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**FACTORS DRIVING THE ACCELERATED ECONOMIC
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Annotation. The study aims to identify the factors driving the accelerated economic development of Almaty, Astana, Shenzhen, Chengdu, and Xi'an and to determine the conditions for adapting the Chinese experience to Kazakhstan's urban policy. The analysis covers 2010-2025 and combines complete annual series of Kazakhstan's real growth with a comparison of the five cities in the reference years of 2010, 2015, 2020, and 2025. The study calculates chain indices of physical volume, assesses the deviation of urban growth from national growth, and conducts a structured analysis of six factor blocks. From 2011 to 2025, the accumulated real GRP index (base year 2010 = 100) reached 227.2 in Almaty and 253.4 in Astana, compared with 177.7 for Kazakhstan as a whole. At the same time, in 2025, Almaty grew more slowly than the national economy, while Astana maintained a positive deviation. In the Chinese part of the sample, Shenzhen and Chengdu exceeded the national rates in all four control years; Xi'an, in 2025, fell below this benchmark. The results reflect interactions among agglomeration, investment, sectoral structure, innovation, human capital, and external connectivity. Different mechanisms for generating added value can accompany the same focus on services. For Kazakhstan,

measures include developing production ties, commercialising research, improving infrastructure accessibility, and evaluating investment projects based on their results. The novelty of the work lies in distinguishing accumulated progress, current acceleration, and the prerequisites for further development in a single comparative scheme. Limitations include differences in administrative boundaries, revisions to statistics, and the incompleteness of the harmonised Chinese annual series. The conclusions are of a comparative nature; the causal coefficients of the influence of factors are not evaluated.

Keywords: urban economy; advanced development; agglomeration; investments; innovations; Kazakhstan; China

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ҚАЗАҚСТАН МЕН ҚЫТАЙ ҚАЛАЛАРЫНЫҢ ОЗЫҢҚЫ ЭКОНОМИКАЛЫҚ ДАМУ ФАКТОРЛАРЫ: САЛЫСТЫРМАЛЫ ТАЛДАУ

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Аннотация. Зерттеудің мақсаты — Алматы, Астана, Шэньжэнь, Чэнду және Сианның озық экономикалық даму факторларын анықтау және Қытай тәжірибесінің Қазақстанның қалалық саясатына бейімделу шарттарын анықтау. Талдау 2010-2025 жылдарды қамтиды және Қазақстанның нақты өсуінің толық жылдық қатарын 2010, 2015, 2020 және 2025 бақылау жылдарындағы бес қаланы салыстырумен біріктіреді. Физикалық көлемдегі тізбекті индекстерді есептеу, қалалық өсудің ұлттық деңгейден ауытқуын

бағалау және факторлардың алты блогын құрылымдық талдау қолданылды. 2011-2025 жылдары 2010 жылғы базада 100-ге тең нақты ЖӨӨ-нің жинақталған индексі Алматыда 227,2 және Астанада Қазақстан бойынша 177,7-ге қарағанда 253,4-ке жеткені анықталды. Сонымен қатар, 2025 жылы Алматы Ұлттық экономикаға қарағанда баяу өсті, ал Астана оң ауытқуды сақтап қалды. Үлгінің қытайлық бөлігінде Шэньчжэнь мен Чэнду барлық төрт бақылау жылында ұлттық қарқыннан асып түсті; Сиань 2025 жылы осы көрсеткіштен төмен болды. Нәтижелер агломерацияның, инвестициялардың, салалық құрылымның, инновацияның, адами капиталдың және сыртқы байланыстың өзара әрекеттесуі арқылы түсіндіріледі. Қызметтерге бірдей бағдарлау қосымша құнды қалыптастырудың әртүрлі механизмдерімен бірге жүруі мүмкін екендігі көрсетілген. Қазақстан үшін өндірістік байланыстарды дамыту, зерттеулерді коммерцияландыру, инфрақұрылымның қолжетімділігін арттыру және нәтижелері бойынша инвестициялық жобаларды бағалау жөніндегі шаралар негізделген. Жұмыстың жаңалығы бірыңғай салыстырмалы схемада жинақталған ілгерілеуді, ағымдағы жеделдетуді және одан әрі дамудың алғышарттарын ажыратудан тұрады. Шектеулер әкімшілік шекаралардың айырмашылығына, статистиканы қайта қарауға және Қытайдың үйлестірілген жылдық қатарларының толық қатынасына байланысты. Нәтижелер салыстырмалы; факторлардың әсер етуінің себептік коэффициенттері бағаланбайды.

