



Ecosystem for Innovation-Driven Entrepreneurship in Central Asia: Comparative Analysis of Kyrgyzstan, Kazakhstan, and Uzbekistan.

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Executive Summary

This paper employs the MIT framework for innovation-driven entrepreneurship to assess the development of Deep Tech and innovation ecosystems in Central Asia, focusing on Kazakhstan, Kyrgyzstan, and Uzbekistan. In this respect, the major challenges on the way to progress the region faces are:

1. The urgent need to enhance research and development (R&D) capacity across the region.
2. Insufficient collaboration between academic institutions and industry, particularly in areas that could drive technological innovation.
3. The necessity of building a stronger and more integrated innovation ecosystem.
4. The importance of fostering regional collaboration, both within Central Asia and with global partners. The findings underscore the critical need for a paradigm shift in regional integration and entrepreneurial mind-set to unlock the tremendous potential of this undervalued geography.

By cultivating a robust ecosystem that champions cutting-edge scientific research, fosters entrepreneurial spirit, and promotes strategic regional cooperation, Central Asia could catalyze unprecedented economic growth and enhance both internal and global integration. The path ahead is complex, but the foundations for a prosperous, technologically advanced future are already taking

Challenges v. opportunities

When viewed as a cohesive region, Central Asia offers a compelling proposition for innovation and economic growth. The region's vast natural resources, strategic location bridging Europe and Asia, and young, increasingly educated population provide a solid foundation for development. Despite these advantages, Central Asia remains one of the most disintegrated regions in the world, significantly constraining its development and innovation potential. The research highlights a prevalent form of entrepreneurship driven primarily by necessity rather than opportunity recognition. This approach, while demonstrating the resilience and adaptability of local entrepreneurs, often falls short of fostering innovation or adopting a problem-driven approach. The prevailing entrepreneurial mind-set appears focused on short-term gains, partly due to a lack of trust in government systems and perceived risks associated with long-term investments.

Recommendations

The following recommendations can help address these challenges and capitalize on the region's potential:

1. **Fostering regional integration:** Central Asian countries must prioritize regional integration efforts. This process should encompass economic cooperation, harmonization of regulatory frameworks, and facilitation of cross-border trade and investment. Entrepreneurs can and should play a crucial role in this process by creating demand for political will and leveraging the comparative advantages of neighboring countries.
2. **Cultivating an "Infinite Game" Mind-Set:** Drawing from James Carse's concept of "Finite and Infinite Games," we recommend implementing a series of programs aimed at training a new generation of entrepreneurs with an "infinite game" mind-set. This approach would encourage viewing other countries and entrepreneurs as "rivals worth learning from" rather than competitors to defeat, fostering a culture of collaboration and continuous innovation.
3. **Strengthening National Innovation Systems:** Policymakers should focus on improving national innovation systems, strengthening links between various parts of the startup ecosystem, and enhancing enterprises' capacities to fund, absorb, and adapt technologies.
4. **Focusing on Deep Tech development:** Central Asia has the great advantage of a highly educated population, which is a strong foundation for Deep Tech development, but it is constrained by several factors such as underfunded R&D, weak collaboration between academia and corporate sector, and weak protection of intellectual property. But if these constraints are properly addressed, the region may unlock tremendous opportunities.
5. **Creating Collaborative Spaces:** Establish and support physical spaces that facilitate collaboration among entrepreneurs, both within and across national borders. These hubs can serve as catalysts for knowledge exchange, partnership formation, and innovation diffusion.

Recommendations (cont.)

6. Addressing Trust Deficits: Implement transparent and consistent policies to build trust between the entrepreneurial community and government institutions. This can encourage long-term investments and more ambitious, innovation-driven entrepreneurial ventures.
7. Promoting Problem-Driven Entrepreneurship: Develop programs & incentives that encourage entrepreneurs to focus on addressing societal and economic challenges, moving beyond necessity-driven entrepreneurship to opportunity-driven innovation.
8. Enhancing Regional Entrepreneurial Networks: Foster the development of regional entrepreneurial networks to overcome the current fragmentation observed both at local and regional levels. These networks can provide support, share best practices, and collectively advocate for favorable business environments.

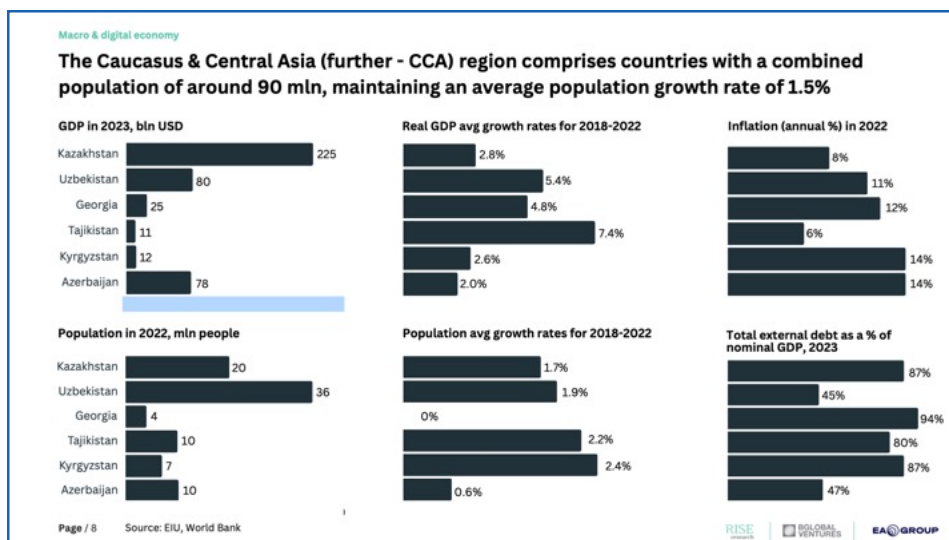


Context

Central Asia, nestled between the economic powerhouses of China and Russia, remains a relatively underrepresented region on the global map of innovation and venture capital investment. Despite its growing potential, the ecosystem for innovation-driven ventures in this region is still in its formative stages. This research seeks to illuminate the intricacies of this nascent ecosystem, exploring its potential to catalyze economic and social transformation in Central Asia. By examining the prerequisites for success in this rapidly evolving field, we aim to provide valuable insights for policymakers, entrepreneurs, and investors alike.

Central Asia is typically discussed in academic publications as comprising five countries: Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan¹.

The population has surged past 79 million, growing by an average of over one million people annually over the past decade. Despite challenges such as low living standards and high mortality rates, experts project that the population will exceed 100 million by 2050². The region's demographics favor economic growth, with an average age of 27³ and on average around 99.8% of the population literacy⁴.



Despite this progress, several systemic problems continue to impede socio-economic development. Central Asia is rich in natural resources and has untapped potential, yet it remains the most isolated micro-region of Eurasia from major global economic centers such as North America, Western Europe, and East and Southeast Asia and still one of the most disintegrated regions⁵.

Central Asia's aggregate GDP totals \$347 billion as of 2023. Over the last two decades, the region's GDP has grown by more than sevenfold.

Over the past 20 years, the average annual economic growth rate for Central Asia has been 6.2%, compared to 5.3% for emerging countries and 2.6% globally.

In 2021, the region's foreign trade in goods totaled \$165.5 billion, a sixfold increase over the last 20 years.

The volume of accumulated incoming direct investment in the region from foreign countries is estimated at \$211 billion. Over the past 20 years, this figure has grown more than 17 times.

The venture capital investments in Central Asia in 2022 reached \$100 mln, in comparison neighboring Indian startups alone raised over \$25 billion across 1,500+ deals, Middle East raised \$3.94 billion across 650+ deals and Southeast Asian startups raised \$17 bn across 1100+ deals⁶, which reveals the enormous potential of underfunded regional startups.

In this research we are focusing on three leading innovative ecosystems of Central Asia – **Kyrgyzstan, Kazakhstan and Uzbekistan.**

Kyrgyzstan is a mountainous country with population of 6.97 mln as of 2022, with relatively high level of labor migration. The economy of Kyrgyzstan is moderately complex with agriculture sector focusing on production of potatoes, berries,

fruits, tobacco, wool, and meat. Kyrgyzstan's economy relies heavily on the strength of mining exports, where export of gold estimated to 38.96% of the total export with following travel and tourism sector estimated to 6.32% of total export. The ICT sector has 2.95% of the total exports. The official estimate for Kyrgyzstan's GDP was \$44 billion at the end of 2023

¹Some researchers include Afghanistan as part of the region, though it was never formally part of the Soviet Union and has no infrastructural, cultural economic and political ties that links all other countries of the region and usually not considered in socio-economic context of Central Asia.

²<https://www.eurasian-research.org/publication/un-population-prospects-case-of-central-asia/>

³<https://www.inform.kz/ru/naselenie-tsentralnoy-azii-rastet-kak-reshit-problemi-demograficheskikh-perekosov-144458>

⁴The Economy of Central Asia: A Fresh Perspective (November 10, 2022). Reports and Working Papers 22/3. Almaty, Bishkek, Moscow: Eurasian Development Bank

⁵<https://www.sciencedirect.com/science/article/pii/S2405473917300429>

⁶Source: Crunchbase, LAVCA, Partech Africa, Magnitt, Venture Intelligence, Cento Ventures

in purchasing power parity terms and estimated to be \$57 billion dollars by World Economics for 2023 - 31% larger than official estimates⁷.

Kazakhstan has an export-oriented economy, highly dependent on shipments of oil and related products (73% of total exports), with the population of 19.62 mln as of 2022. In addition to oil, its main export commodities include ferrous metals, copper, aluminum, zinc and uranium. It counts Italy, China, Netherlands, Russia and France as its main export markets. Others include Switzerland, Ukraine and Canada. The United States account for 1.6% of Kazakh exports. Kazakhstan's real GDP in PPP to be \$705.52 billion in 2023 with estimated \$935 billion dollars by World Economics for 2023 - 32% larger than official estimates⁸. Kazakhstan remains the largest economy in Central Asia and a country with much unfulfilled potential.

Uzbekistan is a country with a population of 36.59 million as of 2024⁹ and economic activity strongly concentrated in its capital and largest city Tashkent (2.63 million people) that benefits from vast natural resources, low public debt, and significant foreign exchange reserves. Uzbekistan's GDP in purchasing power parity (PPP) terms was estimated to be \$321 billion at the end of 2023. However, World Economics estimates that Uzbekistan's GDP in PPP terms was \$409 billion in 2023, which is 27% higher than the World Bank's estimate¹⁰. Despite such strengths and progress, weaknesses persist, notably trade dependence on Russia and China, opaque regulations, as well as vulnerability to commodity fluctuations, high unemployment, and elevated rates of informal economy¹¹. Given the high rate of population growth and the influx of young people into the job market annually, the country's economic expansion must focus on robust job creation¹². Continuing the reform agenda is crucial for this, which includes further market liberalization and enhancing competition.

An average discrepancy of 30% between official and estimated GDP could suggest a substantial informal economy that is not fully captured in official statistics. In these conditions of geographical isolation and increasing challenges posed by climate change, there is a growing political will for a transition from a resource-based economy to a knowledge economy in Central Asia.

A recent IMF study¹³ shows the fundamental economic disruptions brought about by climate change not only endanger food security but also undermine public health, with a ripple effect on poverty and inequality, displacement, political stability, and even conflict for water resources. Past climate disasters have resulted in permanent gross domestic product losses of 5.5 percent in Central Asia and 1.1 percent in the Middle East and North Africa. And these disasters will only become more frequent. Given these prospects, the countries in the region are trying to find new opportunities to adapt to climate change, paying more attention to innovative technologies and economic transformation in favor of innovation-driven entrepreneurship.

