conventional cluster inference. The wild-cluster-bootstrap p-value is 0.030. In exact semi-elasticity terms, a one-unit increase in the standardized index is associated with about 112% higher fixed investment per capita, conditional on region and year effects. This large magnitude should not be interpreted as a structural causal elasticity because the index measures a relative cross-sectional position and may partly proxy for broader changes in productive capacity. Table 3 reports the main panel regression estimates.

The corresponding foreign-investment coefficient is 1.028 with a standard error of 0.676. Its sign and magnitude are economically meaningful, but the conventional p-value is 0.128 and the wild-bootstrap p-value is 0.205. Foreign investment is therefore more volatile and less precisely linked to annual innovation-capacity movements. Large energy, mining, infrastructure, or manufacturing projects can dominate a region-year observation, while financing arrangements and government guarantees may matter more than incremental changes in the regional service economy.

Lagged models remain positive but are not statistically significant at conventional levels. This result is consistent with several explanations: investment decisions have heterogeneous planning horizons; the nine-year panel provides limited time variation; and the annual index is measured with error. The lagged result does not overturn the contemporaneous fixed-investment finding, but it reinforces the need to avoid a simple causal narrative.

Table 3. Main panel regression results

Variable	Foreign: year FE	Foreign: two-way FE	Foreign: lagged IECI	Total: year FE	Total: two-way FE	Total: lagged IECI
IECI (contemporaneous)	0.488*** (0.160)	1.028 (0.676)	-	0.493*** (0.104)	0.751*** (0.232)	-
IECI (one-year lag)	-	-	0.974 (0.695)	-	-	0.440 (0.292)
Region fixed effects	No	Yes	Yes	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	126	126	112	126	126	112
R-squared	0.770	0.897	0.886	0.803	0.943	0.937

Notes: Dependent variables are in natural logarithms. Standard errors clustered by region are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The wild-cluster-bootstrap p-values for the two-way fixed-effects IECI coefficients are 0.205 for foreign investment and 0.030 for total investment (999 replications).

The Mundlak decomposition provides the clearest substantive result. The between-region coefficient is 0.491 for total investment and 0.483 for foreign investment, both statistically significant. These coefficients imply that a one-standard-deviation higher long-run innovation-capacity position is associated with roughly 63% higher fixed investment per capita and 62% higher foreign investment per capita. Persistent capabilities-rather than isolated annual initiatives-are strongly connected to the geography of investment. Table 4 presents the corresponding Mundlak between-within decomposition. For total investment, the within coefficient in the Mundlak model is 0.751 and statistically significant. For foreign investment, the within coefficient is 1.028 but imprecisely estimated. The contrast suggests that domestic capital formation and the aggregate investment process respond more consistently to changes in regional productivity and ICT-service intensity, whereas foreign investment additionally depends on a smaller number of complex projects and national-level decisions.

Table 4. Mundlak between-within decomposition

Variable	Foreign investment per capita	Total fixed investment per capita
Within-region IECI deviation	1.028 (0.639)	0.751*** (0.219)
Between-region mean IECI	0.483*** (0.162)	0.491*** (0.104)
Year fixed effects	Yes	Yes
Observations	126	126
R-squared	0.771	0.804

Notes: The within component is the annual deviation from each region's 2017-2025 mean IECI. The between component is the region mean. Year fixed effects and region-clustered standard errors are used.

The 2025 ranking illustrates both alignment and exceptions. Tashkent city has the highest IECI score and ranks second in foreign investment per capita. Navoi ranks second in IECI and first in foreign investment per capita. Tashkent region also ranks near the top on both measures. Bukhara and Syrdarya combine above-median innovation capacity with substantial investment. Namangan is the most notable positive outlier: its foreign-investment rank is much higher than its IECI rank, which likely reflects large projects not fully captured by the two-component index. Such exceptions are analytically useful because they identify cases for project-level follow-up. Figure 2 visualizes the 2025 relationship between regional innovation capacity and foreign investment and loans per capita. [12-15]