Түйін сөздер: қалалық экономика; озық даму; агломерация; инвестициялар; инновациялар; Қазақстан; Қытай

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ФАКТОРЫ ОПЕРЕЖАЮЩЕГО ЭКОНОМИЧЕСКОГО РАЗВИТИЯ ГОРОДОВ КАЗАХСТАНА И КИТАЯ: СРАВНИТЕЛЬНЫЙ АНАЛИЗ

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Аннотация. Цель исследования - выявить факторы опережающего экономического развития Алматы, Астаны, Шэньчжэня, Чэнду и Сианя и определить условия адаптации китайского опыта к городской политике Казахстана. Анализ охватывает 2010–2025 годы и объединяет полные годовые ряды реального роста Казахстана с сопоставлением пяти городов в контрольные годы 2010, 2015, 2020 и 2025. Применены расчет цепных индексов физического объема, оценка отклонения городского роста от национального и структурированный анализ шести блоков факторов. Установлено, что за 2011–2025 годы накопленный индекс реального ВРП при базе 2010 года, равной 100, достиг 227,2 в Алматы и 253,4 в Астане против 177,7 по Казахстану. Вместе с тем в 2025 году Алматы рос медленнее национальной экономики, тогда как Астана сохраняла положительное отклонение. В китайской части выборки Шэньчжэнь и Чэнду превышали национальные темпы во всех четырех контрольных годах; Сиань в 2025 году оказался ниже этого ориентира. Результаты интерпретируются через взаимодействие агломерации, инвестиций, отраслевой структуры, инноваций, человеческого капитала и внешней связанности. Показано, что одинаковая ориентация на услуги может сопровождаться различными механизмами формирования добавленной стоимости. Для Казахстана обоснованы меры по развитию производственных связей, коммерциализации исследований, повышению доступности инфраструктуры и оценке инвестиционных проектов по результатам. Новизна работы состоит в разграничении накопленного опережения, текущего ускорения и предпосылок дальнейшего развития в единой сравнительной схеме. Ограничения связаны с различиями административных границ, пересмотрами статистики и неполнотой гармонизированных китайских годовых рядов. Выводы имеют сравнительный характер; причинные коэффициенты влияния факторов не оцениваются.

Ключевые слова: городская экономика; опережающее развитие; агломерация; инвестиции; инновации; Казахстан; Китай

Introduction. A city's accelerated development is reflected in its ability to increase real output faster than the corresponding national economy and to sustain this beyond a single investment cycle. This definition requires distinguishing between the size of the economy, the growth rate, and the quality of the value added. A large urban market may have a high share in national output but grow more slowly than the country; rapid growth of a small economy may reflect recovery after a downturn. Therefore, selecting cities based on their prominence or nominal GRP alone does not provide grounds to consider them consistently accelerated.

For Kazakhstan, this issue is related to the concentration of business activity in Almaty and Astana and to the search for new sources of productivity. The Chinese experience makes it possible to expand the comparison by including cities with different development trajectories: Shenzhen represents an economy

in which technological production and developed services play a significant role; Chengdu and Xi'an allow us to examine the development of large domestic centres. Comparing these cases helps select urban policy mechanisms. However, it requires accounting for the scale of the domestic market and the specific features of public administration in each country.

In studies of urban economics, high population density is considered both as a source of production advantages and as a reason for rising housing costs, transport congestion, and competition for land. The effect of agglomeration depends on how much enterprises and employees can benefit from a common labour market, infrastructure, and knowledge. Population growth without improving urban accessibility can increase aggregate output with little change in wealth per inhabitant (Duranton & Puga, 2020; OECD/European Commission, 2020).

The problem is the lack of certainty about the transition from a list of favourable conditions to an explanation of the observed advance. Investments, universities, and transportation hubs are present in many cities. Their economic outcomes vary depending on project composition, relationships between organisations, and local firms' ability to enter new markets. It is necessary to establish which combinations of factors are consistent with the published dynamics and which conclusions require more detailed data.

The article compares the mechanisms of advanced economic development in five cities from 2010 to 2025 and supports directions for urban policy in Kazakhstan. The research questions concern the sustainability of exceeding national growth, differences in sectoral models, and the conditions for effectively using investment, knowledge, and infrastructure. The working hypothesis is that the combination of complementary factors explains the differences in trajectories better than the presence of a single major resource or a single special regime. In this work, we examine this hypothesis through comparative evidence, without assigning unsubstantiated quantitative weights to the factors.

Literature review. Agglomeration theory links urban productivity to the shared use of specialised resources, more precise worker selection, and knowledge dissemination. At the same time, density can be both a cause and a consequence of successful development. The review by Duranton and Puga (2020) shows why interpreting urban concentration requires accounting for the costs of living and moving. This creates a methodological requirement: population size must be paired with indicators of job and infrastructure accessibility; otherwise, the economic benefits of density remain an assumption.