In 2022, Kyrgyzstan's ICT services export reached \$40m, with Uzbekistan's at \$140m, and Kazakhstan's at \$200m. Compare these with \$25m, \$46m, and \$50m, respectively, in 2021. Official figures were "next to nothing" just a few years earlier. Exports go mostly to the US and western Europe. Uzbekistan, for instance, sent 85% of its exports to the US in 2021. There is a growing understanding of the importance and potential for IT exports as it can compete with commodities in scale: Ukraine, for example, exported slightly more IT services than Uzbekistan exported in gold (its main export) in 2021, Ukraine's \$6.9bn to Uzbekistan's \$6.5bn.

This progress is caused by a few transforming actions. Each country has established its own national IT parks—Astana Hub in Kazakhstan, the High Technology Park in Kyrgyzstan, and IT Park in Uzbekistan. All three parks act as special tax regimes to advance IT services development and export. Though, later in the report we highlight the other factors that caused a significant growth of ICT services export in 2022. Several innovation programs funded by international donors focus on digital ventures, though predominantly centered on innovative software and SaaS with a few cases of Tech-based startups. As demand for tech talent grows, investors and firms alike may look to new sources of expertise. Central Asian countries could become new technological hotspots for companies from elsewhere, driving more investment from venture funds that will likely extend into the Caucasus region¹⁴.

⁷<https://www.worldeconomics.com/Country-Size/Kyrgyzstan.aspx>

⁸<https://www.worldeconomics.com/Country-Size/Kazakhstan.aspx#:~:text=LATEST%20ESTIMATES%20FOR%20GROSS%20DOMESTIC,easy%20comparison%20with%20other%20countries.>

⁹<https://www.worldometers.info/world-population/uzbekistan-population/>

¹⁰<https://www.worldeconomics.com/Country-Size/Uzbekistan.aspx>

¹¹<https://gfmag.com/country/uzbekistan-gdp-country-report/>

¹²<https://www.worldbank.org/en/country/uzbekistan/overview>

¹³<https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/03/25/Feeling-the-Heat-Adapting-to-Climate-Change-in-the-Middle-East-and-Central-Asia-464856>

¹⁴https://www.strategieat.org/all_reports/Billion-in-the-Distance.pdf

Methodology

This paper aims to analyze the ecosystem for innovative entrepreneurship in Central Asia with a comparative analysis of the ecosystems in Kyrgyzstan, Kazakhstan and Uzbekistan. We will start with macroeconomic data to provide a bigger picture and then delve into specific details of each country and its stakeholders to understand the major elements and dynamics influencing these ecosystems.

Innovation and entrepreneurship are increasingly sought after, yet they often lack precise definitions and robust measurement frameworks. In this research we apply a systematic MIT approach for assessing 'innovation-driven entrepreneurship' in ecosystems focused on stakeholder engagement and regional strategies¹⁵. This approach is taught through programs like REAP (Regional Entrepreneurship Acceleration Program) and classes like REAL (Regional Entrepreneurship-Acceleration Leaders) at MIT¹⁶. It will be utilized to systematically evaluate the strengths, weaknesses, opportunities, and risks present in each ecosystem of the three countries of Central Asia.

This MIT framework encourages a collaborative approach among five key interconnected actors:



Credit: MIT's Stakeholder Framework for Building & Accelerating Innovation Ecosystems.

The MIT approach is guided by critical insights derived from our research-informed framework and our experience working with numerous decision-makers seeking comparable, sensible, and not overly complex metrics:

1. The proposed metrics are designed to capture both innovation and entrepreneurship, which we identify in successful ecosystems, highlighting the special blend of 'innovation-driven entrepreneurship'.
2. This framework identifies four key elements to measure in such ecosystems: foundational institutions, separate innovation and entrepreneurship capacities, comparative advantage, and impact.
3. Beginning with foundational institutions, we seek globally available metrics that allow for maximum comparability, both over time and across ecosystems. It is important to note that these metrics are typically available at a national level rather than a sub-national 'regional' level.
4. Emphasizing metrics for both innovation and entrepreneurship capacities, we focus on key inputs into these two distinctive capacities, measured across five areas: human capital, funding, infrastructure, demand, and culture/ incentives.
5. Building upon the inputs into innovation and entrepreneurship capacities, we include metrics that capture intermediate outputs. These outputs can, in turn, lead to longer-term regional 'comparative advantage' and ultimately 'impact'

This methodology provides a structured approach to measuring and analyzing innovation and entrepreneurship ecosystems, offering researchers and policymakers a comprehensive framework for assessment and comparison.

We consider Deep Tech ventures as first-of-a-kind, meaning that they produce technical inventions based on cutting-edge research. As such, they are often a technology-push although sometimes, problem-driven entrepreneurs will tap into the frontiers of scientific discovery to solve their challenges.

¹⁵https://innovation.mit.edu/assets/BuddenMurray_An-MIT-Approach-to-Innovation2.pdf
¹⁶<https://reap.mit.edu>; and <https://reap.mit.edu/get-involved/students-real/>

Deep Tech ventures excel in technological superiority, demonstrating unique technological capabilities (protected by patents and trade secrets), and often prioritize ongoing research and development. The Boston Consulting Group and French think tank Hello Tomorrow characterize inventions by deep tech ventures as “solutions built around unique, protected, or hard-to-reproduce technological or scientific advantages”¹⁷.

It is now widely recognized that achieving and sustaining any development outcome depends on the ability of multiple and interconnected actors and factors to work together effectively¹⁸. Each set of interconnected actors whose collective actions produce a particular development outcome is a local ecosystem and they all affected by various factors like level of protection of intellectual property, trustful judicial system and others. Improving that development outcome therefore requires a systemic approach.

Although innovation is a means to improving how development goals are achieved rather than an outcome in itself, the same principles apply. For innovative ideas to be efficiently generated, developed, tested and ultimately scaled for development impact they also require the coordinated, collaborated action and resources of the actors noted above – collectively referred to as the “innovation ecosystem”. But there are some discrepancies in understanding of what “innovation” and innovative ecosystem means. The late Ed Roberts, the founder of the Martin Trust Center for MIT Entrepreneurship, defined innovation as the product of invention and commercialization. So, invention is the primary element, where commercialization transforms this invention to innovation.

Innovation ecosystems can operate at multiple levels (e.g. city, regional, national) and within multiple sectors (e.g. agriculture, health, education). Because of this breadth, it can be difficult to draw meaningful boundaries around who is or isn’t part of an innovation ecosystem. It is therefore helpful to focus first on the sector and problem that the innovation is seeking to address (e.g. “limited access to fresh water for specific areas in a fresh water rich country due to inefficient water use and dilapidated infrastructure”) and then consider the specific actors, resources and contextual factors that the innovation will need to engage, utilize or influence to be impactful.

Adopting an ecosystems approach to innovation recognizes that an innovation ecosystem is made up of different actors, relationships and resources who all play a role in taking a great idea to transformative impact at scale. The effectiveness of each part within the innovation ecosystem is moderated by other parts of the system (e.g. entrepreneurs depend on being able to access financing). A change to one part of the innovation ecosystem leads to changes in other parts of the innovation ecosystem (e.g. development of the co-working spaces concept boosts interconnected links that spark new ideas and initiatives). Some innovative ecosystems will already be well-functioning and will require little support. Others will be problematic due to fragility, inequity, conflict, corruption, weak institutions or political stagnation

We apply the stakeholder model developed at the MIT Sloan School of Management to analyze foundational institutions, the entrepreneurial and innovation capacities and comparative advantage of the Kyrgyzstan, Kazakhstan and Uzbekistan ecosystems¹⁹. Below we outline the current infrastructure supporting entrepreneurship and the biggest challenges to creating a stronger and more vibrant community for promoting the development of Innovation Driven Entrepreneurship (IDEs) in Central Asia.

Stakeholders’ analysis

Entrepreneurs

Entrepreneurship is well-developed in Central Asia, where micro, small, and medium enterprises (MSMEs) contribute significantly to the country’s GDP and employment landscape. All research countries show a significant contribution from SMEs towards national GDP, estimated at 40.5% for Kyrgyzstan²⁰, 37.7% for Kazakhstan²¹ and 50.5% for Uzbekistan²².

A detailed analysis from the Kyrgyzstan National Statistics Committee reveals that SMEs play a pivotal role in job creation, particularly in the apparel manufacturing, trade, IT and agricultural sectors. With 12 thousand enterprises operating in Kyrgyzstan, 94% of them are small enterprises with up to 50 employees and 60% of all enterprises operate in Bishkek, capitol of Kyrgyzstan. Though the Government of Kyrgyzstan regularly design and adopt national programs for entrepreneurship development, no significant contributions were made in innovative ecosystem development.

¹⁷De la Tour, A., P. Soussan, N. Harlé, R. Chevalier, and X. Duportet (2017). From tech to deep tech: Fostering collaboration between corporates and startups. BCG/Hello Tomorrow.

¹⁸What is innovation ecosystem? retrieved from: <https://www.idaiinnovation.org/what-is-an-innovation-ecosystem>

¹⁹<https://innovation.mit.edu/assets/Assessing-IEcosystems-V2-Final.pdf>

²⁰National Statistics Committee of the Kyrgyz Republic, data for 2023

²¹National Statistics Bureau of Kazakhstan, data for 2024

²²Statistics Agency of Uzbekistan <https://stat.uz/en/press-center/news-of-committee/26303-kichik-biznesning-yaim-yahm-dagi-ulushi-qanday-3>

In Kazakhstan's society, entrepreneurship more often now considered a good career choice. However, the innovation ecosystem shares the same challenges as neighboring countries: early-stage entrepreneurial activity in Kazakhstan is very unstable and is prone to early closures. The highest prevalence of entrepreneurial activity is observed in the age group of 55-64 years; 99% of starting and new businesses were expecting their revenues coming from inside the country²³. Being active in international markets however has been shown to improve productivity and performance, thus creating the right framework conditions to facilitate going global may be an important point of attention for policy; access to finance for entrepreneurs improved since 2014 but has seen a decline in 2020.

Government policies and programs are generally assessed positively, though bureaucracy and corruption remain major constraints on entrepreneurship; R&D knowledge and technology transfer to small and medium enterprises is still low; entrepreneurial education is still a problem that continues to deserve further attention; the commercial infrastructure in the country is well developed, especially in terms of availability of banking, legal and accounting services; the state of the physical infrastructure and the ability of new and growing ventures to gain access to it are gradually improving; experts are concerned about such aspects of the internal market dynamics as the ability of new and growing firms to enter new markets, affordability of new market entry, fairness of business competition, and the effectiveness of anti-trust legislation²⁴.

The 2022-2026 Uzbekistan National Development Strategy was adopted following the re-election of President Shavkat Mirziyoyev. The document lists among its goals creating conditions for entrepreneurial activity and introducing innovations into the economy. The new strategy aims to pursue 100 defined goals, one of which is increasing the country's GDP per capita, with small businesses as a driving force. In November 2023 the World Bank has approved a \$50 million concessional loan to implement the Uzbekistan Digital Inclusion Project²⁵.

According to the National Development Strategy, by the end of this decade, the country plans to transform into a Central Asian IT hub, increase the annual volume of IT exports to \$5 billion, attract 1,000 foreign IT companies to launch operation in Uzbekistan, and provide employment opportunities for 300,000 youths in the IT sector. To achieve these ambitious goals, Uzbekistan will need to allocate significant resources to skill training, the development of essential IT and office infrastructure, and the establishment of appropriate legislation, strategies, and incentives to attract foreign and local investments in the IT sector. Though the strategy focused on IT services export instead of focusing on developing innovative products may be perceived a bit outdated.

Entrepreneurship provides over 80% of all employment, over 50% of the economy's added value, and a significant increase in total investments, all of which are proxies of innovation activity. Despite their importance to a healthy and growing economy, SMEs face many challenges in Uzbekistan that require active government intervention to improve the business environment and facilitate their operation.

