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THE DYNAMICS OF INFRASTRUCTURE INVE STMENT IN THE MACROECONOMY OF UZBEKISTAN AND ITS IMPACT ON GDP GROWTH

Abstract
This article examines the dynamics of infrastructure investment in the macroeconomy of Uzbekistan over the period 2019–2024 and assesses its contribution to gross domestic product (GDP) growth. The study is motivated by the rapid scaling-up of fixed-capital investment in the country, the adoption of a dedicated public-private partnership (PPP) framework, and the need to quantify the macroeconomic returns to infrastructure spending. Drawing on official statistics of the Statistics Agency of the Republic of Uzbekistan, the World Bank, the Asian Development Bank and the EBRD, the analysis combines descriptive time-series evidence with a multiplier-based estimation of the output response to infrastructure investment. The results show that fixed-capital investment expanded markedly, reaching an estimated 493.7 trillion soums (about US$38.2 billion) in 2024, equivalent to roughly one-third of GDP, while real GDP grew by 6.7 per cent in the same year. Applying internationally documented public-investment multipliers, a fiscal impulse equal to one per cent of GDP directed to infrastructure is estimated to raise output by between 1.1 and 1.6 per cent over a five-year horizon. The paper concludes that infrastructure investment—particularly when channelled through transparent PPP mechanisms—constitutes a significant and durable driver of macroeconomic growth in Uzbekistan, but that its effectiveness is conditioned by investment efficiency, fiscal space and the quality of project selection.
Keywords: *infrastructure investment, fixed-capital investment, GDP growth, public-private partnership, fiscal multiplier, macroeconomic dynamics, Uzbekistan.*
JEL classification: *E22, H54, O11, O18, O47.*

1. Introduction

The relationship between infrastructure investment and economic growth is one of the most durable questions in macroeconomics. Since the seminal contribution of Aschauer, who demonstrated a strong association between the stock of public capital and aggregate productivity [1], a large empirical literature has confirmed that infrastructure—roads, energy, water, telecommunications and transport networks—raises output, lowers production costs and crowds in private investment. Cross-country evidence assembled by Calderón and Servén further showed that infrastructure development not only accelerates growth but also reduces income inequality [3]. For an emerging economy pursuing structural transformation, the efficiency with which scarce capital is converted into productive infrastructure is therefore a first-order policy concern.

Uzbekistan provides a compelling setting for studying this relationship. Following the launch of comprehensive market reforms after 2017, the country has combined high rates of capital accumulation with a deliberate effort to mobilise private and foreign capital for infrastructure. A dedicated legal framework—the Law “On Public-Private Partnership”—was adopted in 2019, establishing the institutional basis for attracting private investors into public infrastructure [6]. Over 2019–2024 the economy grew at an average rate close to 6 per cent per year, while investment in fixed capital expanded at an accelerating pace, reaching a record level in 2024 [11]. These developments make it both timely and policy-relevant to quantify how the dynamics of infrastructure investment have shaped GDP growth.

The aim of this article is twofold: first, to characterise the dynamics of infrastructure-related fixed-capital investment in Uzbekistan over 2019–2024; and second, to estimate the macroeconomic contribution of that investment to GDP growth using a transparent, internationally grounded methodology. The novelty of the study lies in linking the country's recent PPP-driven investment surge to quantified multiplier-based output effects, thereby offering a replicable analytical template for evaluating infrastructure policy in resource-rich transition economies.

The question is not merely academic. Uzbekistan faces a substantial infrastructure gap inherited from the pre-reform period—ageing electricity networks, an under-capitalised water and irrigation system, and transport corridors that constrain the integration of a doubly land-locked economy into regional and global markets. Closing this gap requires sustained capital mobilisation on a scale that the public budget alone cannot provide, which is precisely why the authorities have placed public-private partnership at the centre of their investment strategy. Understanding how efficiently this investment converts into output is therefore directly relevant to the design of fiscal policy, debt management and the sequencing of structural reforms. A credible estimate of the growth payoff also informs the appropriate pace of borrowing, since infrastructure financed by debt is sustainable only if the resulting output gains exceed the cost of capital.