Studies of special economic zones in China offer a more concrete institutional mechanism. Wang (2013) examines the zones' impact on the municipal economy, including foreign investment inflows and production outcomes. Alder, Shao and Zilibotti (2016) study territorial industrial policy using a panel of Chinese cities. These studies allow us to discuss zones as a combination of conditions related to access to land, infrastructure, and markets. Their results relate to the historical

samples studied and do not determine the effect of any zone in Kazakhstan. Transferring this experience requires analysing local suppliers, workers' skills, and the budgetary cost of support.

Innovative concentration complements the institutional explanation. Moretti (2021) links the size of technology clusters to the productivity of inventors. However, in a subsequent commentary, Wiebe (2026) shows how sensitive causal interpretation is to how an event research tool is constructed and specified. This discussion is essential for this article: the combined presence of universities, patents, and rapid growth confirms the need to study the mechanism of interaction, but does not in itself establish the magnitude of its causal effect.

International comparative studies also pay attention to the unit of observation. The OECD/European Commission (2020) uses harmonised definitions of cities and functional territories because national administrative categories do not match. UN-Habitat (2022) links cities' prospects to planning quality, resilience to shocks, and access to basic services. For Kazakhstan, this means assessing urban economic development alongside the conditions for integrating new residents and suburban areas.

Materials and methods. The study was conducted as a comparative analysis of purposefully selected urban cases. Almaty and Astana are Kazakhstan's largest economic centres and have different functional profiles. The Chinese part includes Shenzhen, Chengdu, and Xi'an, allowing a comparison of a coastal technology centre with two large inland cities. The sample is not representative of all cities in the two countries; the conclusions apply to the cases under consideration and the mechanisms described.

The sources are the dynamic tables of the Bureau of National Statistics of the Republic of Kazakhstan, the final publications on GRP and investments for 2025, and the national and municipal statistical bulletins of China. For Kazakhstan, priority is given to the latest data from the BNS, since early reports from akimats may contain preliminary estimates. For Chinese cities, the values published in the bulletins of the corresponding reporting year are used; the national benchmark is taken from the bulletin of the same year. For Chengdu, part of the historical bulletins is available in the reproduction of the primary statistical document. The 2025 data, published in 2026, relate to 2025 results. The date of access to the sources is October 1, 2026.

The empirical base has varying depths. For two Kazakh cities and Kazakhstan, all 16 annual rates for 2010–2025 have been collected. For international comparison, four identical reference years were used, which provide 20 urban observations. Additionally, the study analyses indicators of the economy's structure and scale for 2025. The intermediate years for Kazakhstan are included in the calculation of accumulated dynamics, while the control sections represent the Chinese part. The study does not claim to have a balanced panel of 80 urban observations and does not restore missing values through interpolation.

The first indicator characterises the current rate of advancement. It is calculated

as the difference between the real growth of the city's GRP and the GDP of the corresponding country, expressed in percentage points:

$$\Delta_{i,t} = g_{i,t} - g_{c,t} \quad (1)$$

Here, $g_{i,t}$ denotes the rate of real urban growth, and $g_{c,t}$ denotes the national growth rate. A positive value indicates that the national benchmark is exceeded in a given year. This indicator does not measure a city's contribution to national growth: to calculate the contribution, city weights and aggregation rules are additionally required. A negative value also does not mean a decline if real urban output continues to increase. For the Kazakhstani part, we calculated a real-volume chain index, with the base year 2010 set to 100. When constructing the index, annual changes starting from 2011 are used; the 2010 rate reflects the change compared to 2009 and is not included in the calculation.

$$I_{i,2010} = 100; I_{i,t} = 100 \prod_{s=2011}^t \left(1 + \frac{g_{i,s}}{100}\right) \quad (2)$$

To assess the accumulated lead, the city index is compared with the national index using the same base:

$$R_{i,t} = \frac{I_{i,t}}{I_{c,t}} \times 100 \quad (3)$$

A value of R above 100 means that the city increased real output relative to the base year faster than the country. The average annual growth rate for 2011–2025 is determined from the ratio of the final and initial levels over 15 intervals. Chinese chain indices are not calculated because the collected database lacks a complete, consistent annual series. Indices of nominal monetary values do not replace indices of physical volume.