From an entrepreneurship perspective, four main groups of policies need attention²⁵:

1. Tax policy
2. Regulation
3. Access to capital markets
4. Legal protection, property rights, and economic freedom

All three countries have national programs where entrepreneurship development is viewed primarily as a tool for boosting employment and GDP per capita growth, rather than as a means for promoting social inclusion and economic justice.

Any growth is important for economic development, but entrepreneurship promotes unique kinds of growth. The Kauffman Foundation, a leading entrepreneurial foundation in the US, has determined that while older and larger firms are the primary source of employment, 95% of new jobs are created by young, high-growth technology-based businesses²⁶.

²³GEM Kazakhstan National Report 2020/2021

²⁴GEM Kazakhstan National Report 2020/2021

²⁵<https://www.worldbank.org/en/news/press-release/2023/11/30/world-bank-to-support-uzbekistan-in-developing-the-digital-economy-and-creating-new-jobs-in-the-it-sector>

²⁶The Index of Economic Freedom. Heritage Foundation

The same phenomenon can be seen in terms of productivity gains, where research has indicated that high growth technology-based firms make disproportionate contributions to increases in output and productivity²⁷. For entrepreneurs to make their ideas reality, it is essential that societies support their needs by building strong and diverse innovation ecosystems. Doing so not only brings economic benefits, but also can encourage trust and empathy, compliance with the rule of law, and dialogue (rather than conflict) to solve problems.

Policymakers concerned with entrepreneurship understand that a trade-off exists between entrepreneurial growth and taxes. Entrepreneurship is an activity that requires investment, consumption, and income generation to be successful. Excessive corporate income taxes, for example, reduce the incentive to start or expand a business, and capital gains taxes reduce the incentive to invest. A sound tax policy that encourages company formation and investments should be devised as a tool to promote entrepreneurial activity.

The development of an entrepreneurial innovation ecosystem requires that all its components be addressed concurrently because the ecosystem works at the pace of its weakest link, not its strongest one. For example, if there is R&D available but no venture capital, R&D will stay in the laboratories with little chance of commercial use. Similarly, if there is enough available funding but no deal flow of technological opportunities, investors will not allocate funding because of a lack of innovation.

The holistic nature of an innovation ecosystem has important policy implications. Government support programs tend to focus on the financial aspects of the entrepreneurial process, providing grants, tax relief, or loans contingent on success. Yet if the ecosystem is fragile, financial support on its own does not produce the value expected from public and private investment. This, in turn, discourages both public and private agents from being involved in the ecosystem over the long term. Entrepreneurs can plan and execute activities that translate potential ideas into actual innovations that have a footprint on the market. Thus, supporting a healthy innovation ecosystem leads to a more creative, bold, just and dynamic economy. For this reason, governments from all over the world have developed a series of programs to support entrepreneurship activity.

However, the development of an ecosystem is a slow incremental process. It may take decades and require a significant cultural and mindset change in how society appreciates and values entrepreneurs, what they do, the benefits of their work, and the risks involved in their endeavors. As such, the sooner a country has an innovative ecosystem strategy, the better.

Universities

Kyrgyzstan universities tend to be more teaching focused with heavily theoretical and often outdated curricula. With high competition between 63 higher education institutions²⁸, many schools are currently restructuring their systems to improve education quality and to better disseminate tacit knowledge. A study²⁹ conducted across 13 universities in Kyrgyzstan involving 793 students found that while students value the educational support they receive, there is a lack of comprehensive business development opportunities, such as mentorship or incubation programs, which hinders the practical application of entrepreneurial skills. Additionally, many students face challenges due to limited access to innovative ecosystems and networks that can facilitate real-world business ventures.

Thus, universities have opened labs and state-of-the-art prototyping space to their students; however, these facilities are not used frequently and are still mostly designed to improve education service delivery, rather than scientific research capacity. Universities express high interest in entrepreneurship, with many planning to introduce new courses or open centers to better support their student and faculty endeavors, but not many practical collaborations took place. Although it will be time before the effectiveness of such efforts can be evaluated.

Universities in Kazakhstan are increasingly focusing on fostering entrepreneurial skills through both traditional and online platforms. These efforts aim to equip students with competencies essential for the digital age, including decision-making, risk evaluation, and adaptability. However, challenges remain, such as outdated infrastructure and the reluctance of some educators to adopt new teaching methods

²⁷Haltiwanger, Jarmin, Kulick and Miranda, 2017 "High Growth Young Firms: Contribution to Job, Output and Productivity Growth", <https://www.nber.org/books-and-chapters/measuring-entrepreneurial-businesses-current-knowledge-and-challenges/high-growth-young-firms-contribution-job-output-and-productivity-growth>.

²⁸<https://erasmusplus.kg/wp-content/uploads/Список-Вузов.pdf>

²⁹https://eric.ed.gov/?q=source%3a%22journal%20of%20further%20and%20higher%20education%22&f1=dtysince_2019&f2=subUniversities&id=EJ1419270

A significant development in Kazakhstan's entrepreneurial education has been the push towards creating innovative ecosystems within universities. These ecosystems are designed to integrate state, business, and educational sectors, providing students with a more practical, real-world approach to entrepreneurship. Despite these advancements, the innovative ecosystem is still in its early stages and faces obstacles, such as limited collaboration between universities and the private sector, and inadequate support for business incubation programs.

Digital education has played a transformative role, especially post-pandemic, by enhancing the accessibility and flexibility of entrepreneurial education. Students now engage with entrepreneurial subjects through online courses, digital simulations, and virtual labs, which help develop both theoretical and practical business skills. However, there are still gaps in the full implementation of these tools across all institutions³⁰. There is little research that has explored the motivations for developing university–industry partnerships and perceptions about their benefits and challenges. Moreover, according to international reports, Kazakhstan is underperforming in terms of innovation and research commercialization. While the government seems to be the dominant player on the University-Industry Partnership (UIP) agenda, universities and industries should adopt a more proactive and innovative approach in developing UIPs. Study of the Nazarbayev University Collaborative Research Program demonstrates that the major barriers take place at the organizational level and include poor research infrastructure, bureaucracy, limited faculty capacity to conduct quality research and limited university authority³¹.

In 2016 there were 77 universities operating in Uzbekistan and for the period of 2022-2023 that number increased to 115. Compared with other central Asian countries, Uzbekistan has one of the largest higher education infrastructures. Entrepreneurial education in Uzbekistan is progressing, with universities increasingly adopting an entrepreneurial university model. This model emphasizes integrating entrepreneurship into the curriculum, supporting students in developing key skills like creativity, problem-solving, and innovation.

However, challenges remain, such as outdated curricula, insufficient collaboration with industry, and a lack of emphasis on skills development. These gaps hinder the effectiveness of entrepreneurial education in aligning with the needs of the job market. Some universities in Uzbekistan, such as Tashkent State Technical University and Tashkent State University of Economics, have been recognized³² for their efforts to incorporate entrepreneurial modules and collaborate with industry partners. Yet, these efforts are still in the early stages and need more structural support and ecosystem development, especially in areas like incubation and mentorship programs. Nonetheless, a single university from the country has not ranked even in the top 1000 in any of the three popular ranking agencies, Times, QS, and AWAS (popularly known as Shanghai Ranking). In general, universities in Uzbekistan experience the same challenges as other countries in the region, with outdated curriculum and broken links with industries and science, focusing mostly on provision of paid academic services rather than R&D.

Research and development expenditure (% of GDP) in Kyrgyzstan estimated to 0.08%, compared to 0.13% in Kazakhstan and 0.16% in Uzbekistan³³. Although there are notable legislative attempts to improve scientific and academic research in all countries, more needs to be done to encourage higher education and research and development institutions to collaborate with the corporate sector and play pivotal role in building innovative ecosystem.

Risk Capital Providers

Despite the region's rapid growth, it remains a small player in the venture market compared to Europe or the U.S. as of December 31, 2023. Kyrgyzstan had 8 operational VC firms, Uzbekistan 11, and Kazakhstan 16. In 2023, Kyrgyzstan's overall VC deal value was \$1.1 million, compared to \$80 million in Kazakhstan and \$6.3 million in Uzbekistan³⁴.

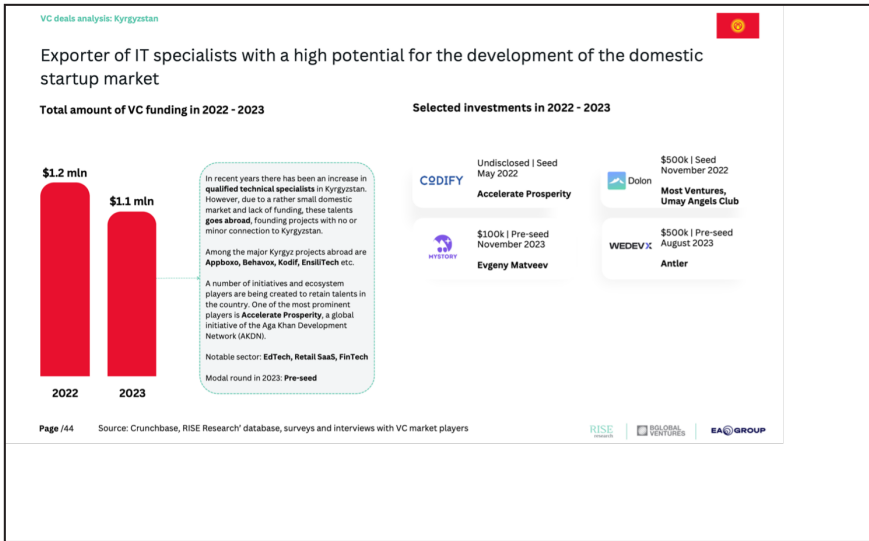
³⁰Aubakirova S, Kozhamzharova M, Zhumabekova G, Artykbayeva G, Iskakova Z and Zhayabayeva R (2023) Experience in forming entrepreneurial education in Kazakhstan universities in the conditions of information and digital development. *Front. Educ.* 8:1199392. doi: 10.3389/educ.2023.1199392

³¹<https://cabar.asia/en/university-industry-partnerships-in-kazakhstan>

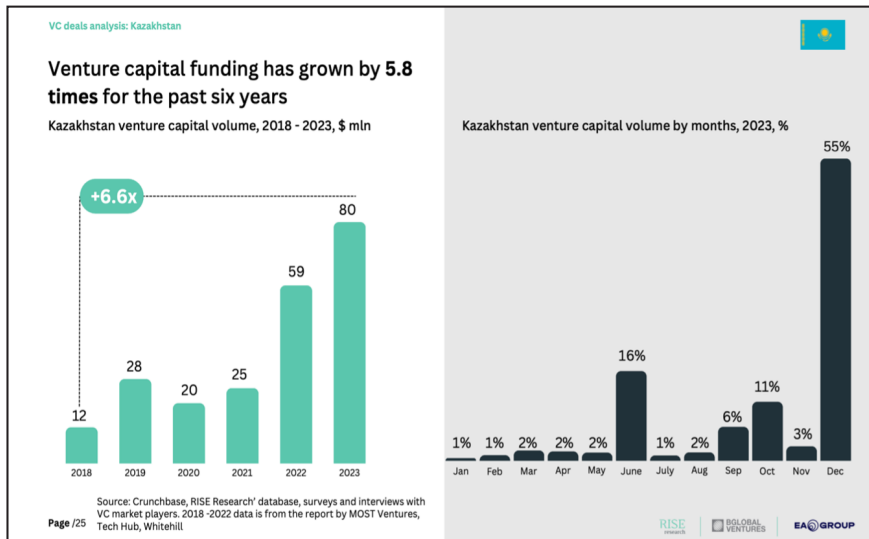
³²<https://tashkenttimes.uz/national/7180-uk-experts-honored-the-best-entrepreneurial-universities-in-uzbekistan>