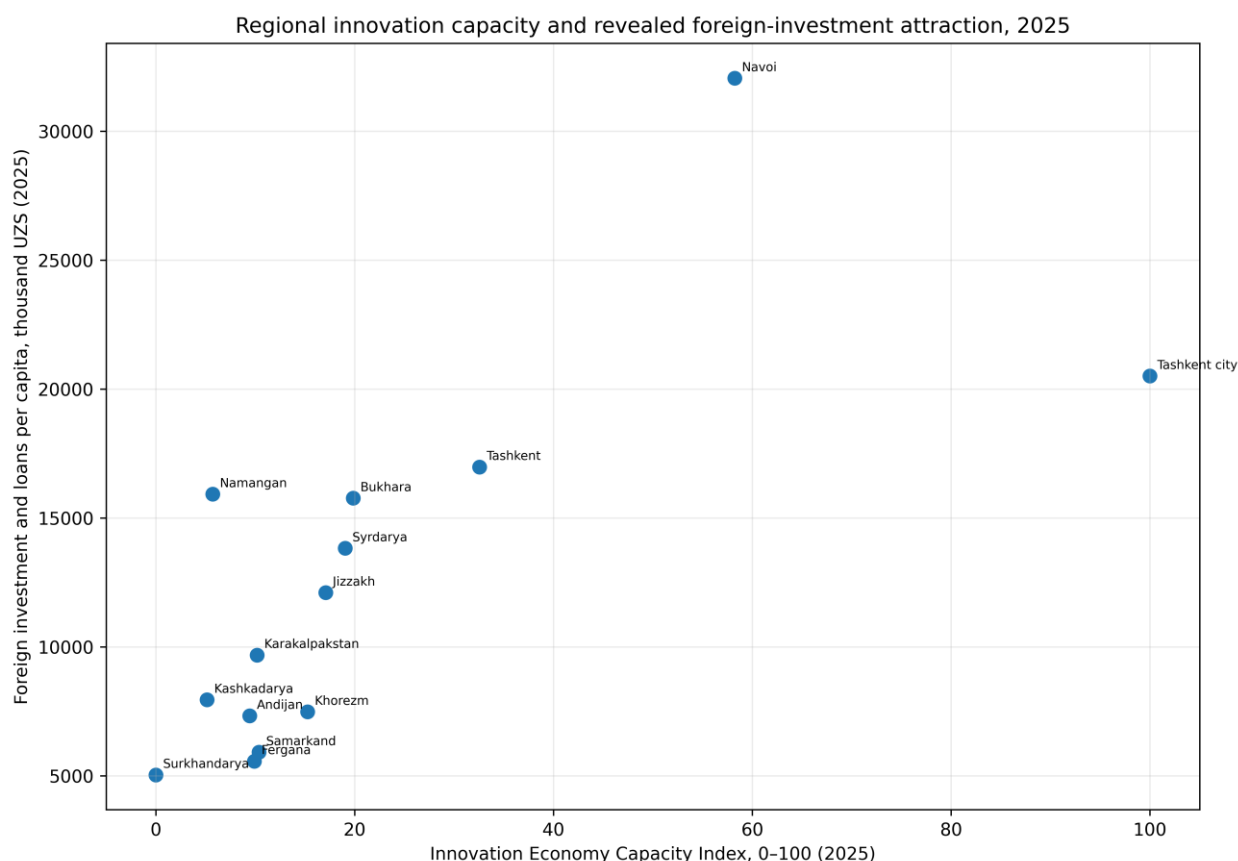


Figure 2. Regional innovation capacity and foreign investment and loans per capita, 2025.

Robustness results are informative. Excluding Tashkent city and Navoi does not reverse the positive coefficients, although precision declines. Estimating ICT services and GRP per capita separately shows that the components are highly collinear after fixed effects, so individual coefficients are unstable even when the composite index is informative. Adding enterprise density to create a three-component index weakens the within-region result, consistent with the documented register harmonization. This sensitivity supports the decision to use the two-component IECI as the main measure and to disclose the alternative rather than conceal it. [16]