Table 1 — Factor blocks and their measurement principles

Factor block:	Economic mechanism	Indicators for verification:
Agglomeration-demographic	Common labour market and access to demand	Employment; travel time; availability of jobs;
Investment-infrastructure	Creation and use of production capacities	Investments for the intended purpose; workload; connection timeframes;
Structural	Links between production and services	Sectoral added value; output per employed person;
Innovation-technological	Integration of knowledge into products and processes	R&D; sales of new products; implemented developments;
Human capital	Adoption of technologies and professional mobility	Skills; employment of graduates; demand for qualifications;
External connectivity and markets	Expansion of external demand and reduction of supply costs	Export of goods and services; delivery timeframes and reliability.

Source: the author's scheme based on the reviewed literature. The list defines the verification program; the work has not developed a complete harmonised set of indicators.

Territorial units are retained within the boundaries of the official statistics for each year. Almaty and Astana are counted as cities of republican significance, while Chinese cities are treated as administrative municipal territories, which may include extensive peripheral and rural areas. A separate decree formalised Almaty's expansion in 2014; therefore, the chain index describes the officially published territory, not the unchanging urban outline (President of the Republic of Kazakhstan, 2014). Geographical differences, census adjustments, and revisions to national accounts limit conclusions about the net effect of agglomeration.

Factor analysis includes six blocks, as shown in Table 1. It represents a comparison of mechanisms and evidence, rather than an arithmetic decomposition of growth by contributions. Regression and the integral rating are not assessed because the harmonised explanatory indicators are incomplete. The absence of consistent data on R&D, employment, or service exports is not interpreted as a lack of relevant activity. The conditions for subsequent verification are reflected in the proposed monitoring system.

Results. Kazakhstan's annual series confirm the accumulated lead of both cities. Using 2010 as the base year, real indices by 2025 amounted to 227.2 for Almaty and 253.4 for Astana, compared with 177.7 for the country as a whole. This corresponds to an increase in real output by approximately 2.27 and 2.53 times. The average annual growth rate over 15 intervals reached 5.62% and 6.39%, respectively, compared to 3.91% for Kazakhstan. The calculations used the current series of BNS physical volume indices, without adjusting for nominal monetary growth (BNS, 2026a).

Table 2 — Accumulated real dynamics of Kazakhstan and two cities

Territory	2010	2015	2020	2025	Average annual growth, %	City/country in 2025
Kazakhstan	100,0	125,8	140,4	177,7	3,91	100,0
Almaty	100,0	153,5	166,0	227,2	5,62	127,9
Astana	100,0	160,8	186,8	253,4	6,39	142,6

Source: authors' calculations based on the BNS (2026a). Chain indices, 2010 = 100; all annual changes for 2011–2025 are used. The last column is the R indicator according to formula (3), equal to 100 for the country.

A comparison of the indices shows that the cumulative result was uneven. Until 2015, both cities increased output rapidly, but in 2016–2020, growth slowed. The pandemic-related decline is particularly noticeable in Almaty, while Astana maintained a positive trend. After 2020, growth resumed, but its distribution among the cities changed. Therefore, the average annual indicator is useful for describing the overall trajectory, but it conceals differences in adaptation to individual shocks and changes in demand sources.

By 2025, the ratio of the urban chain index to the national index had reached 127.9 for Almaty and 142.6 for Astana. These values indicate the relative increase in

officially measured output compared to the base, rather than an excess of the urban standard of living by the corresponding percentage. The accumulated dynamics may have included border changes, migration, the redistribution of organisations, and employment growth. To determine the contribution of productivity, it is necessary to divide output growth by changes in the number of employed workers and output per worker.

An international comparison of current trends provides a different picture. Table 3 shows the actual annual changes, not the average values over five-year periods. In 2010, all Chinese cities exceeded the national benchmark, while Astana matched Kazakhstan's performance. In 2015, a positive deviation was observed in all five cities. In 2020, Almaty fell below the national pace, while the other cities in the sample continued to exceed it. In 2025, Astana, Shenzhen, and Chengdu still showed a positive deviation.

Table 3 — Real annual growth of cities' GRP and countries' GDP, %

City or country	2010	2015	2020	2025
Kazakhstan	7,3	1,2	-2,5	6,5
Almaty	10,4	4,2	-4,7	4,9
Astana	7,3	6,4	1,0	10,2
China	10,3	6,9	2,3	5,0
Shenzhen	12,0	8,9	3,1	5,5
Chengdu	15,0	7,9	4,0	5,8
Xi'an	14,5	8,2	5,2	4,7

Sources: BNS (2026a, 2026b); National Bureau of Statistics of China (2011, 2016, 2021, 2026); municipal statistical bulletins of Shenzhen, Chengdu, and Xi'an for the relevant years.

