

American Journal of Economics and Business Management

Vol. 9 Issue 10 | **pp.** 208-221 | **ISSN:** 2576-5973
Available online @ https://www.globalresearchnetwork.us/index.php/ajebm

Article

Measuring Investment in Start-ups within Official Statistics: A Register-Based Methodological Framework and Pilot Evidence from Uzbekistan

Jomolov Muzaffar Mirzoxitovich

1. Head of Investment and Construction Statistics Department, National Statistics Committee of the Republic of Uzbekistan, Independent researcher of ISAT&SR, Tashkent, Uzbekistan

* Correspondence: jomolovmuzaffar@gmail.com

Abstract: Start-ups are increasingly targeted by public policy, yet official statistics in most emerging economies do not measure how much investment start-ups actually receive or what economic results follow. This paper develops a register-based methodological framework for the statistical measurement of investment in start-ups and its performance and pilots it on data for Uzbekistan and its regions for 2021–2024. The framework defines the start-up enterprise, identified by its taxpayer identification number (TIN) in the Unified State Register of Enterprises and Organisations, as the statistical unit; integrates the national start-up registry, the business register, enterprise statistical reports and administrative data through deterministic record linkage; counts only funds actually disbursed and received; and applies explicit rules against double counting. Nine indicators are organised in two blocks – volume, coverage and structure, and performance – each anchored in national – accounts, business demography and investment-efficiency concepts and complemented by a cohort design. The pilot shows that total start-up funding rose from 26.2 to 176.8 billion UZS, remained highly concentrated in Tashkent city (87–94%) and was financed overwhelmingly by resident sponsors and own funds (82–96%), with foreign and debt sources marginal. Revenue per 100 UZS of funding reached 20.7 UZS in 2024, whereas revenue growth per 100 UZS of funding fell to 2.3 UZS. Extreme ratios in regions with very small denominators, and coverage rates above 100%, reveal population inconsistencies between sources and underline the need for register-based integration. The framework can serve as a basis for experimental official statistics on start-up investment in Uzbekistan and comparable economies.

Keywords: start-up statistics; investment measurement; official statistics; record linkage; business register; business demography; experimental statistics; Uzbekistan

Citation: Mirzoxitovich, J. M. Measuring Investment in Start-ups within Official Statistics: A Register-Based Methodological Framework and Pilot Evidence from Uzbekistan. American Journal of Economics and Business Management 2026, 9(10), 208-221

Received: 13th Jul 2026
Revised: 28th Aug 2026
Accepted: 15th Sep 2026
Published: 08th Oct 2026

Copyright: © 2026 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/)

1. Introduction

Young innovative firms contribute disproportionately to job creation and productivity growth [1], and cross-country evidence shows that a declining share of young firms weakens structural change in many economies [2]. Governments in both advanced and emerging economies have therefore introduced dedicated support schemes – tax regimes, grants, accelerators and public venture funds – aimed at start-ups. The design and evaluation of such policies, however, depend on reliable statistical information on how much finance start-ups actually receive, from which sources, and with what economic results. In most countries this information comes from commercial deal databases and ecosystem reports, which record announced transactions, cover mainly

equity rounds and are not integrated with official enterprise statistics [3]; only recently has the OECD begun to build a start-ups database that combines register-based and commercial sources to improve comparability [4].

Uzbekistan illustrates the problem well. The domestic start-up ecosystem has expanded rapidly: according to IT Park Ventures, the ecosystem grew by 132% in 2025 and venture deals reached USD 329 million [5], while the number of start-ups was reported to have increased from about 400 to 750 [6]. At the same time, the national statistical system has been reformed through the Law on Official Statistics [7] and the reorganisation of the National Statistics Committee [8]. Nevertheless, official statistics still contain no indicators on investment in start-up projects: start-up data are dispersed across the IT Park registry, the business register and tax, labour and customs records, and the notion of "investment" itself spans fixed capital investment, venture finance, grants and loans.

Measuring the effectiveness of such investment is even more demanding, because economic outcomes of start-ups depend on many factors other than finance – team capabilities, market conditions and technology – so that causal attribution cannot be established from aggregate ratios alone. A statistical framework must therefore separate what can be measured reliably by official statistics from what requires dedicated impact-evaluation designs.

The statistical measurement of start-ups builds on business demography, which records enterprise births, deaths and survival using business registers. The Eurostat–OECD manual defines the active enterprise as one with turnover or employment in the reference period and provides harmonised definitions of births and survival [9], which are now implemented in regular Eurostat entrepreneurship indicators [10]. Innovation- and R&D-related aspects of start-ups are covered by the Oslo Manual [11] and the Frascati Manual [12], but these manuals are not designed to measure the flows of finance received by start-ups or the results associated with them. Data on start-up finance are dominated by commercial venture-capital databases, which, as noted above, differ in coverage, often record announced rather than realised amounts and leave grants, loans and founders' funds largely invisible; the OECD scoreboard on financing SMEs and entrepreneurs likewise reports persistent gaps in the measurement of early-stage finance [13]. For emerging economies, where venture markets are thin and much start-up finance comes from sponsors, own funds and public programmes, deal-based measurement is particularly incomplete.

Official statistics increasingly rely on administrative registers integrated through common identifiers rather than on dedicated surveys [14]. The theoretical basis for linking records across files was laid by Fellegi and Sunter [15]; where a reliable unique identifier exists, deterministic linkage on that identifier is the preferred option. The Generic Statistical Business Process Model structures the integration, validation and aggregation stages of statistical production [16], while the Fundamental Principles of Official Statistics [17] and statistical disclosure control methods [18] set requirements for impartiality, transparency and confidentiality.

The aggregation of investment flows follows the national accounting tradition established by Stone [19] and codified in the SNA 2008 [20], while the normalisation of aggregates by gross domestic product rests on Kuznets' national income concept [21]. Ratios of results to invested capital originate in the return-on-investment (ROI) system developed at DuPont [22]. Relating changes in output to investment corresponds to the inverse of the incremental capital–output ratio (ICOR) used in Harrod's [23] and Domar's [24] growth models and, more broadly, to Keynes' marginal efficiency of capital [25]. These concepts provide interpretable benchmarks, but in a statistical framework they measure associations between investment and results rather than causal effects.