Discussion

The evidence supports a capability-based interpretation of regional investment attractiveness. Regions with stronger and more persistent innovation-economy capacity attract more investment, and improvements in relative capacity are associated with greater total capital formation. However, the

foreign-investment result warns against treating digitalization as a stand-alone promotional instrument. Investors require a complete chain from information and infrastructure to skills, suppliers, permits, utilities, finance, and project execution. [2, 6, 7, 20, 22]

First, regional policy should replace generic investment-potential brochures with data-backed project pipelines. Each territory should maintain a small set of priority projects with verified land status, utility capacity, transport access, expected demand, environmental requirements, skills needs, and financing structure. Digital platforms are valuable when they reduce due-diligence costs and provide reliable project information, not merely when they display promotional content. [23, 25]

Second, innovation infrastructure should be tied to sectoral specialization. In industrial regions, technology-extension services can help local suppliers meet quality, energy-efficiency, and certification requirements. In agricultural territories, digital traceability, cold-chain management, water-saving technologies, and food-processing laboratories may be more relevant than general-purpose technology parks. In tourism regions, digital booking, heritage management, transport integration, and service training can raise the productivity of the destination ecosystem. [2, 6, 22, 26]

Third, regional investor facilitation should include aftercare. Existing investors are a source of reinvestment, supplier upgrading, workforce training, and credible information for new investors. Regional teams should track operational bottlenecks after project launch and publish resolution times. This converts investment policy from one-time attraction into a cumulative learning process. [7, 20, 25]

Fourth, skills policy should be linked to actual project demand. Universities, vocational institutions, and employers can use rolling occupational forecasts for priority projects. Short modular programs in industrial maintenance, automation, data analysis, quality control, logistics, languages, and project management may generate faster returns than expanding generic enrollment without employer coordination. [22, 25, 26]

Fifth, lagging regions require connectivity and institutional reliability before sophisticated incentives. Reliable electricity, broadband, freight connections, land administration, and predictable permits are foundational. National equalization and infrastructure programs can reduce the fixed cost of participation in the innovative economy, while competitive regional grants can reward measurable improvements in project readiness and service delivery. [23, 25, 26]

Sixth, evaluation should focus on outcomes and additionality. A regional investment-attractiveness dashboard can track fixed investment per capita, foreign investment per capita, reinvestment, export entry, supplier contracts, skilled employment, project completion, utility connection times, and investor aftercare. The IECI can serve as a diagnostic indicator, but should not become a target that encourages nominal growth in ICT services without productive impact. [19, 23, 25]

A practical policy sequence has four stages. Stage one establishes the evidence base and cleans regional project data. Stage two closes critical infrastructure and skills bottlenecks. Stage three connects local firms and institutions to anchor investors. Stage four evaluates additionality and scales interventions that improve both productivity and investment. This sequence recognizes that durable attractiveness is cumulative and cannot be produced by a single decree or promotional event. [2, 6, 18, 22]

The study has several limitations. The panel contains only fourteen clusters and nine years, reducing statistical power. Official regional innovation indicators are limited, so IECI is a capacity proxy rather than a complete innovation-system measure. Nominal per-capita series are standardized within year to reduce inflation effects, but relative values may still reflect sector-specific price changes. Foreign

investment and loans combine financing types and may include government-supported projects. The inferred population denominator introduces small measurement differences. The 2025 observations are preliminary, and the enterprise series has a documented methodological break. [12-16]

Future work should add regional R&D expenditure, patents, broadband quality, education and skills, firm productivity, export complexity, and project-level greenfield investment when consistent data become available. Spatial models could test spillovers from neighboring territories and transport corridors. Project-level event studies could distinguish policy effects from the timing of large investments. Investor surveys could complement revealed outcomes with information on decision criteria and post-investment constraints. [3, 4, 22, 23, 25]

Conclusion

This paper provides a reproducible assessment of innovation capacity and regional investment attraction across all first-level territories of Uzbekistan from 2017 to 2025. The evidence shows that persistent innovation-economy capacity is strongly associated with both total and foreign investment per capita. Within-region improvements are significantly related to total fixed investment, while the foreign-investment relationship is positive but less precisely estimated.