The reduction in the gap between Chinese cities and the national economy in the later time slice is consistent with the transition to more moderate growth rates. However, the four observed years do not allow us to establish the continuity between them or the moment of a structural turning point. Shenzhen and Chengdu exceeded the national rate in all selected time slices; for Xi'an, this is true for the first three. This formulation preserves the boundaries of the available data and does not turn the control points into a complete history of annual superiority.

Small deviations require particularly careful interpretation. In 2025, the gap in Xi'an was -0.3 percentage points, while in Shenzhen it was +0.5 percentage points. These values reflect the position relative to the published national benchmark, but they do not establish the statistical significance of the differences. In administrative statistics, subsequent revisions may alter the compared values. Therefore, the conclusion about a structural advantage should be verified using several years and additional results, including productivity and employment. For the same reason, the study does not build an intercity ranking based solely on differences in growth rates: such a ranking would mix differences in the industry cycle with the economy's stable characteristics.

In 2025, Almaty increased its real output by 4.9% while the national growth was

6.5%, and Astana increased its output by 10.2%. The deviations were -1.6 and $+3.7$ percentage points. At the same time, Almaty retained a 22.7% share in the national GDP, while Astana accounted for 12.3% (BNS, 2026b). Consequently, Almaty's economic weight and its accumulated dynamics are consistent with a current growth rate below the national average. Given changes in commodity output, the national benchmark may also accelerate for reasons unrelated to urban services.



Figure 1 — Deviation of the city's real growth from the national pace

Source: authors' calculations based on Table 3 and formula (1). Blue indicates exceeding the national pace, red indicates falling behind. Only the control years are shown; the data between them are not interpolated.

Figure 1 shows varying resilience to the crisis year. The gap for Almaty in 2020 was negative, while Astana and three Chinese cities exceeded the corresponding national pace. This is evidence of differences in the observed response to the shock. For a causal explanation, sectoral data on output, activity constraints, and budgetary support are needed. The mere excess of national growth does not allow us to assert that a particular transport project or institutional regime ensured sustainability.

The agglomeration-demographic factor manifests itself through the capacity of the labour market and consumer demand. In Almaty, the accumulated concentration of services suggests the importance of specialised business ties. At the same time, in Astana, the expansion of the urban economy is accompanied by the creation of new work and residential spaces. These mechanisms complement the quantitative result but do not replace the assessment of efficiency. If travel time increases faster than job availability, territorial and population growth may worsen opportunities to use the common labour market.

Chinese cases help to clarify this relationship. By the end of 2025, Shenzhen's

permanent population was 18.25 million, and Xi'an's was 13.24 million; these figures refer to administrative territories and do not define the same functional agglomerations (Shenzhen Statistics Bureau, 2026; Xi'an Statistics Bureau, 2026). Therefore, comparing market density or size requires additional spatial harmonisation. For urban policy in Kazakhstan, the practical consequence is the joint planning of jobs, housing, and public transport, including suburban travel.

The investment and infrastructure block clearly shows the difference between expenditure volume and economic outcomes. According to the BNS's latest publication, investments in fixed capital in 2025 amounted to 2,547.9 billion tenge in Almaty and 2,515.2 billion tenge in Astana. The physical volume indices were 119.0 and 122.2, meaning growth reached 19.0% and 22.2% (BNS, 2026c). A similar absolute scale of investments was combined with noticeably different GRP growth rates. This requires studying the composition of investments and the time lag between facility commissioning and product output.

Shenzhen's experience shows another aspect of the investment mechanism. In 2025, the published volume of investments in fixed assets decreased by 21.7%, while the real urban output increased by 5.5%. At the same time, investments in the technological modernisation of industry grew by 19.2% (Shenzhen Statistics Bureau, 2026). The Chinese investment indicator should not be equated with Kazakhstan's physical volume index: the price basis and statistical coverage differ. In China, observations show that changes in total investment and the modernisation of individual production facilities can move in different directions.

This result supports assessing projects based on additional output, capacity utilisation, and infrastructure availability after construction completion. For Almaty, the ability of investments to reduce the costs of the city's economy is significant; for Astana, it is the ability of new facilities to generate sustainable private demand. A temporary acceleration of construction may accompany high investment activity and does not guarantee subsequent productivity. The investment-to-GDP ratio should also be interpreted with caution: investment statistics and value added are accounted for under different principles.