The remainder of the article is organised according to the IMRAD convention. Section 2 describes the data and sources. Section 3 sets out the methodology, combining descriptive analysis with a multiplier-based estimation. Section 4 reports the results in the form of three tables and three figures. Section 5 discusses the findings, their policy implications and the limitations of the approach, and Section 6 concludes.

2. Materials

The empirical material of this study is drawn from official and internationally validated sources. Macroeconomic aggregates—nominal and real GDP, real GDP growth, and the structure of gross value added—are taken from the Statistics Agency under the President of the Republic of Uzbekistan and cross-checked against the World Bank country database [13], the Asian Development Bank's *Asian Development Outlook* [10] and the EBRD *Transition Report 2024–25* [4]. Data on the volume, growth and structure of investment in fixed capital, including the split between centralised and non-centralised financing and the share of foreign direct investment, are obtained from the Statistics Agency [11].

According to these sources, Uzbekistan's GDP reached 1,535.4 trillion soums (about US$121.4 billion) in 2024 following a methodological revision, with real GDP growth estimated at 6.7 per cent, up from 6.3 per cent in 2023. Investment in fixed capital reached approximately 493.7 trillion soums (about US$38.2 billion) in 2024, growing by 27.6 per cent in real terms—the highest rate of the preceding five years. Of total fixed-capital investment, roughly three-quarters was financed from attracted (borrowed and foreign) sources and about one-quarter from own funds, while non-centralised sources dominated the financing structure. Energy and gas supply, transport, manufacturing and utilities—sectors with a strong infrastructure component—absorbed the largest shares of foreign investment.

Parameter values used in the quantitative estimation—namely the range of public-investment output multipliers—are taken from the international empirical literature rather than estimated de novo on a short national sample, in order to ensure robustness and comparability. These include the welfare- and output-multiplier estimates of the IMF, the cross-country multiplier estimates of the World Bank, the survey evidence compiled by Ramey, and the fiscal-stimulus literature reviewed by the Economic Policy Institute.

A measurement caveat applies throughout. The national accounts of Uzbekistan, like those of most countries, do not publish a single line item labelled "infrastructure investment." Infrastructure spending is distributed across several statistical categories—transport and storage, electricity and gas supply, water supply and sewerage, information and communication, and parts of construction. For the descriptive analysis the study therefore uses total fixed-capital investment as the broad aggregate, while for the structural analysis it isolates the sectors with the highest infrastructure content (energy, transport and utilities). This convention follows the practice of the

World Bank and OECD in their cross-country infrastructure work and avoids the spurious precision that would arise from an artificially narrow definition. All soum figures are reported in nominal terms unless an explicit real growth index is indicated, and US-dollar equivalents use the average annual exchange rate published by the Central Bank of Uzbekistan.

3. Methods

The methodology proceeds in three steps. First, a descriptive time-series analysis traces the co-movement of fixed-capital investment and real GDP growth over 2019–2024, complemented by an examination of the investment-to-GDP ratio as a measure of investment intensity. Second, a correlation analysis assesses the strength and stability of the contemporaneous association between investment momentum and output growth. Third, and most importantly, a multiplier-based estimation translates a standardised infrastructure-investment impulse into an implied output response.

The multiplier approach rests on the standard fiscal-impulse identity. If a country directs an additional volume of investment equal to ΔI into infrastructure, the resulting change in output is approximated by $\Delta Y = m \times \Delta I$, where m is the output multiplier. The empirical literature provides a well-documented range for m. Evidence from the United States Recovery Act suggests short-run multipliers between 0.4 and 2.2 depending on the type of programme [2]; the IMF reports sizeable welfare and output multipliers for public infrastructure that rise over time as the capital stock expands [5]; and the most recent World Bank cross-country estimates find that scaling up public investment by one per cent of GDP raises output by about 1.1 per cent after five years on average, reaching 1.6 per cent where fiscal space and investment efficiency are high [12]. Ramey's survey confirms that effects are modest in the short run but become large in the long run, conditional on the elasticity of output to public capital [9].

Applying this framework to Uzbekistan, the standardised impulse is defined as one per cent of 2024 GDP—approximately 15.4 trillion soums—allocated to PPP-based infrastructure. The implied output response is then computed across five scenarios spanning the documented multiplier range. The transmission mechanism underlying these effects is summarised schematically in Figure 3. This design deliberately avoids estimating a fragile single-country regression on only six annual observations, a period that contains the structural break of the 2020 pandemic; instead it anchors the quantitative conclusions in parameters that have been estimated on large international samples.