³³<https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=KG>

³⁴Venture Capital in Central Asia and the Caucasus 2023, Mar 2024

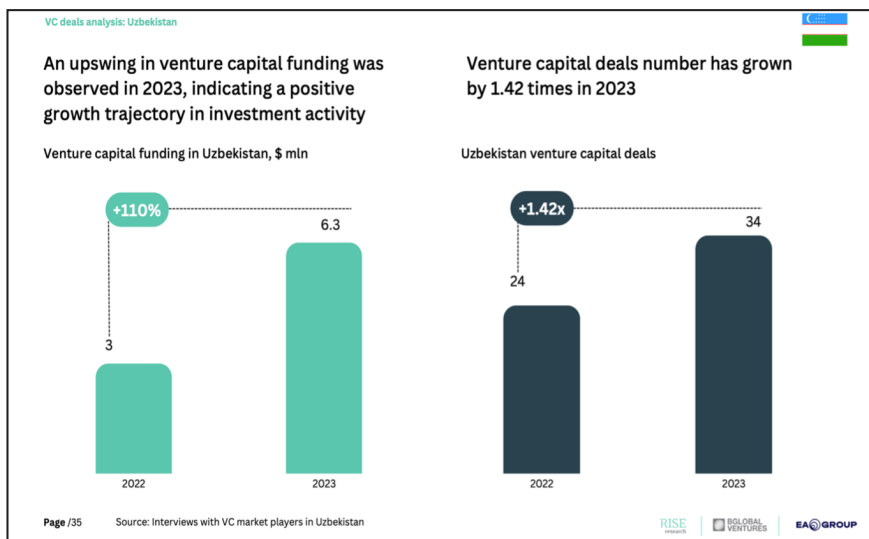


Overall, few high-risk funds are specifically available for entrepreneurs in Kyrgyzstan. Venture capital is essentially non-existent in the country. Startups face a significant challenge: a lack of diverse funding sources due to a substantial capital deficit. Insufficient investors, from angels to venture funds, hinder startups' growth and make them overly reliant on a limited number of financial partners.



The boost in high-risk funds market development, particularly in Kazakhstan was given in 2018 with the establishment of the Astana International Financial Center (AIFC), a special jurisdiction in Kazakhstan based on the principles, legislation, and precedents of British law and the standards of leading global financial centers. This special jurisdiction, along with a favorable tax regime, made the AIFC an attractive destination for regional startups seeking trustful judicial system, high-risk investments and venture investors looking for early-stage regional startups.

However, according to industry experts, public deals represent only ~60% of the actual market size, indicating a significant number of deals that are not reported or disclosed publicly³⁵.



An upswing in venture capital in Uzbekistan funding was observed in 2023, indicating a growth trajectory in investment activity.

In general jurisdictions of the region, funds are available for traditional SMEs (with fewer than 150 employees) through government programs with interest rates starting at 6%, and through commercial banks and microfinance services with interest rates ranging from 6% to 30%. Commercial banks provide loans with interest rates around 18-22% for SMEs and require a one-year operational history and immovable assets as collateral.

These criteria make such funding difficult to obtain for startups.

³⁵As per research data from Most Business Intelligence

Corporates

Corporate representatives often describe their innovations as having the internal impact

of increasing productivity and decreasing costs. Large corporations in Kyrgyzstan tend to grow horizontally rather than vertically, preferring to branch out to new orthogonal ventures rather than build depth. Many of the companies also do not have a dedicated research and development division, only examining the feasibility of the new direction when proposed. In general, corporations recognize the value of entrepreneurship but have little interest and effect on directly contributing to the development of startups that are supported mostly by international organizations and affiliated programs or venture funds. Though the country hosts a large, informal economy estimated to be the equivalent of between 25 and 72 percent of GDP³⁶. The top three industries are mining, textiles, and agriculture, but information technology (IT) and renewable energy have a growing trend.

Kazakhstan's corporate sector is diverse, with many industries and companies. Kazakhstan is a leading producer of oil and gas, with major oil fields like Tengiz and Kashagan. The country's oil and gas sector include around 170 companies, including international firms like Chevron, ExxonMobil, and Royal Dutch Shell, as well as the state-owned KazMunayGas. Kazakhstan is rich in mineral resources and is a leading producer of uranium, with over 40% of global production. The country also produces chromium, lead, zinc, manganese, and copper. Retail, wholesale trade, and motor vehicle repair. As of March 2023, this sector had the most registered enterprises in Kazakhstan, with over 138,000. As of March 2023, the construction sector had the second-highest number of registered companies, with approximately 69,000.

Over the past decade, Kazakhstan's innovation system—the network of institutions, firms, and people that boost the flow of information and technology—has become considerably more market driven.

That has been partially achieved thanks to two World Bank-supported projects, Technology³⁷ Adoption of competitive grant funding mechanisms has made the national R&D funding programs more transparent and improved the quality of R&D project proposals in terms of their scientific merit and commercialization potential though, there is still a need for a greater academic-industry cooperation legislation and stimulus exists as Kazakhstan remains the leading industrial economy of the region with relatively low expenditures by corporate sector in R&D.

Formal private firms in Uzbekistan do not grow in size as they age. Analysis based on data from the 2019 World Bank Enterprise Surveys indicates that formal private firms, especially in manufacturing and service sectors, have not grown as quickly in comparison to those in other major transition economies such as Vietnam and Russia. In addition, these firms tend to remain small over time: Uzbek formal private firms up to 10 years old employ, on average, 20 workers compared with 33.6 workers in similar firms in Vietnam. The same micro-level analysis showed that labor productivity (defined as sales revenue per worker) in the formal private sector has decreased continuously over the past decade, with -1.2 percent annual growth during 2010–13 and -6.7 percent during 2016–19. These recent decreases reveal low performance in other entrepreneurship domains, such as insufficient trade exposure, low innovation intensity, and weak firm capabilities³⁸. During the period 2008–2017, the main sources of R&D funding in Uzbekistan have been the government. The share of government funding rose from 45.54% in 2008 to 56.94% in 2017. In the same period, the share from business enterprises decreased from 49.92% to 41.23% of the total amount of R&D funding. The share of funds from the higher education sector and other sectors remained³⁹.

³⁶<https://www.trade.gov/country-commercial-guides/kyrgyz-republic-market-overview>

³⁷<https://www.worldbank.org/en/news/feature/2023/09/04/modernizing-kazakhstan-s-innovation-ecosystem-through-technology-commercialization>

³⁸<https://blogs.worldbank.org/en/europeandcentralasia/boosting-private-sector-development-uzbekistan>

³⁹<https://unesdoc.unesco.org/ark:/48223/pf0000374566.locale=en>

Government

The Cabinet of Ministers has adopted the Kyrgyzstan Business Development Program through 2026.

This program envisages a transition to a service-based model for business support, characterized by reduced tax inspections, digitalization of customs infrastructure, deregulation, and de-bureaucratization in state regulation of entrepreneurship. Additionally, it aims to protect intellectual property rights to foster technological advancement and healthy competition. There are two special tax regimes exists in Kyrgyzstan for export-oriented IT service companies and creative industry companies in the forms of the High Technology Park and Creative Industry Parks.

In general, many legal experts agree that the tax and economic laws are written well, but the major challenge is implementing and enforcing these laws. Corruption is still perceived as one of the top three main problems in accordance with the International Republic Institute public survey for 2023⁴⁰, along with the cost of living and unemployment concerns. In the recent 2 years the government of Kyrgyzstan adopted several restrictive legislations that undermine the work of civil society organizations who traditionally act as watchdogs for corruption and bad practices, raising concerns on cases of excessive control and abuse of power, dragging Kyrgyzstan to Not free country in Freedom House Index and mostly unfree in Index of Economic Freedom what undermines trust to keep and invest savings in the country.

Since coming to power, President Shavkat Mirziyoyev has pursued policies to liberalize Uzbekistan's economy and foster innovation. A key step was establishing IT Park Uzbekistan in 2018, aiming to boost annual IT exports to \$5 billion by developing local talent and attracting foreign investment⁴¹. The government has also provided incentives for startups and investors, including tax benefits and regulatory support, resulting in over 500 companies operating within the park by 2022⁴² (Ministry of Innovative Development, 2022). In addition to tech sector growth, Uzbekistan launched initiatives like the National Venture Fund and Startup Development Program, aiming to support R&D and entrepreneurship⁴³ (Uzbekistan National Venture Fund, 2021). However, progress on civil liberties remains limited; the Freedom House Index still classifies Uzbekistan as "not free," and it ranks "mostly unfree" in the Index of Economic Freedom (Freedom House, 2023; Heritage Foundation, 2023).

This highlights the government's cautious approach to political openness, even as it actively fosters economic modernization. Uzbekistan's evolving tech and startup environment reflects both significant growth potential and constraints, balancing an expanding innovative ecosystem with measured political reforms.

In Kazakhstan, business development strategies have focused on digitalization, diversification, and fostering innovation through government-led programs.

The government has adopted initiatives aimed at improving the business environment, with a focus on enhancing digital infrastructure and providing support for small and medium-sized enterprises (SMEs). For example, Kazakhstan 2050 Strategy aims to create a knowledge-based economy, and the Business Roadmap 2025 emphasizes reducing bureaucratic barriers and improving access to finance for entrepreneurs. Tax incentives are available for industries like IT, tourism, and manufacturing, although challenges persist in enforcement. However, the implementation and enforcement of laws remain significant obstacles, similar to Kyrgyzstan. Corruption, lack of transparency, and bureaucratic inefficiencies continue to be cited as major hurdles for entrepreneurs. According to a recent World Bank Enterprise Survey, businesses in Kazakhstan identify corruption as a key obstacle, undermining the effectiveness of regulatory reforms intended to promote business development. Kazakhstan has also been addressing intellectual property (IP) issues to foster innovation and competitiveness. The protection of IP rights is recognized as crucial for technological advancement and the development of creative industries. Nevertheless, Kazakhstan has struggled with corruption and inconsistent law enforcement, which often discourages foreign investors from bringing in capital or launching businesses. Despite a decade of progress, institutional shortcomings such as a weak judicial system and persistent corruption discourage diversification and modernization in Kazakhstan. The regulatory framework has undergone reform. The procedures for establishing a business, while streamlined, are still costly. Labor regulations are relatively flexible, but enforcement of the labor code remains inefficient. Substantial oil revenues enable a high degree of fiscal freedom. Broader and stronger foundations of economic freedom are even more critical to the country's long-term economic prospects and overall competitiveness.

⁴⁰<https://www.iri.org/resources/national-poll-of-kyrgyzstan-dec-2023-jan-2024/>

⁴¹<https://it-park.uz/en/itpark/news/results-of-2021-the-number-of-it-companies-of-it-park-residents-amounted-to-more-than-500>

⁴²Ministry of Innovative Development of Uzbekistan, 2022

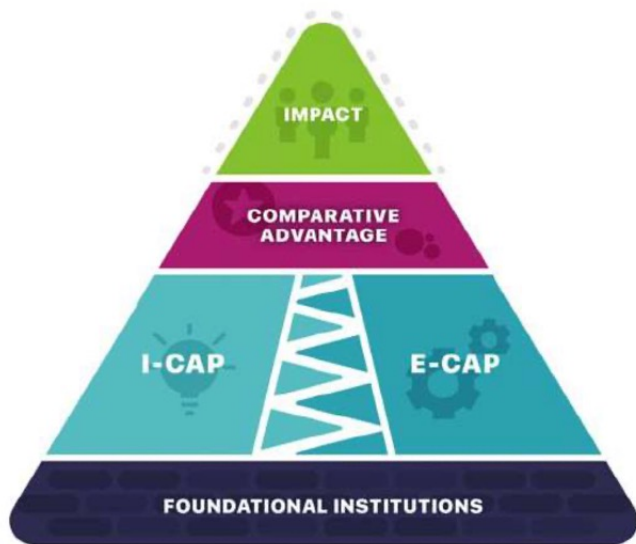
⁴³<https://www.adb.org/sites/default/files/publication/905251/uzbekistan-ecosystem-technology-startups.pdf>

Inflationary pressures continue. Even though Kazakhstan is considered Not free country in Freedom House Index, it has moderately free economy in accordance with Index of Economic Freedom.