Table 4 — Economic scale and individual evidence of factors in 2025

City	Currency	GRP, billion units of currency	GRP per capita, thousand units of currency	Separate certificate
Almaty	Tenge	36 195,8	15 601,1	IFO of investments in fixed capital: 119.0
Astana	Tenge	19 593,3	12 370,0	IFO of investments in fixed capital: 122.2
Shenzhen	Yuan	3 873,2	213,8	High-tech manufacturing: 59.9% of the added value of large enterprises' industry
Chengdu	Yuan	2 476,4	115,2	66 universities; 1.316 million students at universities
Xi'an	Yuan	1 390,3	105,3	Services: 69.05% of urban output

Sources: BNS (2026b, 2026c); Shenzhen Statistics Bureau (2026); Chengdu Statistics Bureau (2026); Xi'an Statistics Bureau (2026).

The monetary indicators in Table 4 describe the scale of the national price system. They cannot be used for direct ranking of cities in two countries without a common price basis. GRP per capita differs from a resident's income and from labour productivity: it includes corporate value added, and the population size does not coincide with the number of workers. Therefore, the indicators are useful for a general characterisation of economic concentration, but they require separate verification when discussing well-being.

The structural factor lies in the composition of value added and the depth of connections between sectors. In 2025, services accounted for 62.5% of Shenzhen's output, 69.9% of Chengdu's, and 69.05% of Xi'an's. However, in Shenzhen, the share of high-tech manufacturing in the value added by large enterprises in the industrial sector reached 59.9% (Shenzhen Statistics Bureau, 2026; Chengdu Statistics Bureau, 2026; Xi'an Statistics Bureau, 2026). A high share of services, therefore, can coexist with a developed production base. To assess the structure, it is necessary to distinguish between trade intermediation, public services, and services that support technological production.

In Kazakhstani cities, this framing shifts attention to the content of service specialisation. Almaty can expand its export business and digital services through ties with industrial customers, while Astana can leverage the demand from large organisations to develop engineering and technology suppliers. These directions are proposed as hypotheses for urban policy. Their results must be confirmed by revenue from external customers, stable jobs, and changes in output per employee, rather than by the share of services.

The innovation and technology block is related to the transfer of knowledge into production processes. Chinese indicators of patents, high-tech enterprises, and sectoral output relate to different accounting objects. Combining them into a single rating without normalisation and definition verification would create false accuracy. For example, the number of patents may reflect the quality of the research environment, but it does not indicate revenue from new products. The increase in the innovative activity of Kazakhstani enterprises cannot be directly equated to the growth in the share of high-tech production in the Chinese bulletin.

For Kazakhstan, a consistent analysis of the transition from research to implementation is more useful. First, assess enterprises' participation in joint projects, then the actual adoption of the technology, and after that—production, exports, and productivity. Support for laboratories and technology parks has an economic basis if companies use the results beyond the subsidy period. The discussion between Moretti (2021) and Wiebe (2026) further demonstrates the need to separate the association between knowledge concentration and outcome from the proven effect of a particular tool.

Human capital complements the technological mechanism through employees' qualifications and enterprises' ability to master equipment. In Chengdu, 66 higher education institutions operated in 2025, with 1.316 million students enrolled

according to published urban statistics (Chengdu Statistics Bureau, 2026). This characterises the scale of the educational environment of the administrative territory. To compare with Almaty or Astana, we need agreed accounting boundaries and indicators for specialist graduation, employment, and retention in the city. The number of organisations and students alone does not measure the matching of skills to employer demand.

Xi'an shows why education and technology resources should be considered alongside commercialisation mechanisms and current demand. Its growth in 2025 was 4.7%, below the national target of 5.0%, despite the availability of conditions for innovation. This does not imply a negative effect of science. The observation shows that a significant research base can co-exist with constraints in other parts of the urban economy. To establish their role, we need data on enterprises and industries, including investment cycles and sales of new products.

External connectivity and market access determine how much urban firms can expand demand beyond the local area. Shenzhen's coastal location and the development of inland centres like Chengdu and Xi'an create different conditions for transport organisation. A common mechanism for reducing supply time, cost, and uncertainty is useful for Kazakhstan. Transferring the coastal model to continental cities without accounting for these differences does not yield comparable results. The Asian Development Bank (2024) study treats transport restrictions as a combination of infrastructural and organisational problems, which aligns with this approach.

Connectivity brings added value to the city when local businesses provide transportation, storage, processing, design, or sales services to external customers. The increase in transit flows may have a limited effect if key operations are carried out outside the urban economy. Therefore, monitoring should cover delivery times, route reliability, and revenue from local suppliers. For Almaty and Astana, digital exports of services can complement the transport channel, but require measuring actual cross-border sales.