The plausibility of the multiplier mechanism in Uzbekistan is corroborated by sub-national evidence from comparable studies. Pérez-Montiel and Manera, using regional Spanish data, find that the multiplier of public infrastructure investment exceeds unity after five years and is larger in lower-income regions [8]—a pattern consistent with the high infrastructure gap typical of developing and transition economies.

4. Results

Table 1 presents the dynamics of fixed-capital investment and real GDP growth over 2019–2024. Two features stand out. First, the period contains a clear pandemic-induced contraction in 2020, when both the investment growth index and real GDP growth fell sharply. Second, from 2022 onward investment momentum accelerated strongly, culminating in a 27.6 per cent real increase in 2024, while GDP growth recovered to 6.7 per cent.

Year	Fixed-capital investment, real growth index (%)	Investment-to-GDP ratio (%)	Real GDP growth (%)	Nominal GDP (trln soums)
2019	105.0	37.1	5.7	511.8
2020	99.0	36.8	2.0	580.2
2021	97.8	28.6	7.4	738.4
2022	115.2	30.4	5.7	888.3
2023	113.6	31.5	6.3	1 202.2
2024	127.6	32.1	6.7	1 535.4

Table 1. Dynamics of fixed-capital investment and real GDP growth in Uzbekistan, 2019–2024. Source: Statistics Agency of the Republic of Uzbekistan; World Bank; author's compilation. Nominal GDP and ratios for earlier years are indicative.

The same co-movement is illustrated in Figure 1, which plots the investment growth index against real GDP growth. The visual evidence is suggestive rather than mechanical: the deep 2020 trough is common to both series, but the post-pandemic rebound of 2021 was driven by base effects and consumption recovery rather than by investment, which itself only regained momentum from 2022. This timing pattern is fully consistent with the literature's finding that infrastructure investment acts on output with a lag.

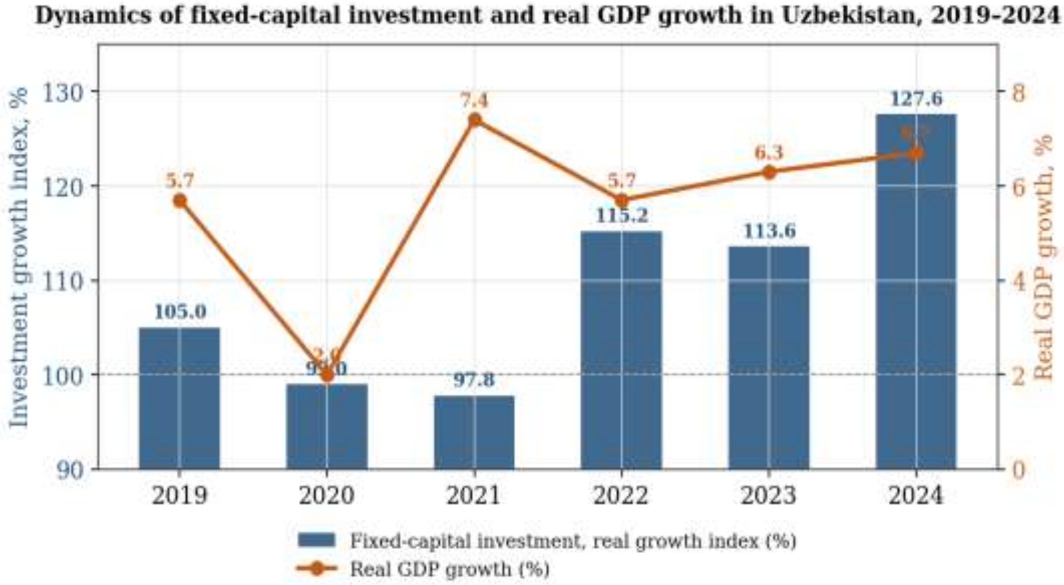

Figure 1. Dynamics of fixed-capital investment (real growth index) and real GDP growth, 2019–2024.