In a 2023 survey conducted by MOST Business Intelligence as a follow-up to the QrltAI Hackathon and Startup Weekend for Central Asia, 65% of public service participants reported having a basic understanding of AI technology, 25% indicated an average knowledge, and only 10% demonstrated an advanced understanding of AI and its practical applications. In 80% of the government institutions no staff who is capable of coordination of AI integration in business processes and 85% of participants expressed willingness to study in this field.

A framework analyzing Innovation Ecosystems

The MIT framework comprises a 'system' of four levels with five elements, and we have used it below⁴⁴. Taken together, these elements lead to 'comparative advantage' and ultimately (to a greater or lesser extent) 'impact' within an iEcosystem.



Working from the bottom of the system to the up, we'll explore of these elements in the with comparative analysis of **Kyrgyzstan, Kazakhstan and Uzbekistan**.

Foundational Institutions

Foundational institutions are those institutions, rules, practices and norms that are often taken for granted, but ensure that investments in a wide variety of capacities and assets can be effectively protected and leveraged to the benefit of the economy. At the core, they include rule of law (and conversely lack of corruption), protection of property rights (especially for intellectual property), financial institutions, freedom for new ideas (including scientific openness), and general ease of doing business.

For the sake our Central Asia research, we also added another data for Human Freedom, created by Cato Institute, unfortunately their data is available for Kyrgyzstan and Kazakhstan only, but this data gives us a foundation to analyze and compare the role of civil society organizations, human capital and relevance of diversity and social tolerance for iEcosystems. We shall delve into this topic later in the document.

We have five sources of data used for comparative analysis. The World Bank (WB) World Development Indicators (WDI) is the Bank's primary collection of metrics, collected from official sources from around the world. It covers over 1500 variables. The data is available for 1990 (for selected countries) until 2019 (latest to date) and is comprehensive in its coverage including up to 264 countries for some measures in some years. It covers a wealth of detailed data about the structure of the national economy, agriculture, energy and education:

Ease of doing business is a composite country ranking from the World Bank across 10 topics relevant to ease of operating private-sector firms.

Starting a business is a ranking of the simplicity of starting a new business for entrepreneurs incorporating and registering a new firm.

Paying taxes is a ranking level of tax rates and administrative burden in tax payment for typical medium-size firms.

Resolving insolvency is a ranking level of weaknesses in insolvency law and main bottlenecks in the process.

Enforcing contract is a ranking level of time/cost for resolving a commercial dispute including degree of good practices in the court system.

⁴⁴Budden & Murray, A systematic MIT approach for assessing 'innovation-driven entrepreneurship' in ecosystems <https://innovation.mit.edu/assets/Assessing-iEcosystems-V2-Final.pdf>

Foundational institutions metrics WB data May 2019 IEF data 2024 TI data 2023 Ci data 2023	Kyrgyzstan	Kazakhstan	Uzbekistan
Ease of doing business rank (WB)	80	25	69
Starting a business (WB)	42	22	8
Paying taxes (WB)	117	64	69
Resolving insolvency (WB)	78	42	100
Enforcing contract (WB)	134	4	22
Property rights (IEF)	22.4	54.1	32.9
Government Integrity (IEF)	24.8	36.5	29.1
Labor freedom (IEF)	52.3	62.6	48.2
Index of Economic Freedom total score (IEF)	55.2	62	55.9
Corruption Perceptions Index (TI)	26	39	33
Human Freedom (Cato Institute)	6.64	6.4	No sufficient data

The Heritage Foundation data for the Index of Economic Freedom (IEF) has measured the impact of liberty and free markets from 0 (repressive) to 100 (no government interference)⁴⁵. Economic freedom is the fundamental right of every human to control his or her own labor and property. In an economically free society, individuals are free to work, produce, consume, and invest in any way they please. In economically free societies, governments allow labor, capital, and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself⁴⁶.

Property rights are scored across the strength of laws allowing individuals to accumulate five types of property rights (including IPRs).

Government integrity is a score capturing levels of trust, transparency and absence of corruption.

Labor freedom is a score capturing flexibility and efficiency of a country's labor market including hindrance to hiring etc.

Corruption Perception Index by Transparency International is an annual report on corruption perception that starts from 0 (very corrupted) to 100 (very clean), unlike from the previous metrics where the higher number reflects better results.

Human Freedom by Cato Institute is an annual assessment of human freedom measured from 0 (less freedom) to 9 (more freedom). Human freedom is an inherently valuable social concept that recognizes the dignity of individuals. Human freedom enables and empowers people to do as they please, free from constraints or punishments, so long as it does not impinge upon the freedom of another.

We have ranked three countries by green (the best performance), yellow (average) and red (worst) in comparison to each other for clarity of each country's positioning to each other.

⁴⁵<https://www.heritage.org/index/pages/about#indexMethodology>
⁴⁶<https://www.heritage.org/index/pages/about>

Measuring Innovation and Entrepreneurship Capacities

Together, I-Cap and E-Cap capture the sense that a system is capable of two activities: innovation and entrepreneurship respectively. As a starting point, we usefully think of a ‘capacity’ as a sort of ‘production function’ - i.e. a way of relating a series of well-defined inputs to the outputs, in this case of entrepreneurial or innovative capacity outputs. Through a decision-making lens, it is critical that the inputs into the production function be defined and then optimized for - or at least made as appropriate as possible for – innovation (moving ideas from inception e.g. in the lab through to impact in a variety of organizational settings not just in start-up enterprises) and entrepreneurship (the creation of start-ups and the scale-up of all new enterprises). We consider five critical inputs into the I-Cap and E-Cap production functions, based on MIT research about the drivers of ‘innovation-driven entrepreneurship’ in a variety of locations – some within the United States but also from regions worldwide.

Due to limited comparative data on quality STEM education, PhD graduates per capita, and STEM graduates per capita for Kyrgyzstan, Kazakhstan, and Uzbekistan as outlined in the initial REAP framework for human capital, we had to adjust some metrics and add alternatives. One proposed metric is the Global Talent Competitiveness Index⁴⁷, an input/output model with 48 variables covering 103 countries that describes a country’s competitiveness and attractiveness for talents. By adding this metric, we propose to broaden the perception of human capital prerequisites, not limiting it to access to quality education, but also including the attractiveness of geographical areas, as a country or a city for talents, the infrastructure and all those intangible factors that affect the choice of a talent for reallocation. Countries and cities are competing globally for talents that will contribute to diversity, competitiveness, innovation, and growth and develop means to retain these talents. In this context, governments, businesses, civil society, and various other stakeholders need quantitative instruments to inform their decisions—whether as investors, employers, employees, or jobseekers—and help to design and implement better policies in areas such as safety, social and cultural infrastructure, employment, and immigration among many other.

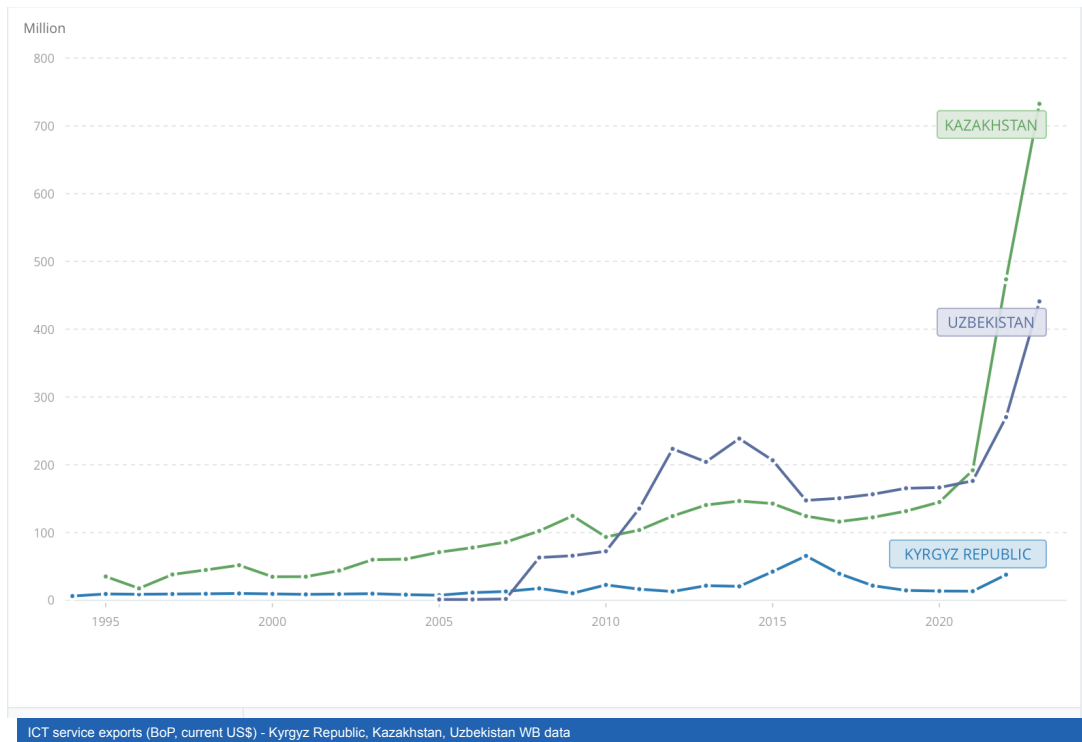
A notable example of talent movement effect in Central Asia, affected by both post-COVID transformation and the geopolitical situation in the region, occurred when thousands of skilled and educated professionals from Russia sought new destinations where their expertise could be applied. In 2022, the conflict in Ukraine drove Russian IT professionals and companies to relocate to Central Asia, potentially boosted the IT sector in the region. Kazakhstan has almost tripled ICT services export and Uzbekistan doubled it in 2022 with Kyrgyzstan having the least benefits of this shift. However, assessing the long-term impact remains challenging due to data limitations⁴⁸.

Sources:

<https://archive.doingbusiness.org/en/rankings>
<https://www.heritage.org/index/pages/all-country-scores>
<https://www.transparency.org/en/ici/2023>
<https://www.cato.org/human-freedom-index/2023>

⁴⁷<https://www.insead.edu/system/files/2023-11/gtci-2023-report.pdf>

⁴⁸Sharshenova Aijan, Rahat Sabyrbekov, and Burulcha Sulaimanova. “Digitalization of Infrastructure and Decarbonization in Central Asia: Opportunities and Challenges.” CAREC Think Tank Network Paper (2024)



Innovation Capacity (I-Cap) Inputs

Sources:
GII https://www.wipo.int/global_innovation_index/en/2023/
GCI <https://www.weforum.org/>
UNESCO <http://data.unesco.org/>

Human Capital	Kyrgyzstan	Kazakhstan	Uzbekistan
Human Capital Index UN e-government knowledge base data 2022	0.8119	0.9021	0.7778
Global Talent Competitiveness Index 2023	38.58	43.01	44.97
Researchers in R&D (per million people) UNESCO data 2022	No data	681	547

Funding	Kyrgyzstan	Kazakhstan	Uzbekistan
R&D expenditure as a % GDP WB 2022	0.089	0.13	0.16

Infrastructure	Kyrgyzstan	Kazakhstan	Uzbekistan
ICT access (GII) data 2022	81.8	90.2	82.7
Internet Bandwidth Mbps (World Population Review)	54.37	47.53	54.12
Production Process Sophistication (WEF)	2.97	3.59	No data
Availability of latest technologies (WEF)	3.58	4.13	No data
Total patent grants (World Population Review 2024)	39	651	298

Demand	Kyrgyzstan	Kazakhstan	Uzbekistan
Trade, diversification, and market scale (GII)	40.8	58.5	60.8
Government procurement of advanced technology, ranking (GCI)	103	73	No data
University-industry research collaborations (GII)	6	20.3	62.4

Culture and incentives	Kyrgyzstan	Kazakhstan	Uzbekistan
Quality of scientific research institutions, ranking (GCI)	116	78	No data
Graduates in science & engineering (%) (GII)	19.2	24.1	36.9

The weakest performance is in Creative outputs (102nd). Political and operational stability (rank 123) remains the weakest indicator⁴⁹. As per I-Cap analysis, the weakest performance is in university-industry research collaboration and total patent grants, that undermines deep tech capabilities of the country.