Table 5 — Comparative matrix of urban economy mechanisms

Factor Agglo- meration	Almaty	Astana	Shenzhen	Chengdu	Xi'an
Investment	Specialized services	Expansion of urban demand	Technological labour market	Large domestic market	Scientific and business ties
Structure	Cost reduction through concentration	Capacity and subsequent demand	Modernisation of production	Equipping the domestic centre	Development of new industries
Innovation	Services for external clients	Services and private suppliers	Links between production and services	Diversification of the large centre	Services and technological niches
Human capital	Implementation in the service business	Pilots and private demand	Technological chains	Connections between universities and enterprises	Comme-rcialisation of research



Conne- ctedness	Qualification for complex services	New professional competencies	Engineering competencies	Educational environment	Transformation of knowledge into output
Factor Agglo- meration	Business and digital sales	External customers and partners	External production markets	Connections between inland areas	Industrial and scientific markets

Source: the author's interpretation of the urban cases considered.

Discussion. The results of the comparative study broaden understanding of the factors driving accelerated economic development in cities in Kazakhstan and China and clarify the mechanisms through which agglomeration advantages, investment activity, sectoral specialisation, innovation, and human capital translate into sustained increases in real output. Of fundamental importance is the established distinction between accumulated economic advantage and the current excess of national growth rates. The results show that significant economic potential and a high concentration of resources do not automatically ensure the maintenance of accelerated dynamics in each subsequent period.

In particular, the accumulated indices of real GRP for Almaty and Astana for 2010–2025 exceeded the national indicator, reaching 227.2 and 253.4, respectively, while Kazakhstan reached 177.7. At the same time, in 2025, Almaty's economic growth was 4.9%, below the national level of 6.5%, while Astana showed stronger dynamics—10.2%. This discrepancy indicates the need to distinguish between long-term accumulated results and current economic activity. It also shows that the scale of the urban economy alone cannot be considered a sufficient indicator of the sustainability of its competitive advantages.

These patterns align with the theoretical framework of Duranton and Puga (2020), who view agglomeration as the result of mechanisms for the joint use of resources, the matching of workers to jobs, and the dissemination of knowledge. However, this study's results allow us to supplement this interpretation in the context of Kazakhstan's cities. The high concentration of economic activity in Almaty creates the prerequisites for the development of specialised services and enterprise interaction. However, it also increases the importance of transport accessibility, the cost of locating a business, and the efficiency of using the city's infrastructure. Consequently, the positive effect of agglomeration depends not only on the scale of concentration but also on the urban system's ability to limit associated costs.

The differences in investment and infrastructure mechanisms deserve special attention. In 2025, investments in fixed capital in Almaty and Astana were at a comparable absolute level—2,547.9 billion and 2,515.2 billion tenge, respectively—but the growth rates of real GRP differed significantly. This observation does not allow for a direct assessment of the causal impact of investments, as their results may manifest with a time lag and depend on the sectoral structure. Nevertheless, it confirms the need to shift from assessing the scale of capital investments to studying the actual use of the production capacity and infrastructure created.

The Chinese experience helps clarify this issue. In Shenzhen in 2025, a 21.7% reduction in total investment in fixed assets was accompanied by a 19.2% increase in investment in the technological modernisation of industry and a 5.5% growth in real output. Given the differences in national statistical methodologies, these indicators cannot be directly compared with Kazakhstan's investment indices. However, in the Chinese case under consideration, they show the possibility of multidirectional changes in overall investment activity and investment in the renewal of production technologies.

The results are closely aligned with Wang (2013) and Alder et al. (2016), which examine the role of special economic zones and territorial industrial policy in the development of Chinese cities. At the same time, the case analysis shows that it is advisable to evaluate institutional advantages in relation to industry specialisation, employee qualifications, and enterprise industrial relations. For Kazakhstan, this means that creating special regimes and providing investment preferences must be accompanied by an assessment of additional value, the participation of local suppliers, and the sustainability of results after government support ends.

A key finding of the study is the differences between service specialisation and the technological content of the urban economy. In 2025, the share of services in the output structure of Shenzhen, Chengdu and Xi'an was 62.5%, 69.9% and 69.05%, respectively. At the same time, Shenzhen maintained a developed high-tech industrial base, which indicates the possibility of complementarity between production and service activities. For Almaty and Astana, this observation is of practical importance, since it is advisable to link service-sector expansion with the development of engineering, digital, research, and other specialised services aimed at production and external customers.

The innovative and technological factor requires separate consideration. Moretti (2021) examines the relationship between the concentration of technological activity and the productivity of inventors, while Wiebe (2026) draws attention to the methodological limitations of the causal interpretation of such relationships. The results of this study are consistent with the need for such a distinction. A well-developed educational and research infrastructure does not guarantee economic acceleration without mechanisms to implement developments and generate commercial demand for innovations. In particular, Xi'an's economic growth in 2025 fell below the national benchmark, despite having the prerequisites for scientific and technological development. This observation does not imply a negative impact of science, but it does highlight the need to study the interaction between the research environment and enterprises and markets.