A simple correlation analysis confirms that the contemporaneous link between investment momentum and output growth is positive but weak over this short and structurally disturbed sample (Pearson correlation coefficient $r \approx 0.37$). When the pandemic year 2020 is excluded the sign becomes unstable, underscoring that a six-observation national regression cannot reliably isolate the investment–growth elasticity. This statistical fragility is precisely why the study relies on the multiplier-based estimation for its quantitative conclusions.

The investment-to-GDP ratio reported in Table 1 deserves separate comment. At between 29 and 37 per cent, Uzbekistan's investment intensity is high by international standards and comparable to the fast-growing economies of East and South-East Asia during their catch-up phases. The dip in the ratio in 2021 reflects the denominator effect of the strong nominal GDP rebound rather than a fall in investment itself. Sustaining such a high investment rate is a necessary but not sufficient condition for rapid growth: as the literature stresses, the productivity of that investment—how much output each additional soum of capital generates—matters as much as its volume. This is the central reason why the institutional quality of the PPP framework, and not merely the headline investment figure, is decisive for the country's growth prospects.

Table 2 summarises the financing structure of fixed-capital investment in 2024, which is central to understanding the role of private and PPP-based capital. The dominance of attracted and non-centralised sources reflects the success of the post-2019 strategy of mobilising private and foreign capital for infrastructure.

Financing source / sector (2024)	**Share (%)**	**Approx. value (trln soums)**
Attracted (borrowed + foreign) funds	75.9	374.7
Own funds of enterprises and households	24.1	119.0

Financing source / sector (2024)	Share (%)	Approx. value (trln soums)
Non-centralised sources	≈90.0	444.3
Centralised sources	≈10.0	49.4
Foreign investment and loans (of which)	≈67.6	333.8
– Manufacturing	35.7*	119.2
– Electricity and gas supply	19.5*	65.0
– Mining	17.1*	57.0

*Table 2. Structure of fixed-capital investment in Uzbekistan, 2024. Source: Statistics Agency of the Republic of Uzbekistan. * Shares marked with an asterisk are expressed as a percentage of foreign investment.*

The core quantitative result is reported in Table 3 and visualised in Figure 2. Applying the documented multiplier range to a standardised infrastructure impulse of one per cent of 2024 GDP (≈ 15.4 trillion soums) yields a spectrum of output responses. Under a conservative short-run multiplier of 0.4 the impulse adds about 0.4 per cent of GDP; under the World Bank central five-year estimate of 1.1 it adds 1.1 per cent; and where fiscal space and investment efficiency are high (m = 1.6) the cumulative output gain reaches 1.6 per cent, with an upper bound of 2.2 per cent under the most favourable conditions.

Scenario	Multiplier (m)	Output response (% of GDP)	Implied ΔY (trln soums)
Lower bound (short-run)	0.4	0.40	6.2
Short-run central	1.0	1.00	15.4
Cumulative 5-year, average	**1.1**	**1.10**	**16.9**
High efficiency / fiscal space (5-yr)	1.6	1.60	24.6
Upper bound	2.2	2.20	33.8

Table 3. Estimated output response to a 1%-of-GDP infrastructure investment impulse (≈ 15.4 trln soums of 2024 GDP). Source: author's estimation using multiplier ranges from IMF (2016), World Bank (2024), Ramey (2020) and EPI (2017).