Studies of Uzbekistan have analysed fixed capital investment in the context of digital transformation [26] and developed approaches to assessing the socio-economic development of regions [27], including methods of selecting indicators for comprehensive assessment [28] and priority directions of regional statistical research [29]. Investment statistics are governed by the methodological guidelines [30] and the methodological

regulation [31] of the National Statistics Committee, within the legal framework for investment activity [32]. However, no study has yet proposed a statistical framework for measuring investment in start-ups within the official statistical system.

This paper addresses these gaps. Its aim is to develop a methodological framework for the statistical measurement of investment directed to start-ups and of its performance that is consistent with the principles of official statistics, the System of National Accounts (SNA) and international statistical manuals, and to test the framework on pilot data for Uzbekistan. The paper makes three contributions. First, it proposes a register-based design in which the start-up enterprise, identified by its taxpayer identification number (TIN), is the statistical unit, and data from several agencies are integrated at this level. Second, it specifies a coherent system of nine indicators covering the volume, coverage, structure and performance of start-up funding, each linked to an established methodological foundation. Third, it applies the indicators to regional data for 2021–2024, showing both the analytical value of the framework and the data-quality problems that it helps to expose.

The remainder of the paper is organised as follows. Section 2 presents the methodology. Section 3 reports the pilot results and discusses the findings and limitations, and Section 4 concludes.

2. Materials and Methods

2.1 Statistical unit and scope

The statistical unit is the **start-up enterprise**: a legal entity included in the start-up registry and identified by its TIN in the Unified State Register of Enterprises and Organisations (USREO) maintained by the National Statistics Committee. The choice of the legal unit is deliberate: only at this level can revenue, investment, exports and employment be measured reliably through official statistical reports. Ideas and projects without legal-entity status may be monitored by the registry operator, but they are excluded from the core indicators, since including units that cannot be measured would bias the aggregates.

Following the business-demography approach of the Eurostat–OECD manual, an **economically active start-up enterprise** is defined as one that shows at least one of the following in the reference period: revenue, output, exports, investment, employment or tax-administrative activity. The use of several alternative criteria is consistent with the Eurostat–OECD definition of an active enterprise.

A key principle is that only **funds actually disbursed by the provider and received by the start-up** are counted. Investment agreements, pledged amounts and investment intentions registered on platforms are excluded from the core indicators, because the gap between announced and realised funding in start-up ecosystems can be large. Relying only on realised amounts confirmed in reports satisfies the principles of objectivity and comparability of official statistics.

2.2 Data sources and integration

The indicators are compiled by integrating four sources: (i) the list of start-up projects and enterprises maintained by IT Park under the Ministry of Digital Technologies; (ii) the USREO (enterprise name, region code, economic activity, size class, activity status and date of establishment); (iii) statistical reports submitted by legal entities (revenue, investment, exports, employment); and (iv) administrative data on taxes, labour and foreign trade.

Records are combined by deterministic record linkage on the TIN into a single enterprise profile. This approach maximises the use of existing administrative and statistical data, avoids additional response burden and improves data quality, and is therefore preferred to new primary surveys. Two rules prevent double counting. If one enterprise implements several start-up projects, the core indicators are recorded once at enterprise level; if one project is implemented through several legal entities, each is a separate unit, but any single funding amount is attributed only once. Without these rules aggregate funding would be artificially inflated. Where sources disagree, a predefined

source-priority rule is applied and the discrepancy is logged. The overall framework is shown in Figure 1.