Kyrgyzstan

As per the Global Innovation Index, relative to GDP, Kyrgyzstan's innovation performance meets expectations for its level of development. However, it produces fewer innovation outputs relative to its level of innovation investments. Kyrgyzstan performs above the regional average in four pillars:

- 1) Institutions (95th)**
- 2) Human capital (70th)**
- 3) Infrastructure (87th)**
- 4) Market sophistication (52nd)**

Kyrgyzstan ranks lowest in:

- 1. Creative outputs (102nd).**
- 2. Political and operational stability (123rd)**

As per I-Cap analysis, the weakest performance is in university-industry research collaboration and total patent grants, that undermines deep tech capabilities of the country.

Kazakhstan

Kazakhstan takes the leading position in Central Asia, with the most advanced infrastructure and the highest number of patent grants. It ranks 81st among the 132 economies featured in the Global Innovation Index (GII) 2023. However, Kazakhstan produces fewer innovation outputs relative to its level of innovation investments.

Kazakhstan ranks highest in:

- 1) Human Capital and Research**
- 2) Infrastructure (59th)**
- 3) Institutions (61st)**
- 4) Business Sophistication (75th)**

Kazakhstan ranks lowest in:

- 1) Creative Outputs (90th)**
- 2) Market Sophistication (87th)**
- 3) Knowledge and Technology Outputs (83rd)**

Kazakhstan's main innovation strengths are:

- 1) Government's Online Service (8th)**
- 2) Utility models by origin/bn PPP\$ GDP (10th)**

Uzbekistan

Uzbekistan produces fewer innovation outputs relative to its level of innovation investments. However, relative to GDP, Uzbekistan is performing above expectations for its level of development.

Uzbekistan ranks highest in:

- 1) Institutions (55th)**
- 2) Market Sophistication (69th)**
- 3) Infrastructure (73rd)**
- 4) Business Sophistication, Knowledge and Technology Outputs (78th)**

Uzbekistan ranks lowest in:

- 1) Creative Outputs (93rd)**
- 2) Human Capital and Research (89th)**

Underfunded R&D and creative outputs are the weakest performances for all three countries.

There is an obvious need in the region to enhance cooperation in research and development. Cooperation in research, development and innovation (RD&I) between universities or research institutes and industries plays a fundamental role in the economic development of a country. Industry benefits from state-of-the-art laboratories and technologies from academia, while institutes learn about business reality and market needs. Numerous barriers to the establishment and maintenance of these partnerships have been investigated and reported in the literature, but the information generated by these empirical studies is very fragmented and there is a need to consider the barriers systematically in order to clarify the topic.

Within the context of university-industry collaboration (UIC), universities and research institutes fulfill the same function since both have research, development and innovation (RD&I) as part of their mission⁵⁰. Private companies depend on partnership with such institutes to ensure competitiveness in the marketplace⁵¹, either through innovation produced directly or through the training of human resources⁵².

⁴⁹https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000_2022/kg.pdf

⁵⁰Fuentes C, Dutrénit G (2012) Best channels of academia-industry interaction for long-term benefit. Res Policy 41(9):1666–1682. <https://doi.org/10.1016/j.respol.2012.03.026>

⁵¹Villani E (2013) How external support may mitigate the barriers to university-industry collaboration. Econ e Politica Ind 40(4):117–145. <https://doi.org/10.3280/polit2013-004005>

⁵²Galán-Muros V, Plewa C (2016) What drives and inhibits university-business cooperation in Europe? A comprehensive assessment. R D Manag 46(2):369–382. <https://doi.org/10.1111/radm.12180>

The importance of scientific knowledge generated by academic/research institutions in collaboration with the private sector is undeniable for the economic growth of a nation but, in less developed countries, diverse barriers may impede this type of cooperation⁵³. Collaboration between highly qualified academics/researchers and professionals in private organizations and companies within the country and globally, could boost local economies by combining all existing technical skills and capabilities. Examples of the impact of UICs on economic development have been examined by various authors (Bercovitz and Feldman 2006; Ford et al. 2012; Yu et al. 2021). However, emerging industries, unlike their mature counterparts, lack fully developed knowledge networks and have meager public funding for research projects, thus making cooperative processes somewhat difficult.

In order for UICs to thrive, companies need to learn to work outside the boundaries of their organization and to develop capabilities to interact and cooperate with partners that have different characteristics, which is to say that they must manage their relationships. Academics and their peers in industry will need to learn from experience throughout the partnership period, especially during the first interaction when participants discover the norms and culture of the disparate organizations, with the necessity to reconcile differences, to reach a common understanding and to build trust⁵⁴. But the interventions to improve the R&D capabilities of universities start with the school level. Promotion of academic freedom is essential not only for fostering innovation at the university level but also for shaping foundational education systems, particularly in enhancing STEAM (Science, Technology, Engineering, Arts, and Mathematics) curricula. Academic freedom allows educators at all levels to explore diverse pedagogical approaches and introduce cutting-edge scientific concepts into the classroom, thus preparing students for the intellectual rigor of higher education and future work in scientific fields.

In Central Asia, where R&D and creative outputs remain underfunded and underdeveloped, the ability of schools to cultivate a scientific mindset is hindered by rigid curricula and limited access to new knowledge and methodologies. By embedding academic freedom into school-level education, curricula can evolve to encourage critical thinking, problem-solving, and innovation—skills that are imperative for success in science and technology disciplines. This approach not only nurtures curiosity and a passion for scientific inquiry among young students but also ensures that they enter higher education with a strong foundation in STEAM subjects. Moreover, academic freedom in schools would enable educators to better align their teaching with the needs of an evolving global economy, preparing students to actively engage with modern scientific challenges and equipping them with the skills required for collaborative research in university and industry settings. Therefore, fostering academic freedom at the primary and secondary education levels is a vital step in building a pipeline of students eager to pursue careers in science and innovation, ultimately contributing to the region's long-term socio-economic development.

⁵³Atta-Owusu K, Fitjar RD, Rodríguez-Pose A (2021) What drives university-industry collaboration? Research excellence or firm collaboration strategy? *Technol Forecast Soc Change* 173:121084. <https://doi.org/10.1016/j.techfore.2021.121084>
⁵⁴Bruneel J, D'Este P, Salter A (2010) Investigating the factors that diminish the barriers to university-industry collaboration. *Res Policy* 39(7):858–868. <https://doi.org/10.1016/j.respol.2010.03.006>

Entrepreneurship capacity (E-Cap) inputs

Human Capital	Kyrgyzstan	Kazakhstan	Uzbekistan
Tertiary enrolment, % gross (GII)	53.5	70.7	15.9

Funding	Kyrgyzstan	Kazakhstan	Uzbekistan
Domestic credit to private sector, % GDP (GCI)	28.3	25.6	35.7
Ease of access to loans (GCI)	3.7	3.4	n/a
Venture capital funding per country, 2023, \$ mln (CCA VC report)	1.1	80	6.3

Demand	Kyrgyzstan	Kazakhstan	Uzbekistan
Buyer sophistication (GCI)	3.6	3.6	n/a
Domestic market sale (GII)	39.2	536.3	291.2

Infrastructure	Kyrgyzstan	Kazakhstan	Uzbekistan
Quality of electricity supply (GCI)	3.6	4.6	n/a
Internet penetration rate % of population (Global Digital Insights)	77.9	90.9	76.6
Logistics performance index (WB)	2.3	2.7	2.6

Kyrgyzstan

In recent years, there has been an increase in qualified technical specialists in Kyrgyzstan, thanks to the efforts of the High Technology Park (HTP) supported by various donors including the Soros Foundation Kyrgyzstan, Aga Khan Development Network, and USAID. However, due to the relatively small domestic market and lack of funding, these talented individuals often go abroad, founding projects with little or no connection to Kyrgyzstan.

One of the interviewees, the head of an IT company, highlighted a significant challenge faced by HTP resident companies. The HTP requires its resident companies to generate at least 80% of their revenue from service exports. According to the interviewee, this stipulation creates substantial operational constraints for businesses within the park. The interviewee's company exemplifies the unintended consequences of this policy.

Initially registered in Kyrgyzstan, the firm opted to relocate its operations to Uzbekistan while continuing to serve the Kyrgyz market. This strategic move was necessitated by the HTP's export-focused revenue requirement, which significantly restricts a company's ability to engage with the domestic market. This case illustrates a broader issue: while the HTP aims to stimulate export-oriented growth in the IT sector, its stringent revenue requirements may inadvertently encourage companies to relocate or restructure their operations. Such outcomes could potentially undermine the park's effectiveness in fostering a robust, locally-based IT ecosystem.

Moreover, while HTP residents are constrained by the 80% export requirement, the local IT market in Kyrgyzstan is dominated by companies with residences in Kazakhstan, Belarus, and Cyprus. This situation raises questions about the balance between promoting export-driven growth and supporting the development of a strong domestic IT market. Among the major Kyrgyz projects abroad are Appboxo, Behavox, Kodif, and EnsiliTech. A number of initiatives and ecosystem players, such as Accelerate Prosperity (a global initiative of the Aga Khan Development Network), are being created to retain talent within the country. These initiatives focus on sectors like EdTech, Retail SaaS, and FinTech, with notable pre-seed funding rounds in 2023.

Kyrgyzstan has long been a regional leader in IT outsourcing, but product development startups in the country are developing in spite of, rather than thanks to, a favorable environment. The market still lacks venture capital financing (especially angel investments), supportive measures, and greater popularization of product startups. However, there are private initiatives, such as the chain of co-working spaces Ololo House that acts as an enabler for startups and the HTP's efforts to advance international programs like the one with Draper University in San Mateo, CA, that aim to create a community of innovators.

Kazakhstan

Kazakhstan's venture capital (VC) ecosystem experienced unprecedented growth in 2023, with VC funding reaching over \$80 million and exits exceeding \$151 million⁵⁵. This represents a remarkable 5.8-fold increase in venture capital funding over the past six years, underscoring the rapid development of the country's startup ecosystem. The nation demonstrates strong capabilities in early-stage venture investments. However, a notable financing gap exists for scale-up stages, indicating a potential area for future development. An analysis of investor demographics reveals that while local investors account for 80% of venture capital deals by number, they contribute only 45% of the total investment amount. This disparity highlights a significant reliance on international investors for larger-scale funding, suggesting both an opportunity for growth in local investment capacity and the country's increasing attractiveness to foreign capital. This significant progress can be attributed to several factors, with the establishment of the Astana International Financial Center (AIFC) playing a crucial role. The AIFC offers preferential tax regimes and operates under a regulatory framework based on the principles of British law, providing a familiar and trusted legal environment for international investors. The center was established with the explicit purpose of creating a hub for financial services and investment in Central Asia, aiming to attract foreign investment and promote the development of the region's financial sector. The AIFC represents an innovative public policy approach in Central Asia, designed to improve the rule of law and increase trust in venture investments. This initiative appears to be yielding positive results, as evidenced by its emerging significance as a preferred destination for regional startups seeking investors. The ability to register within the AIFC⁵⁶ provides these startups with access to a more robust legal framework and a larger pool of potential investors, both domestic and international. This development not only demonstrates Kazakhstan's commitment to fostering a vibrant startup ecosystem but also highlights the potential for policy innovations to address longstanding challenges in emerging markets, such as legal uncertainties and limited access to capital. The success of the AIFC model could provide valuable insights for other developing economies seeking to boost their startup and investment ecosystems.