The central policy lesson is that innovation and investment policies should be integrated. Digital services and higher productivity improve attractiveness when they are connected to infrastructure, skills, suppliers, credible projects, and effective public administration. Regional strategies should therefore focus on cumulative capability building and investor aftercare rather than isolated incentives or rankings. [2, 6, 19, 23, 25]

The results are best interpreted as disciplined evidence for policy design, not as a causal estimate. Even with this caution, the between-within distinction is valuable: Uzbekistan's investment geography reflects long-standing regional capabilities, while measurable improvements in those capabilities can support broader capital formation. The included data, code, source log, and robustness checks are intended to facilitate verification and extension. [11, 24]

REFERENCES

1. Acs, Z. J., de Groot, H. L. F., & Nijkamp, P. (Eds.). (2002). *The emergence of the knowledge economy: A regional perspective*. Springer.
2. Asheim, B. T., & Gertler, M. S. (2005). The geography of innovation: Regional innovation systems. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford handbook of innovation* (pp. 291-317). Oxford University Press.
3. Audretsch, D. B., & Feldman, M. P. (1996). R&D spillovers and the geography of innovation and production. *American Economic Review*, 86(3), 630-640.
4. Boschma, R. (2005). Proximity and innovation: A critical assessment. *Regional Studies*, 39(1), 61-74. <https://doi.org/10.1080/0034340052000320887>
5. Cameron, A. C., Gelbach, J. B., & Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. *Review of Economics and Statistics*, 90(3), 414-427. <https://doi.org/10.1162/rest.90.3.414>
6. Cooke, P., Uranga, M. G., & Etzebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy*, 26(4-5), 475-491. [https://doi.org/10.1016/S0048-7333\(97\)00025-5](https://doi.org/10.1016/S0048-7333(97)00025-5)

7. Dunning, J. H. (1988). The eclectic paradigm of international production: A restatement and some possible extensions. *Journal of International Business Studies*, 19(1), 1-31. <https://doi.org/10.1057/palgrave.jibs.8490372>
8. Feldman, M. P. (1994). *The geography of innovation*. Kluwer Academic Publishers.
9. Krugman, P. (1991). *Geography and trade*. MIT Press.
10. Lundvall, B.-Å. (Ed.). (1992). *National systems of innovation: Towards a theory of innovation and interactive learning*. Pinter.
11. Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica*, 46(1), 69-85. <https://doi.org/10.2307/1913646>
12. National Statistics Committee of the Republic of Uzbekistan. (2026a). Gross regional product and gross regional product per capita, annual regional series. SIAT Integrated Information System.
13. National Statistics Committee of the Republic of Uzbekistan. (2026b). Communication and information services, annual regional series. SIAT Integrated Information System.
14. National Statistics Committee of the Republic of Uzbekistan. (2026c). Investment in fixed assets per capita, annual and quarterly regional series. SIAT Integrated Information System.
15. National Statistics Committee of the Republic of Uzbekistan. (2026d). Foreign investments and loans in fixed assets, annual and quarterly regional series. SIAT Integrated Information System.
16. National Statistics Committee of the Republic of Uzbekistan. (2026e). Operating enterprises and organizations, annual regional series. SIAT Integrated Information System.
17. Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Harvard University Press.
18. North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.
19. OECD/Eurostat. (2018). *Oslo Manual 2018: Guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing. <https://doi.org/10.1787/9789264304604-en>
20. Porter, M. E. (1990). *The competitive advantage of nations*. Free Press.
21. President of the Republic of Uzbekistan. (2023). On the Uzbekistan-2030 Strategy, Decree No. PF-158 of 11 September 2023. LexUZ.
22. Rodríguez-Pose, A., & Crescenzi, R. (2008). Research and development, spillovers, innovation systems, and the genesis of regional growth in Europe. *Regional Studies*, 42(1), 51-67. <https://doi.org/10.1080/00343400701654186>
23. UNCTAD. (2025). *World Investment Report 2025: International investment in the digital economy*. United Nations.
24. Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press.
25. World Bank. (2024). *Uzbekistan Country Economic Memorandum: Fostering private sector-led growth and global integration*. World Bank.
26. World Bank. (2025). *At your service? The promise of services-led growth in Uzbekistan*. World Bank.