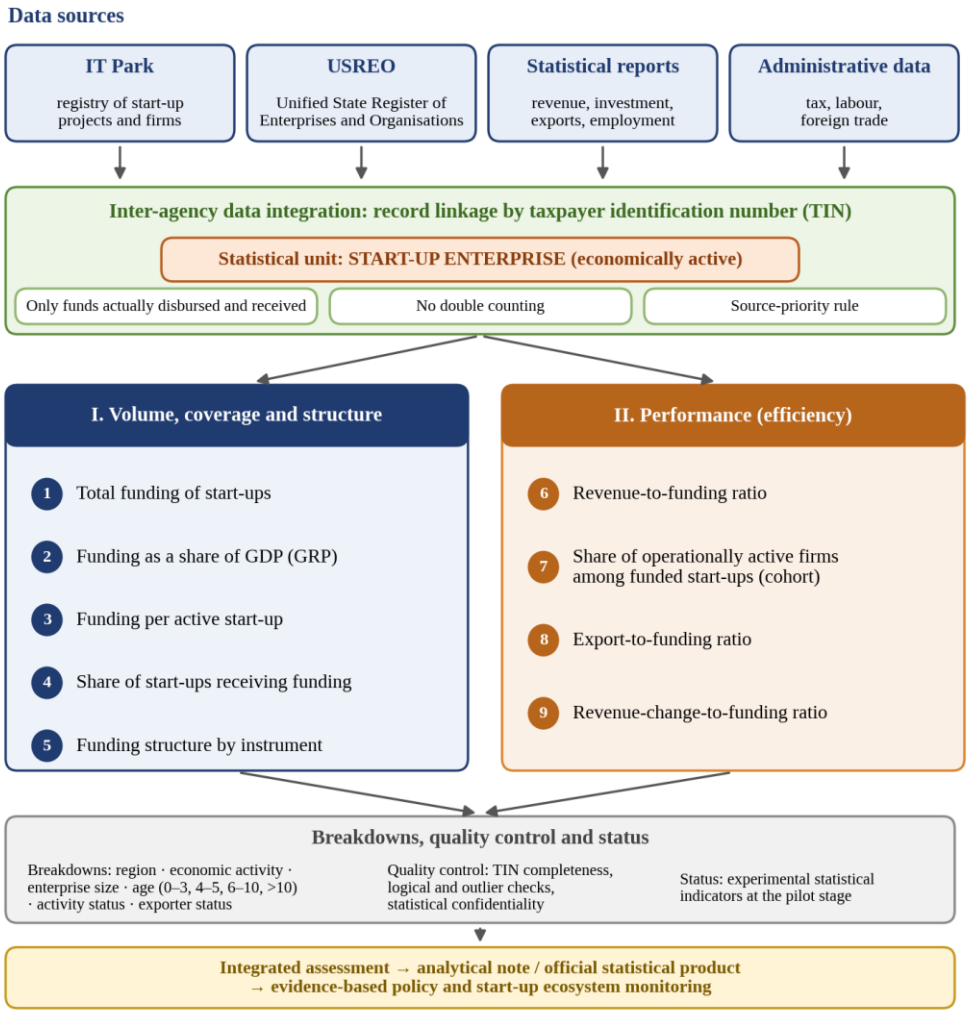


Figure 1. Framework for measuring investment in start-ups and its performance
Source: developed by the authors.

2.3 Indicator system

The indicators are grouped into two blocks: (I) volume, coverage and structure of funding and (II) performance. Their formulas are given below and summarised, together with their methodological foundations, in Table 1.

Block I. Volume, coverage and structure. Total funding of start-ups aggregates all funding operations that meet the inclusion criteria:

$$I_s = \sum_{i=1}^{n} I_i \qquad (1)$$

where I_i is the funding actually disbursed to and received by start-up enterprise i in the reference period and n is the number of funded start-ups (or funding units included in the core accounts). All relative and performance indicators use I_s as their base. To make the aggregate comparable across economies of different size and over time, it is expressed as a share of GDP (for regions, gross regional product, GRP); this is treated as a supplementary analytical rather than a core indicator:

$$K_{GDP} = \frac{I_s}{GDP} \times 100 \qquad (2)$$

Funding intensity per economically active start-up normalises the aggregate by the size of the start-up population, since two regions with equal total funding may differ radically in funding per firm:

$$K_I = \frac{I_s}{N_{fs}} \qquad (3)$$

where N_{fs} is the number of operationally active start-ups in the reference population at the reference date. Coverage is measured by the share of active start-ups that received

funding, because a high total concentrated in a few firms signals concentration rather than breadth of the ecosystem:

$$U_{inv} = \frac{N_{is}}{N_{fs}} \times 100 \quad (4)$$

where N_{is} is the number of start-ups in the reference population that received funding during the period. By construction, $0 \le U_{inv} \le 100\%$, provided that the numerator is a subset of the denominator. Finally, the structure of funding is computed only for economically mutually exclusive financial instruments – equity, debt, grants and other separately identified instruments – so that the shares sum to 100%:

$$U_a = \frac{I_a}{I_s} \times 100, \ \sum_a U_a = 100 \quad (5)$$

Provider sector, residence, venture status, programme or delivery channel, funding stage, transaction status and purpose are additional independent classification variables; amounts broken down by them are not added back to the instrument total.

Block II. Performance. Performance indicators express statistical ratios between funding and economic results. They measure associations rather than causal effects, because start-up outcomes depend on many factors besides finance. The revenue-to-funding ratio relates the revenue of funded start-ups to the funding they received and is rooted in ROI analysis:

$$K_{RF} = \frac{R_{is}}{I_s} \quad (6)$$

where R_{is} is the revenue of funded start-ups in the reference period or in the relevant post-funding period. The indicator does not measure additional revenue caused by funding or the investor's financial return. The share of operationally active firms among funded start-ups is computed for a fixed funding cohort:

$$K_{AF}(\tau) = \frac{N_{AF}(\tau)}{N_{C0}} \times 100, \ \tau = t, t+1, t+2, t+3 \quad (7)$$

where N_{C0} is the number of start-ups in the initial funding cohort and $N_{AF}(\tau)$ is the number of them found operationally active in period τ. Operational activity is not inferred from the fact of receiving funding: an enterprise is active if it is active in the USREO and shows positive revenue, output, exports, employment, wage payments or sales-related tax activity. The indicator follows the survival-rate logic of business demography. The export-to-funding ratio captures the extent to which funding is associated with foreign-market results:

$$K_{EF} = \frac{E_{is}}{I_s} \quad (8)$$

where E_{is} denotes exports of funded start-ups. Finally, the revenue-change-to-funding ratio relates the change in revenue of funded start-ups to the funding received and corresponds to the inverse of ICOR:

$$K_{\Delta R} = \frac{R_t - R_{t-1}}{I_s} \quad (9)$$

where R_t is revenue in the reporting period and R_{t-1} is revenue in the comparable pre-funding base period. For newly established start-ups without a pre-funding base, the indicator is not computed; such firms are analysed in a separate cohort using first-full-year revenue, employment, exports and survival, and growth after the first full year may be computed as a separate indicator. In the pilot, ratios (6) and (9) are expressed per 100 units of funding.

Table 1. System of indicators for measuring investment in start-ups and its performance

Indicator	Eq.	Methodological foundation	Analytical purpose
I.1 Total funding of start-ups	(1)	Statistical aggregation; SNA	Base for all relative and performance indicators
I.2 Funding as % of GDP (GRP)	(2)	GDP concept (Kuznets)	Comparability across economies and over time
I.3 Funding per active start-up	(3)	Arithmetic mean; business demography	Funding intensity across regions and periods
I.4 Share of start-ups receiving funding	(4)	Relative measure of structure	Breadth versus concentration of funding
I.5 Funding structure by instrument	(5)	Structural analysis of mutually exclusive instruments	Maturity of financing mechanisms
II.6 Revenue-to-funding ratio	(6)	ROI and capital productivity	Static association of funding and revenue
II.7 Share of operationally active funded start-ups	(7)	Cohort analysis; survival rates	Continuation of activity after funding
II.8 Export-to-funding ratio	(8)	International trade statistics	Association of funding with export results
II.9 Revenue-change-to-funding ratio	(9)	Inverse ICOR (Harrod–Domar); marginal efficiency of capital (Keynes)	Dynamic association of funding and business growth

Source: developed by the authors.