⁵⁵Crunchbase, RISE Research' database, surveys and interviews with VC market players

⁵⁶International Monetary Fund, Monetary and Capital Markets Department "Republic of Kazakhstan: Financial Sector Assessment Program-Technical Note on Astana International Financial Center and the Kazakhstan Financial System", IMF Staff Country Reports 2024, 313 (2024), accessed December 2, 2024, <https://doi.org/10.5089/9798400291197.002>

Uzbekistan

An upswing in venture capital funding was observed in Uzbekistan in 2023, indicating a positive growth trajectory in investment activity. The number of venture capital deals has grown by 1.42 times in 2023 from 24 in 2022 to 34 in 2023, from \$3 mln in 2022 to \$6.3 mln in 2023. While the majority of investments were concentrated in the seed stage, there is a noticeable expansion across various developmental phases with 22% at pre-seed stage, 51% at seed stage, 13.5% at pre series A, 13.5% at growth stage⁵⁷.

In 2023, fintech deals ranked as the most prevalent among various sectors, highlighting their prominent position in the market. International investors accounted for 60% of the investments, surpassing the contribution made by local investors in 2023. Uzbekistan's national strategy on digital transformation sets the goal to reach \$5 bn annual IT services outsource export⁵⁸, with the volume of \$238,7 mln in 2023⁵⁹.

A World Bank assessment⁶⁰ underscores the multifaceted challenges impeding entrepreneurial growth in Uzbekistan. Key constraints include a dearth of entrepreneurial skills among the population, particularly in rural areas, coupled with limited access to financial resources. The report highlights the role of social norms, particularly affecting women, as a barrier to entrepreneurial pursuits. Furthermore, infrastructure deficiencies, especially in rural regions, and a complex regulatory environment pose significant obstacles. The overlapping and fragmented nature of existing support programs exacerbates these challenges, hindering efficient resource allocation and program impact.

Despite these challenges, Uzbekistan possesses untapped entrepreneurial potential. The country's large and young population represents a substantial pool of talent, and the government's stated commitment to economic diversification offers opportunities for entrepreneurial-led growth. To capitalize on this potential, targeted interventions are necessary. These include enhancing access to finance, particularly for women and youth; improving the business environment through regulatory reforms; investing in skills development and entrepreneurship education; and strengthening the support ecosystem through better coordination and evaluation of programs.

Several factors contribute to the growth and vibrancy of innovative ecosystems in Central Asia. One key factor is the region's youthful population and burgeoning middle class, which provides a fertile ground for innovation and consumer-driven businesses. Additionally, the availability of skilled labor, affordable living costs, and improving infrastructure create conducive conditions for startups to thrive. Moreover, the increasing inflow of IT specialists and entrepreneurs from Russia, who move to Central Asia because of the war in Ukraine with ideas and capital, enhance availability of funding and support services. In recent years, Central Asia has seen a surge in venture capital investment and financing activity, signaling growing investor confidence in the region's entrepreneurial potential. Companies like Sequoia Capital, a global venture capital firm based in Silicon Valley, have shown interest in Central Asian startups, providing funding and mentorship to support their growth ambitions. But the region still remains very desintegrated, with many barriers in cross-border financial transactions, logistics and trade. Though in general entrepreneurship in Central Asia is well developed, with Uzbekistan and Kyrgyzstan leading enterpreneurial rate⁶¹ the complexity and innovation of entrepreneurship is still constrained with income generation necessity, rather than economic opportunity with low tolerance to risk and new ideas.

Comparative Advantage

For comprehensive analysis of comparative advantage, we use the Economic Complexity Index developed by the Harvard Kennedy School Center for International Development⁶².

Kyrgyzstan ranks as the 65th most complex country in the Economic Complexity Index (ECI) ranking. Compared to a decade prior, Kyrgyzstan's economy has become more complex, improving 4 positions in the ECI ranking. Moving forward, Kyrgyzstan is positioned to take advantage of a moderate number of opportunities to diversify its production using its existing knowhow. Kyrgyzstan is more complex than expected for its income level. As a result, its economy is projected to grow moderately. The Growth Lab's 2031 Growth Projections foresee growth in Kyrgyzstan of 4.0% annually over the coming decade, ranking in the top quartile of countries globally.

⁵⁷Interviews with VC market players in Uzbekistan

⁵⁸<https://it-park.uz/ru/itpark/news/obzor-it-rynka-uzbekistana>

⁵⁹<https://it-park.uz/en/itpark/news/results-of-2023-transformation-and-plans-for-2024>

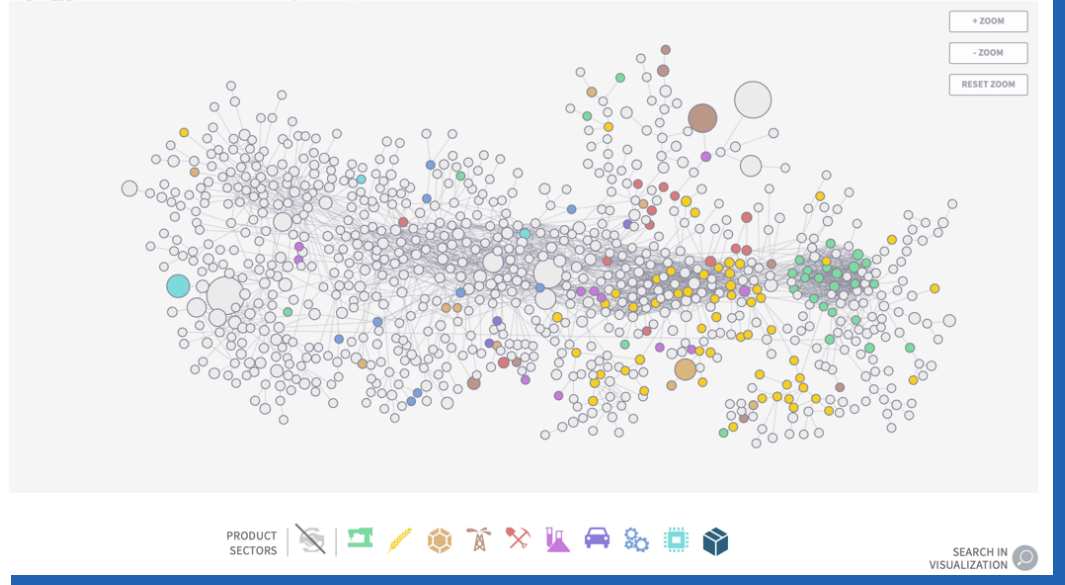
⁶⁰Sormani, Roberto Claudio; Honorati, Maddalena; Boe, Eila Pietro. 2023. What support do Uzbek entrepreneurs need? Policy lessons from a household survey © World Bank, Washington DC."

⁶¹Entrepreneurship in Eastern Europe and Central Asia - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Entrepreneurship-rates-across-the-post-communist-region-LiTS-2016_fig1_381855217 [accessed 20 Aug 2024]

⁶²<https://atlas.cid.harvard.edu>

Kyrgyzstan's Product Space, 2021

Total/Shown: \$3.27B



Kyrgyzstan exported products worth USD \$3.27 billion in 2022. Exports have grown by an annual average of 12.8% over the past five years, which has outpaced overall economic growth, as exports represent a growing segment of the economy. Non-oil exports have grown by 13.0% annually over the past five years, outpacing the global average growth.

Imports totaled USD \$12.0 billion in 2021, leaving Kyrgyzstan with a trade deficit in goods and services.

The Product Space depicts the connectedness between products, based on the similarities of know-how required to produce them. Product nodes are sized by world trade.

Kyrgyzstan has well developed textile and apparel manufacturing industry that has high level of economic complexity index (ECI), in other words the existent know how in this sector makes close proximity to other know-how in connected sectors. Another developed sector is agriculture, but it has a lower ECI. Countries are more successful in diversifying when they move into production that requires similar knowhow and builds on existing capabilities. Opportunity gain for future diversification: higher values hold more linkages to other high-complexity products, opening more opportunities for continued diversification. Given its current exports, some of the sectors with high potential for new diversification in Kyrgyzstan are: Industrial Machinery and Articles of iron or steel; Electrical insulators of any material; Electric signal and traffic controls.

Due to its mountainous landscape, over 90% of power generation from hydroelectric sources, and growing solar energy production and ubiquitous electrification, Kyrgyzstan has a significant advantage for developing data center infrastructure. Establishing data processing centers in these regions can greatly reduce operational and maintenance costs, as the low environmental temperatures eliminate the need for cooling systems. However, the main infrastructural challenge to fully leverage this advantage is a limited internet bandwidth.

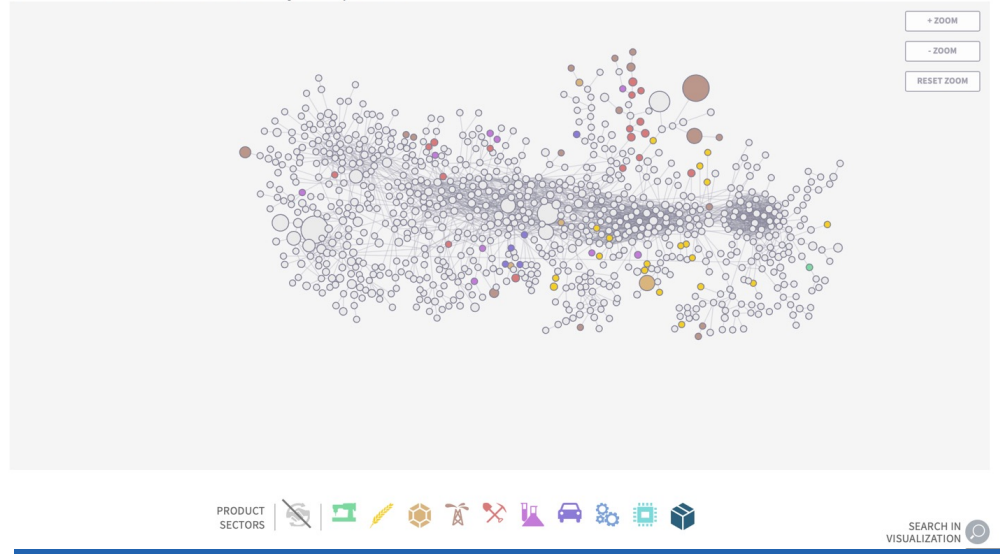
Top 50 Products Based on Strategy Approach

Click on product names to explore in the Atlas

PRODUCT NAME	"NEARBY" DISTANCE	OPPORTUNITY GAIN	PRODUCT COMPLEXITY	GLOBAL SIZE (USD)	GLOBAL GROWTH 5 YR
Parts for use with hoists and excavation machinery (8431 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$60.6B	↑ 35.3%
Electrical insulators of any material (8546 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$2.42B	↑ 2.3%
Other lifting machinery (8428 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$33.0B	↑ 24.6%
Electric signal and traffic controls (8530 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$2.78B	↑ 7.8%
Other articles of iron or steel (7326 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$61.3B	↑ 49.3%
Vulcanized rubber plates (4008 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$4.62B	↑ 24.4%
Mineral wools and insulating materials (6806 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$5.28B	↑ 34.1%
Pigments, nonaqueous (3212 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$2.42B	↑ 12.6%

Kazakhstan is an upper-middle-income country, ranking as the 52nd richest economy per capita out of 133 studied. Its 19 million inhabitants have a GDP per capita of \$10,373 (\$28,811 PPP; 2021). GDP per capita growth has averaged 1.5% over the past five years, above regional averages. Kazakhstan ranks as the 88th most complex country in the Economic Complexity Index (ECI) ranking. Compared to a decade prior, Kazakhstan's economy has become more complex, improving 21 positions in the ECI ranking. Moving forward, Kazakhstan

Kazakhstan's Product Space, 2021



is positioned to take advantage of few opportunities to diversify its production using its existing knowhow. Kazakhstan is less complex than expected for its income level. As a result, its economy is projected to grow moderately. Growth Projections foresee growth in Kazakhstan of 3.2% annually over the coming decade, ranking in the top half of countries globally.