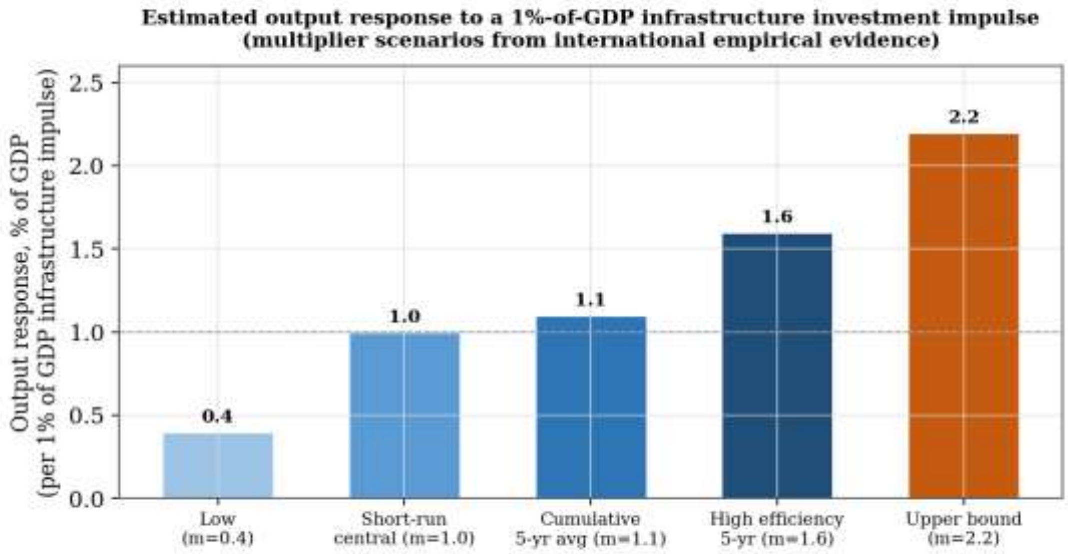

Figure 2. Estimated output response to a 1%-of-GDP infrastructure investment impulse under alternative multiplier scenarios.

Figure 3 sets out the transmission channels that generate these effects. Infrastructure investment raises output through three reinforcing channels: an aggregate-demand (multiplier) channel operating in the short run; an accelerator channel in which public infrastructure crowds in private investment; and a supply-side channel in which the expanded and modernised capital stock raises productive capacity, productivity and competitiveness over the medium term. A fiscal-feedback loop, whereby higher output generates revenues that can be reinvested, closes the system.

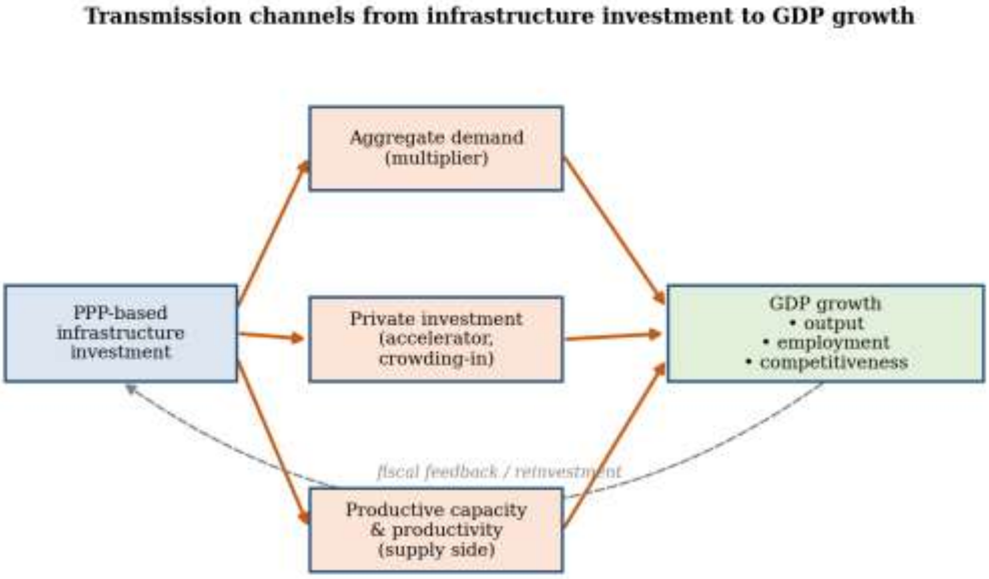

Figure 3. Transmission channels from infrastructure investment to GDP growth (multiplier–accelerator framework).

5. Discussion

The findings have three principal implications. First, the magnitude of the estimated effects is economically significant. A cumulative output gain of 1.1–1.6 per cent of GDP from an impulse of only one per cent of GDP implies that well-selected infrastructure investment more than pays for itself in output terms over a five-year horizon. Given that Uzbekistan already invests around a third of GDP, even modest improvements in the efficiency and targeting of that spending could translate into measurable additional growth. This is consistent with the World Bank’s conclusion that the size of the multiplier is conditional on fiscal space and public-investment efficiency [12].