2.4 Cohort design, breakdowns and quality assurance

In the cohort analysis, the composition of the initial cohort is kept fixed in periods t+1, t+2 and t+3. Each enterprise is assigned one status in every observation period – active, temporarily inactive, ceased, restructured, not observed or out of source coverage. Computing results only for surviving firms is not permitted, and coverage and non-observed units are reported separately to avoid survivorship bias. The cohort entry date is the date on which funding meeting the inclusion criteria was first disbursed and received, or the closest reliable administrative date. Causal evaluation with a control group lies outside the scope of the framework and requires a separate research design.

All core indicators are compiled for the country and its regions and broken down by economic activity, enterprise size class and legal form, enterprise age (0–3, 4–5, 6–10 and over 10 years, based on the date of establishment in the USREO), activity status and exporter status. Revenue and funding per employee, capital intensity, export intensity, the value-added-to-funding ratio and the tax-to-funding ratio may be used as supplementary or experimental indicators where data permit. Quarterly estimates are based on quarterly reports and interim integration data, and annual estimates on annual reports and final register data. At the initial stage, the indicators are published as experimental statistics, which signals that coverage and quality have not yet stabilised and allows the methodology to be refined in practice.

Quality assurance covers the completeness, format and uniqueness of TINs; reconciliation of the start-up registry with the USREO; logical checks of activity status,

dates and economic activity codes; detection of outliers and abrupt changes in investment, revenue, exports and employment; and cross-programme checks to prevent the same enterprise from being counted several times. Discrepancies are recorded in a control log (TIN, error type, source, proposed correction, responsible officer). Enterprise-level data are confidential; results are released only in aggregated form, and cells with high disclosure risk are suppressed or combined. Each release states the data source, reference period, coverage, indicator status and methodological notes.

3. Results

The framework was piloted on integrated data for the Republic of Uzbekistan, 14 regions and Tashkent city for 2021–2024, in compliance with the principle of confidentiality of primary data. Values are in current prices. Because the numbers of funded start-ups in most regions are very small, regional ratios are used here to illustrate the behaviour of the indicators rather than to rank regions.

3.1 Volume and concentration of funding

Total funding received by start-ups increased from 26.2 billion UZS in 2021 to 184.4 billion UZS in 2022, fell to 120.0 billion UZS in 2023 and rose again to 176.8 billion UZS in 2024 (Figure 2). Funding is extremely concentrated: Tashkent city accounted for 22.8, 173.0, 111.9 and 164.8 billion UZS in the respective years, i.e. 87.0%, 93.8%, 93.3% and 93.2% of the total. All other regions together received only 3.4–12.0 billion UZS per year. Among them, Tashkent region was the largest recipient in 2021–2023 (about 2.0, 9.0 and 5.9 billion UZS), whereas in 2024 funding shifted towards Jizzakh region and Tashkent region received about 2.3 billion UZS.

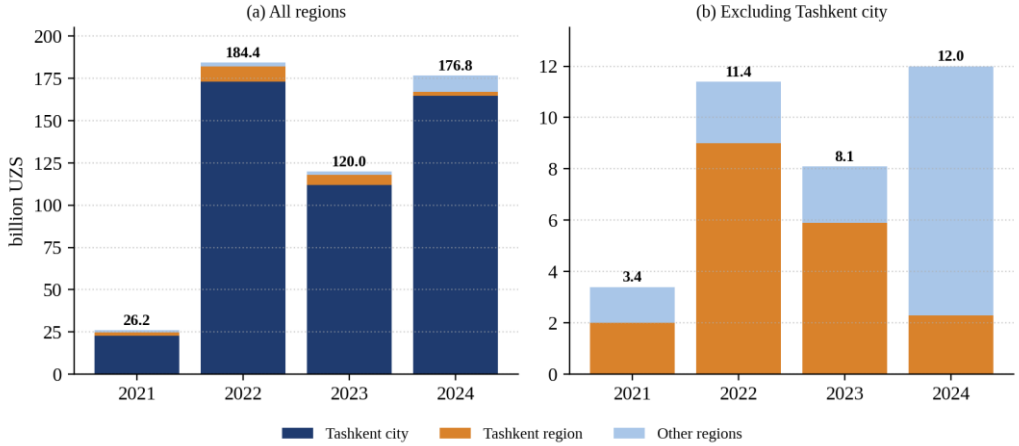


Figure 2. Total funding of start-ups (indicator 1), billion UZS, 2021–2024
Source: authors' calculations based on the integrated pilot dataset. Tashkent region values are read from the pilot dataset at 0.1 billion UZS precision.

Relative to GDP, start-up funding remains negligible: 0.0030% in 2021, 0.0177% in 2022, 0.0100% in 2023 and 0.0115% in 2024 (Table 2). In relation to GRP, Tashkent city stands out (0.0158–0.0967%), followed by Jizzakh region (0.0135% in 2024) and Tashkent region, which ranked second in 2022 (0.0087%) and third in 2024 (0.0015%).

Table 2. Start-up funding as a share of GDP (GRP) by region (indicator 2), %

Region	2021	2022	2023	2024
Uzbekistan	**0.0030**	**0.0177**	**0.0100**	**0.0115**
Karakalpakstan	0.0000	0.0004	0.0000	–
Andijan	0.0005	0.0000	0.0000	0.0011
Bukhara	0.0000	0.0000	–	–
Jizzakh	0.0029	0.0064	0.0020	0.0135
Kashkadarya	0.0000	0.0000	–	–
Navoi	0.0000	0.0000	0.0010	0.0014
Namangan	0.0000	0.0000	0.0000	–
Samarkand	0.0006	0.0002	0.0000	0.0009
Surkhandarya	0.0000	0.0000	0.0000	–
Syrdarya	0.0000	0.0000	–	–
Tashkent region	0.0021	0.0087	0.0050	0.0015
Fergana	0.0000	0.0000	0.0010	0.0001
Khorezm	0.0000	0.0000	–	–
Tashkent city	0.0158	0.0967	0.0500	0.0544

Note: 0.0000 denotes a value below 0.00005%; "–" denotes no funded start-ups or no data.
Source: authors' calculations.