Kazakhstan exported products worth USD \$66.1 billion in 2021. Exports have grown by an annual average of 13.7% over the past five years, which has outpaced overall economic growth, as exports represent a growing segment of the economy. Non-oil exports have grown by 13.3% annually over the past five years, outpacing the global average growth. Imports totaled USD \$53.8 billion in 2021, leaving Kazakhstan with a trade surplus in goods and services. Kazakhstan's Product Space Recommended Strategic Approach

Kazakhstan's existing knowhow affords a few opportunities to diversify into related products. In diversifying its economy, Kazakhstan may consider a strategic bets approach with few nearby opportunities call for coordinated long jumps into strategic areas with future diversification potential. Given its current exports, some of the sectors with high potential for new diversification in Kazakhstan are: Industrial Machinery and Vehicles.

Top 50 Products Based on Strategy Approach

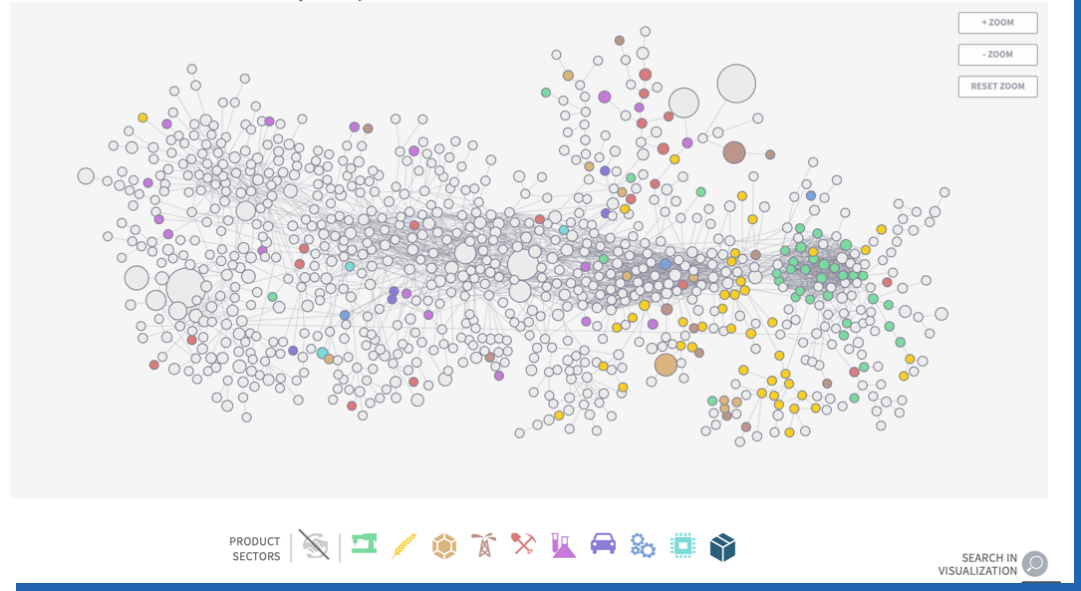
Click on product names to explore in the Atlas

PRODUCT NAME	"NEARBY" DISTANCE	OPPORTUNITY GAIN	PRODUCT COMPLEXITY	GLOBAL SIZE (USD)	GLOBAL GROWTH 5 YR
Ion-exchangers based on polymers (3914 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$2.29B	↑ 76.7%
Articles for utensils, of cermet (8209 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$6.31B	↑ 24.5%
Pickling preparations for metal surfaces (3810 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$1.92B	↑ 33.5%
Parts and accessories for metal working machines (8466 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$19.5B	↑ 18.1%
Flat-rolled products of other alloy steel, width > 600 mm (7225 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$37.1B	↑ 45.3%
Nuclear reactors and related equipment (8401 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$3.74B	↓ 1.3%
Equipment for temperature change of materials (8419 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$44.8B	↑ 22.4%
Transmission shafts (8483 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$63.3B	↑ 31.5%

Uzbekistan is a lower-middle-income country, ranking as the 109th richest economy per capita out of 133 studied. Its 34.9 million inhabitants have a GDP per capita of \$1,993 (\$8,607 PPP; 2021). GDP per capita growth has averaged 3.2% over the past five years, above regional averages. Uzbekistan ranks as the 72nd most complex country in the Economic Complexity Index (ECI) ranking. Compared to a decade prior, Uzbekistan's economy has become

more complex, improving 20 positions in the ECI ranking. Uzbekistan's improving complexity has been driven by diversifying its exports. Moving forward, Uzbekistan is positioned to take advantage of a moderate number of opportunities to diversify its production using its existing knowhow. Uzbekistan is more complex than expected for its income level. As a result, its economy is projected to grow moderately. Growth Projections foresee growth in Uzbekistan of 4.5% annually over the coming decade, ranking in the top quartile of countries globally.

Uzbekistan's Product Space, 2021



Given its current exports, some of the sectors with high potential for new diversification in Uzbekistan are: Articles of iron or steel and Aluminium. Textile and Agriculture are the most developed sectors in the economy of Uzbekistan what opens up opportunities to develop other industrial sectors with connected know-how.

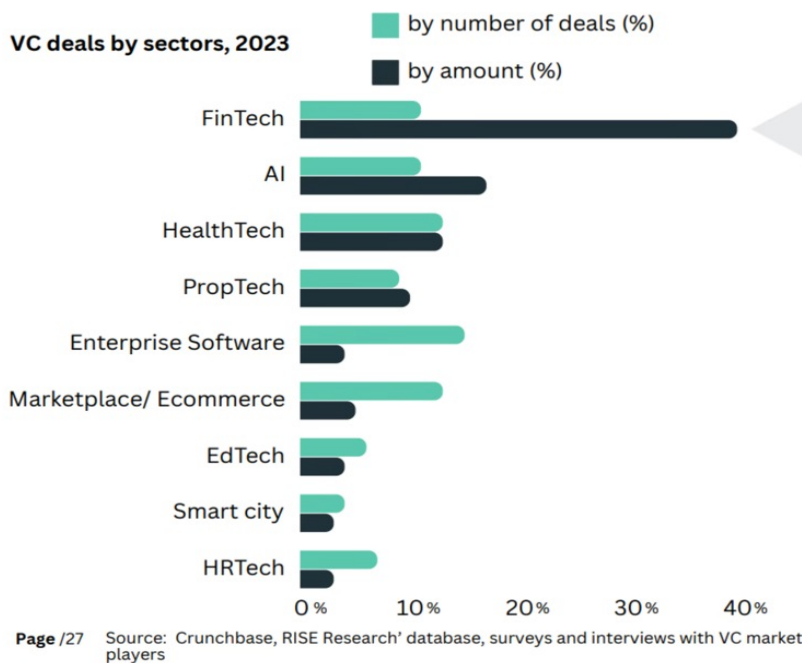
Top 50 Products Based on Strategy Approach

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Transmission shafts (8483 HS92)	◆◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆	\$63.3B	↑ 31.5%

Based on the economic complexity analysis, Kyrgyzstan has the most complex economy in the region with Uzbekistan on the second place and Kazakhstan the third. **Economic complexity shows the advantage of the market with the know-how in place. We may say that economic complexity defines opportunities and demands for scientific research in those fields to enhance and expand it, though quite often those product niches are not reflected in the VC and startup trends.**

Over thirty investors from the region shared their top predictions for 2024 and consider as the most promising for VC investments in the nearest future the following sectors:



The biggest challenges and barriers for the VC industry in the region the interviewers indicated:

1. **Market reliance on government**
2. **Regulatory restrictions on venture investments by banks**
3. **Geopolitical, economic, and regulatory uncertainties**
4. **Educational and language barriers.**
5. **Limited pipeline of quality startups, and talents ready to dive into risky ventures⁶⁴.**

Conclusion and Recommendations

This research on the innovative ecosystem in Central Asia reveals a complex landscape characterized by both potential and significant challenges. The findings underscore the critical need for a paradigm shift in regional integration and entrepreneurial mindset to unlock the tremendous potential of this undervalued geography.

Central Asia, comprising Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, presents a paradoxical situation. Individually, these countries may not appear attractive on the global market. However, when viewed as a cohesive region, Central Asia offers a compelling proposition for innovation and economic growth. The region's vast natural resources, strategic location bridging Europe and Asia, and young, increasingly educated population provide a solid foundation for development. Despite these advantages, Central Asia remains one of the most disintegrated regions in the world, significantly constraining its development and innovation potential.

⁶³Most Business Intelligence data
⁶⁴RISE research "Venture Capital in Central Asia and the Caucasus 2023"

The research highlights a prevalent form of entrepreneurship driven primarily by necessity rather than opportunity recognition. This approach, while demonstrating the resilience and adaptability of local entrepreneurs, often falls short of fostering innovation or adopting a problem-driven approach. The prevailing entrepreneurial mindset appears focused on short-term gains, partly due to a lack of trust in government systems and perceived risks associated with long-term investments.

To address these challenges and capitalize on the region's potential, we propose the following recommendations:

1. These Central Asian countries may wish to deepen this analysis, and apply to MIT's REAP program, as well as implement regional level programs for entrepreneurs to take greater advantage of these MIT frameworks.
2. **Regional Integration:** Central Asian countries must prioritize regional integration efforts. This process should encompass economic cooperation, harmonization of regulatory frameworks, and facilitation of cross-border trade and investment. Entrepreneurs can and should play a crucial role in this process by creating demand for political will and leveraging the comparative advantages of neighboring countries.
3. **Cultivating an "Infinite Game" Mindset:** Drawing from James Carse's concept of "Finite and Infinite Games," we recommend implementing a series of programs aimed at training a new generation of entrepreneurs with an "infinite game" mindset. This approach would encourage viewing other countries and entrepreneurs as "rivals worth learning from" rather than competitors to defeat, fostering a culture of collaboration and continuous innovation.
4. **Strengthening National Innovation Systems:** Policymakers should focus on improving national innovation systems, strengthening links between various parts of the startup ecosystem, and enhancing enterprises' capacities to fund, absorb, and adapt technologies.
5. **Deep Tech development:** Central Asia has a great advantage of highly educated population and still a strong foundation for Deep Tech development, that is constrained by several factors as underfunded R&D, weak collaboration between academia and corporate sector, weak protection of intellectual property. But if these constraints are properly addressed, the region may unlock tremendous opportunities.
6. **Creating Collaborative Spaces:** Establish and support physical spaces that facilitate collaboration among entrepreneurs, both within and across national borders. These hubs can serve as catalysts for knowledge exchange, partnership formation, and innovation diffusion.
7. **Addressing Trust Deficits:** Implement transparent and consistent policies to build trust between the entrepreneurial community and government institutions. This can encourage long-term investments and more ambitious, innovation-driven entrepreneurial ventures.
8. **Promoting Problem-Driven Entrepreneurship:** Develop programs and incentives that encourage entrepreneurs to focus on addressing societal and economic challenges, moving beyond necessity-driven entrepreneurship to opportunity-driven innovation.
9. **Enhancing Regional Entrepreneurial Networks:** Foster the development of regional entrepreneurial networks to overcome the current fragmentation observed both at local and regional levels. These networks can provide support, share best practices, and collectively advocate for favorable business environments.

In conclusion, while Central Asia faces significant challenges in developing its innovative ecosystem, the region possesses unique attributes that, if properly leveraged, could position it as a significant player in the global innovation landscape. The key lies in fostering regional integration, cultivating a collaborative entrepreneurial mindset, and creating supportive ecosystems that encourage innovation-driven growth. By adopting these strategies, Central Asia can transform its current limitations into opportunities, paving the way for sustainable development and enhanced global competitiveness.