Second, the financing structure documented in Table 2 indicates that the PPP strategy is materially altering the composition of investment. With roughly three-quarters of fixed-capital investment now financed from attracted sources and around 90 per cent from non-centralised channels [11], the state is increasingly acting as an enabler and risk-sharer rather than the sole financier. The concentration of foreign investment in energy, transport and manufacturing—sectors with high backward and forward linkages—amplifies the accelerator channel of Figure 3, because such projects directly raise the productivity of downstream private activity. The EBRD likewise attributes a substantial part of Uzbekistan’s robust growth trajectory to infrastructure investment and buoyant domestic demand [4].

Third, the analysis cautions against over-interpreting short-run national correlations. The weak and unstable bivariate association observed over 2019–2024 is not evidence that investment does not matter; it reflects the small sample, the lagged nature of infrastructure effects, and the dominance of the pandemic shock and the subsequent consumption-led rebound. This is exactly the configuration in which the international literature recommends relying on structurally grounded multipliers rather than reduced-form national regressions. The lag structure also implies that the full output dividend of the 2022–2024 investment surge is likely to materialise over 2025–2027, a hypothesis that future research with longer data series and quarterly frequency could test directly.

Several limitations should be acknowledged. The boundary between “infrastructure” and other fixed-capital investment is not sharp in the national accounts, so the standardised impulse is necessarily an approximation. The multiplier range is imported from other economies and may differ in Uzbekistan owing to its specific import content, exchange-rate regime and degree of economic slack. Finally, the quality of project selection and the avoidance of cost overruns—factors emphasised throughout the public-investment-management literature—are decisive for realising the upper end of the estimated range.

Placing the results in international perspective reinforces their plausibility. The cross-country welfare-multiplier estimates of the IMF and the survey evidence of Ramey both point to output effects that are modest on impact but accumulate over several years as the productive capital stock expands [9]. The Spanish regional evidence of Pérez-Montiel and Manera shows multipliers above unity after five years, with larger effects in lower-income regions [8]—a configuration that closely matches Uzbekistan, where the marginal productivity of infrastructure is high because the existing stock is relatively scarce. The OECD’s work on local investment similarly finds that effective public investment can generate aggregate gains exceeding the initial outlay [7]. Taken together, these comparisons suggest that the central and upper scenarios of Table 3 are more likely to apply to Uzbekistan than the conservative lower bound, provided that investment efficiency is maintained.

A regional dimension also merits attention. Because infrastructure investment in Uzbekistan is unevenly distributed across provinces, its aggregate growth effect is shaped by where projects are located. Directing investment toward regions with the largest infrastructure deficits is likely to yield higher marginal returns and, simultaneously, to narrow inter-regional income gaps—echoing the equity dividend identified by Calderón and Servén. The PPP framework, by enabling project-level cost–benefit appraisal and competitive selection of private partners, provides an institutional channel through which this spatial targeting can be improved. The interaction between infrastructure investment, regional convergence and the multiplier is a promising avenue for subsequent sub-national research.

6. Conclusion

This article analysed the dynamics of infrastructure investment in Uzbekistan over 2019–2024 and estimated its contribution to GDP growth. The descriptive evidence documents a strong acceleration of fixed-capital investment, which reached about 493.7 trillion soums (US$38.2 billion) in 2024—roughly a third of GDP—financed increasingly through private, foreign and PPP-based channels following the 2019 PPP Law. While short-run national correlations are weak owing to the pandemic break and the lagged effect of infrastructure, a multiplier-based estimation grounded in international evidence indicates that a one-per-cent-of-GDP infrastructure impulse raises output by between 1.1 and 1.6 per cent over five years, and potentially more where investment efficiency and fiscal space are high.

The policy message is clear. Infrastructure investment is a powerful but conditional engine of macroeconomic growth in Uzbekistan. To capture the upper end of the estimated returns, the authorities should continue to deepen the PPP framework, strengthen public-investment-management institutions, prioritise projects with high economic linkages, and improve the transparency of project selection and risk allocation. Future research should extend the analysis to quarterly and sectoral data, estimate Uzbekistan-specific multipliers as the time series lengthens, and evaluate the realised growth dividend of the 2022–2024 investment surge.

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