3.2 Funding intensity and coverage

Funding per active start-up (indicator 3) varied widely across regions and years (Figure 3). At the national level it rose from about 160 million UZS in 2021 to about 650 million UZS in 2022 and then fell to 260–300 million UZS in 2023–2024. The highest intensities were observed in Tashkent region (about 2.0–4.5 billion UZS per active start-up in 2021–2023), reflecting large amounts received by a very small number of firms, whereas in several regions intensities were below 20 million UZS.

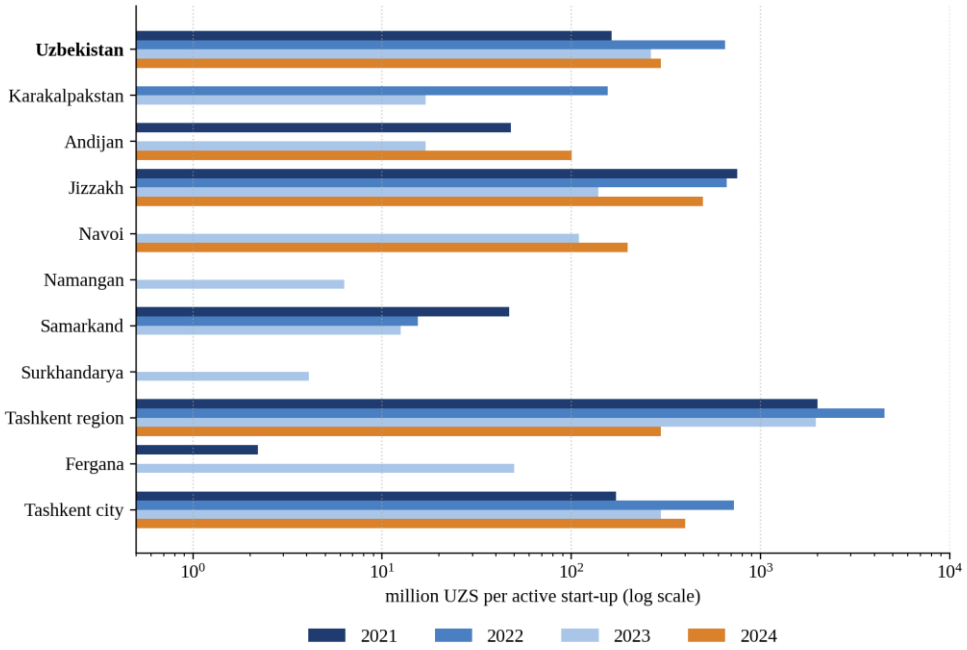


Figure 3. Funding per active start-up (indicator 3), million UZS, log scale, 2021–2024
Source: authors' calculations based on the integrated pilot dataset.

Coverage (indicator 4) declined steadily at the national level: the share of active start-ups that received funding fell from 35.6% in 2021 to 30.4% in 2022, 19.5% in 2023 and 16.1% in 2024 (Figure 4). Thus, while total funding grew almost sevenfold, it reached a shrinking share of start-ups, i.e. funding became more concentrated. In several regions the indicator exceeded 100% – 300.0% in Jizzakh region and 200.0% in Tashkent region in 2021 – which is logically impossible if the numerator is a subset of the denominator. These values show that in the pilot data some funded enterprises were not part of the reference population of active start-ups; this issue is discussed in Section 3.5.

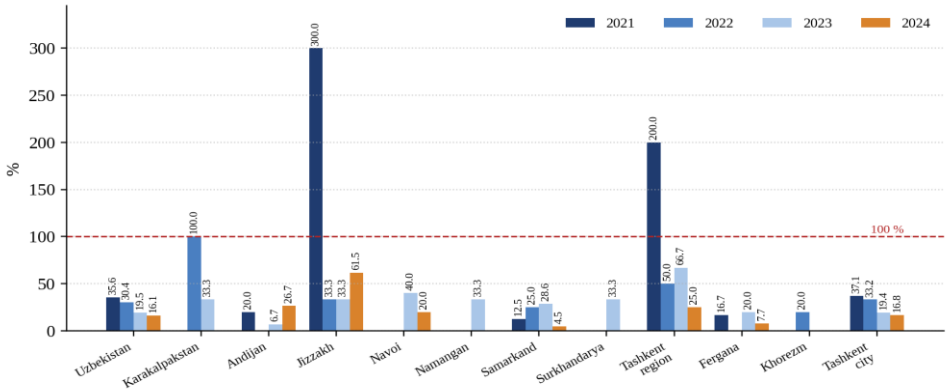


Figure 4. Share of start-ups receiving funding (indicator 4), %, 2021–2024
Source: authors' calculations based on the integrated pilot dataset.

3.3 Structure of funding

The structure of funding (indicator 5) is dominated by resident sponsors and the start-ups' own funds, which accounted for 91.2% in 2021, 96.1% in 2022, 81.6% in 2023 and 92.4% in 2024 (Figure 5). Foreign direct investment was significant only in 2023 (16.2%); foreign investors' funds contributed 3.1% in 2021 and 1.2% in 2022, and bank loans and other borrowed funds 2.6%, 0.8%, 1.2% and 7.6% in the four years. Foreign loans, other foreign investment, local budgets and household funds each accounted for less than 1%. The small share of market-based and foreign sources indicates that venture and credit mechanisms for start-ups are still underdeveloped.

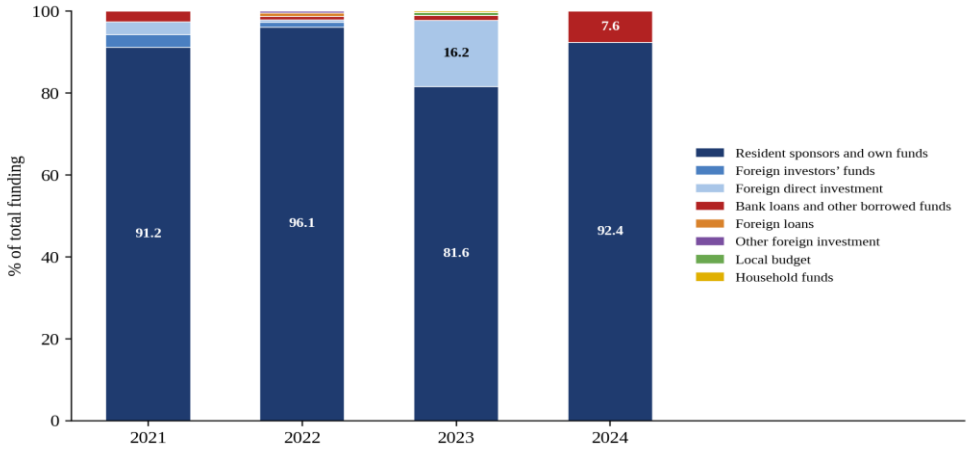


Figure 5. Structure of start-up funding by instrument (indicator 5), Uzbekistan, % of total
Note: shares below 5% are not labelled in the chart; see text. Source: authors' calculations.

3.4 Performance of funded start-ups

At the national level, the revenue of funded start-ups amounted to 15.1 UZS per 100 UZS of funding in 2021, 9.7 in 2022, 27.1 in 2023 and 20.7 in 2024 (indicator 6; Figure 6). Tashkent city, which dominates the aggregate, shows almost identical values. In Tashkent

region, the ratio increased from 0.1 in 2021 to 5.6 in 2023 and 19.3 in 2024, approaching the national level. Very high values – 2,008.8 in Namangan and 1,773.2 in Surkhandarya in 2023, 346.9 in Karakalpakstan in 2023 and 585.1 in Fergana in 2024 – occur where funding was only 0–0.5 billion UZS, so the denominator is very small and the ratio is mechanically inflated. Such values cannot be interpreted as high efficiency; indicator 6 should always be read together with the absolute volume of funding (indicator 1).

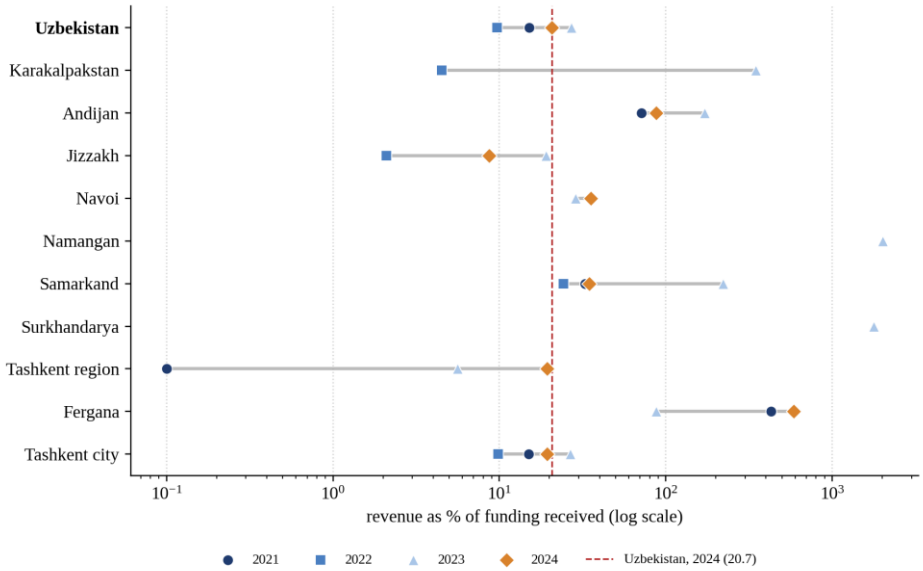


Figure 6. Revenue-to-funding ratio (indicator 6), revenue per 100 UZS of funding, log scale

Source: authors' calculations based on the integrated pilot dataset.

The revenue-change-to-funding ratio (indicator 9) provides the most important signal (Figure 7). At the national level, the increase in revenue per 100 UZS of funding was 8.8 in 2021, 7.5 in 2022 and 12.2 in 2023, but only 2.3 in 2024 – the lowest value of the period – although funding in 2024 (176.8 billion UZS) was among the highest. Tashkent city recorded only 1.4 in 2024. Negative values were observed in Samarkand (−78.9 in 2022 and −4.1 in 2024) and Andijan (−0.4 in 2023), meaning that revenue declined after funding. In 2024, substantial positive values were recorded only in Fergana (215.0), Andijan (45.4) and Navoi (26.8); in Tashkent region the ratio was 5.5 in 2023 and 4.5 in 2024.

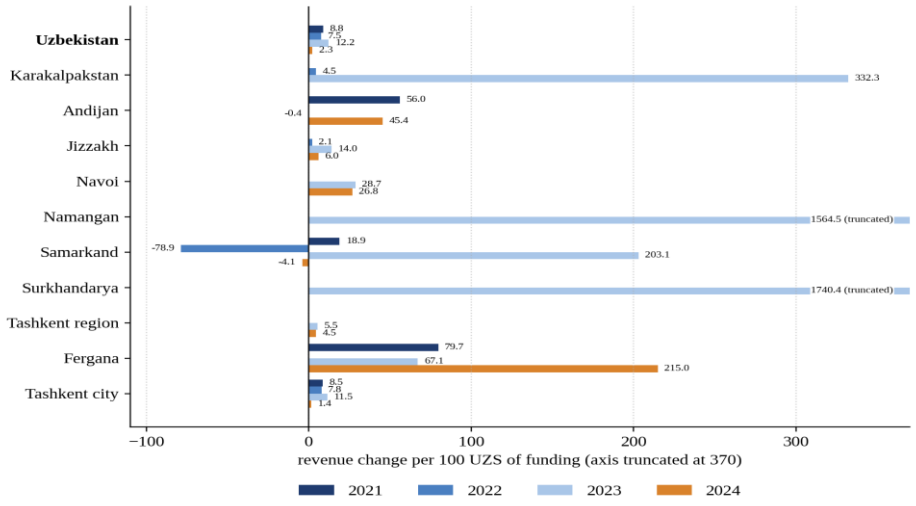


Figure 7. Revenue-change-to-funding ratio (indicator 9), revenue change per 100 UZS of funding

Source: authors' calculations based on the integrated pilot dataset.

Table 3. Summary of pilot indicators for Uzbekistan, Tashkent city and Tashkent region

Indicator / territory	2021	2022	2023	2024
1. Total funding, billion UZS				
Uzbekistan	26.2	184.4	120.0	176.8
Tashkent city	22.8	173.0	111.9	164.8
Tashkent region	≈2.0	≈9.0	≈5.9	≈2.3
2. Funding as % of GDP (GRP)				
Uzbekistan	0.0030	0.0177	0.0100	0.0115
Tashkent city	0.0158	0.0967	0.0500	0.0544
Tashkent region	0.0021	0.0087	0.0050	0.0015
4. Share of start-ups receiving funding, %				
Uzbekistan	35.6	30.4	19.5	16.1
Tashkent city	37.1	33.2	19.4	16.8
Tashkent region	200.0*	50.0	66.7	25.0
6. Revenue per 100 UZS of funding				
Uzbekistan	15.1	9.7	27.1	20.7
Tashkent city	15.0	9.8	26.6	19.4
Tashkent region	0.1	–	5.6	19.3
9. Revenue change per 100 UZS of funding				
Uzbekistan	8.8	7.5	12.2	2.3
Tashkent city	8.5	7.8	11.5	1.4
Tashkent region	–	–	5.5	4.5

Note: * value above 100% indicates inconsistency between the funded and reference populations (see Section 3.5); "–" denotes not available. Source: authors' calculations.

4. Discussion

The pilot demonstrates that the proposed indicators can be compiled from existing administrative and statistical sources and that, taken together, they reveal features of the start-up ecosystem that are invisible in deal-based statistics. Three findings stand out.

First, start-up funding in Uzbekistan is characterised by rapid growth combined with extreme spatial concentration and declining coverage. Around 93% of funding is received by start-ups in Tashkent city, and the share of active start-ups receiving any funding more than halved between 2021 and 2024. Growth in volume therefore did not translate into broader access to finance. This pattern is consistent with the agglomeration of start-up activity in capital cities documented in other countries, but its degree suggests that regional start-up support in Uzbekistan remains weak.

Second, the funding structure differs sharply from the venture-driven model implicit in most international start-up statistics. Resident sponsors and own funds accounted for 82–96% of funding, while foreign and debt instruments were marginal. Measurement systems based on venture deal databases would therefore capture only a small fraction of start-up finance in such an economy, which supports the register-based, instrument-neutral design proposed here.

Third, the performance indicators point to a weakening association between funding and business growth. While revenue per 100 UZS of funding remained at 20–27 UZS in 2023–2024, the revenue increase per 100 UZS of funding fell to 2.3 in 2024, the lowest in the period, despite near-record funding. Together with the declining coverage, this suggests that the main problem of the start-up financing system lies less in the scarcity of funds than in their allocation and in the mechanisms for monitoring results. Because the

indicators measure associations, this conclusion should be tested with impact-evaluation methods using control groups.

The pilot also illustrates why the methodological safeguards of the framework matter. Ratios with very small denominators produce extreme values – revenue-to-funding ratios above 1,700 or revenue changes of −78.9 per 100 UZS – that are statistically fragile and uninformative about efficiency. Coverage rates above 100% in Jizzakh and Tashkent regions reveal that funded enterprises and the reference population of active start-ups were drawn from sources that were not fully reconciled. In the proposed framework, both problems are addressed by construction: the TIN-based integration ensures that the numerator is a subset of the denominator, and minimum-count thresholds combined with disclosure control suppress or aggregate cells based on very few enterprises. The latter is also required by statistical confidentiality, since several regional cells in the pilot correspond to only one or two funded firms.

The study has limitations. Values are expressed in current prices; the pilot period is short; small regional counts limit inference; and the performance indicators do not identify causal effects. In addition, the GDP denominators and the units of the export series used in the pilot require harmonisation with the published national accounts and foreign trade statistics. These limitations define directions for further work: deflation of funding and revenue, extension of the time series, linkage with employment and value-added data, and quasi-experimental evaluation of public start-up programmes.

5. Conclusion

This paper has proposed a methodological framework for measuring investment in start-ups and its performance within official statistics and tested it on data for Uzbekistan for 2021–2024. The framework integrates the start-up registry, the business register, enterprise statistical reports and administrative data at the level of the start-up enterprise using the TIN; counts only realised funding; prevents double counting; and combines nine indicators of volume, coverage, structure and performance, each linked to established concepts from national accounts, business demography and investment-efficiency analysis.

The pilot shows that start-up funding in Uzbekistan grew almost sevenfold in 2021–2024 but remained concentrated in Tashkent city, reached a declining share of start-ups, relied predominantly on sponsors' and own funds, and was associated with weakening revenue growth in 2024. The framework thus provides policy-relevant information for evaluating public start-up programmes and monitoring the ecosystem, while its quality rules expose inconsistencies in existing data.

For statistical practice, we recommend introducing the indicators as experimental official statistics, institutionalising TIN-based data exchange between IT Park, the tax authority and the National Statistics Committee, applying minimum-count and disclosure-control rules to regional releases, and complementing the statistical indicators with impact evaluations of public support programmes. Because the framework relies on concepts common to international statistical standards, it can be adapted by other emerging economies and can contribute to the international comparability of start-up investment statistics.

Declarations

Funding. This research received no external funding.

Conflict of interest. The authors declare no conflict of interest.

Data availability. Enterprise-level data are confidential under the Law on Official Statistics of the Republic of Uzbekistan. Aggregated indicators are available from the corresponding author on reasonable request.

REFERENCES

[1] J. Haltiwanger, R. S. Jarmin, and J. Miranda, "Who creates jobs? Small versus large versus young," *The Review of Economics and Statistics*, vol. 95, no. 2, pp. 347–361, 2013, doi: 10.1162/REST_a_00288.

[2] F. Calvino, C. Criscuolo, and C. Menon, "No country for young firms?" *OECD Science, Technology and Innovation Policy Papers*, OECD Publishing, Paris, France, 2016.

[3] S. N. Kaplan and J. Lerner, "Venture capital data: Opportunities and challenges," in *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*, J. Haltiwanger, E. Hurst, J. Miranda, and A. Schoar, Eds. Chicago, IL, USA: Univ. of Chicago Press, 2017.

[4] OECD, "The OECD start-ups database," *OECD Science, Technology and Industry Working Papers*, no. 2026/04, OECD Publishing, Paris, France, 2026.

[5] The Tech, "Uzbekistan's start-up ecosystem grew by 132%: IT Park Ventures results of 2025," 2026. [Online]. Available: https://the-tech.kz/startap-ekosistema-uzbekistana-vyrosla-na-132-itogi-goda-ot-it-park-ventures

[6] Dealroom and IT Park Uzbekistan, "Investments and start-ups of Uzbekistan," *Fintech & Retail*, 2026. [Online]. Available: https://fintech-retail.com/2026/03/04/investicii-7/

[7] Law of the Republic of Uzbekistan No. ZRU-707, "On official statistics," Aug. 28, 2021. [Online]. Available: https://lex.uz/docs/5569619

[8] Resolution of the President of the Republic of Uzbekistan No. PQ-75, "On measures to organise the activities of the National Statistics Committee," Feb. 24, 2025. [Online]. Available: https://lex.uz/docs/-7409802

[9] Eurostat and OECD, *Eurostat–OECD Manual on Business Demography Statistics*. Luxembourg: Office for Official Publications of the European Communities, 2007.

[10] Eurostat, "Entrepreneurship – statistical indicators," *Statistics Explained*, 2025. [Online]. Available: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Entrepreneurship_-_statistical_indicators

[11] OECD and Eurostat, *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation*, 4th ed. Paris, France: OECD Publishing, 2018, doi: 10.1787/9789264304604-en.

[12] OECD, *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*. Paris, France: OECD Publishing, 2015, doi: 10.1787/9789264239012-en.

[13] OECD, *Financing SMEs and Entrepreneurs 2026: An OECD Scoreboard*. Paris, France: OECD Publishing, 2026.

[14] A. Wallgren and B. Wallgren, *Register-Based Statistics: Statistical Methods for Administrative Data*, 2nd ed. Chichester, U.K.: Wiley, 2014.

[15] I. P. Fellegi and A. B. Sunter, "A theory for record linkage," *Journal of the American Statistical Association*, vol. 64, no. 328, pp. 1183–1210, 1969, doi: 10.1080/01621459.1969.10501049.

[16] UNECE, "Generic Statistical Business Process Model (GSBPM), Version 5.1," United Nations Economic Commission for Europe, Geneva, Switzerland, 2019.

[17] United Nations, "Fundamental principles of official statistics," General Assembly Resolution A/RES/68/261, 2014.

[18] A. Hundepool *et al.*, *Statistical Disclosure Control*. Chichester, U.K.: Wiley, 2012.

[19] R. Stone, "Definition and measurement of the national income and related totals," in *Measurement of National Income and the Construction of Social Accounts*. Geneva, Switzerland: United Nations, 1947.

[20] European Commission, International Monetary Fund, OECD, United Nations, and World Bank, *System of National Accounts 2008*. New York, NY, USA: United Nations, 2009.

[21] S. Kuznets, *National Income, 1929–1932*. New York, NY, USA: National Bureau of Economic Research, 1934.

[22] F. D. Brown, "Pricing policy in relation to financial control," *Management and Administration*, vol. 7, 1924.

[23] R. F. Harrod, "An essay in dynamic theory," *The Economic Journal*, vol. 49, no. 193, pp. 14–33, 1939, doi: 10.2307/2225181.

[24] E. D. Domar, "Capital expansion, rate of growth, and employment," *Econometrica*, vol. 14, no. 2, pp. 137–147, 1946, doi: 10.2307/1905364.

[25] J. M. Keynes, *The General Theory of Employment, Interest and Money*. London, U.K.: Macmillan, 1936.

[26] B. A. Begalov, I. E. Zhukovskaya, A. D. Abdurakhmonov, and M. M. Jomolov, "Statistical analysis of investments in fixed capital in the Republic of Uzbekistan in the context of digital transformation," *Digital Models and Solutions*, vol. 2, no. 3, 2023, doi: 10.29141/2949-477X-2023-2-3-3.

[27] B. T. Begalov and O. T. Mamadaliyev, "Socio-economic development of regions: The practice of Uzbekistan," in *Proc. Int. Sci. Pract. Conf. "Regional Strategies and Project Management of Ecological, Economic and Social Development of Territories"*, MEESI Section of RANS, 2023, pp. 21–30.

[28] O. T. Mamadaliyev, "Methods of selecting indicators for comprehensive assessment of the socio-economic development of regions," *EPRA International Journal of Economic and Business Review*, vol. 11, no. 10, 2023, doi: 10.36713/epra14549.

[29] O. T. Mamadaliyev, "Priority directions of statistical research of socio-economic development of regions," *Digital Economy Scientific-Electronic Journal*, Special issue, 2026. [Online]. Available: https://infocom.uz/magazine/29

[30] National Statistics Committee of the Republic of Uzbekistan, "Methodological guidelines approved by Order No. 56 of 25 April 2024," 2024. [Online]. Available: https://lib.stat.uz/images/metodika/56-buyruq-m_jomolov_compressed.pdf

[31] National Statistics Committee of the Republic of Uzbekistan, "Methodological regulation approved by Order No. 55 of 25 April 2024," 2024. [Online]. Available: https://lib.stat.uz/images/metodika/55-buyruq-m_jomolov_compressed.pdf

[32] Law of the Republic of Uzbekistan No. ZRU-598, "On investments and investment activity," Dec. 25, 2019. [Online]. Available: https://lex.uz/docs/4664142