In the context of human capital development, the experience of Chengdu is noteworthy: in 2025, it had 66 higher education institutions with a total student population of 1.316 million people. The scale of the education system creates potential prerequisites for providing the economy with qualified personnel. However, its impact on productivity depends on the structure of specialist training,

the alignment of competencies with employer demand, and graduates' employment opportunities. For cities in Kazakhstan, this requires closer coordination of educational, innovation, and industrial policies.

Generalising the considered mechanisms makes it possible to interpret advanced urban development as a result of complementary factors rather than the simple accumulation of individual resources. Infrastructure increases the availability of labour and customers, human capital drives technological development, industrial specialisation generates demand for research, and external connectivity expands the possibilities for selling products and services. These relationships are shown in Figure 2. The proposed scheme is conceptual and not the result of an econometric assessment of causal effects.

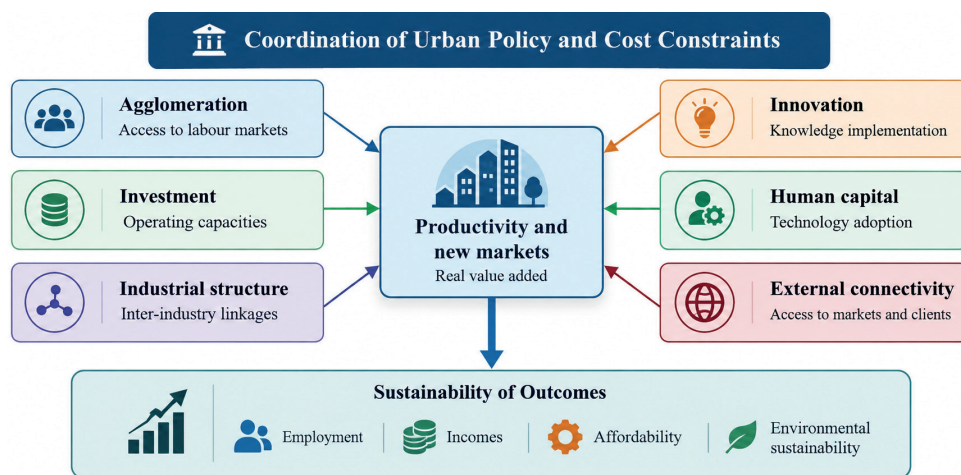


Figure 2 — Complementarity of Urban Development Factors

Source: author's analytical diagram. The arrows indicate предполагаемые relationships that require independent empirical verification; the magnitudes of the causal effects have not been assessed.

The practical significance of the results lies in the ability to differentiate urban economic policy tools in Kazakhstan. For Almaty, priority areas include reducing agglomeration costs, developing specialised business and digital services, improving transport accessibility, and expanding business interaction with research organisations. For Astana, the diversification of economic activity, the formation of sustainable demand for products from private technology enterprises, and the assessment of the effectiveness of large infrastructure investments after facilities are put into operation are particularly relevant.

At the same time, adapting Chinese experience should not be limited to directly reproducing organisational models. Differences in domestic market scale, administrative-territorial structure, sectoral structure, and economic geography limit the possibility of mechanically transferring industrial and innovation policy tools.

It seems more reasonable to use individual institutional mechanisms, followed by a check of their effectiveness in terms of productivity, employment, external sales, and value added. Table 6 systematises the relevant areas and monitoring indicators.

Table 6 — Policy areas and verification indicators for cities in Kazakhstan

Territory	Direction	Performance indicator:
Almaty	Connections between business and digital services and external customers	Revenue from external sales; output per employee
Almaty	Coordination of workspaces and public transport	Travel time; availability of jobs and housing
Astana	Development of private technology suppliers	Number of stable private customers; local value added
Astana	Assessment of investments after the facilities are commissioned	Capacity utilisation; employment in 2–3 years; operating costs
Both cities	Commercialisation of research in collaboration with enterprises	Implemented developments; sales of new products after support ends

Source: authors' proposals. This is a system for follow-up assessment, not a list of effects already achieved. Indicators should be compared with the baseline level and suitable control areas.

The findings must be considered in light of the study's limitations. Firstly, the sample includes five deliberately selected cities, so the results cannot be automatically extended to all urban areas in Kazakhstan and China. Second, Chinese statistics are represented by four reference years, which does not allow assessment of the continuity of accelerated development throughout the entire period from 2010 to 2025. Thirdly, differences in administrative boundaries, statistical accounting methods, and data revisions limit direct international comparability. Finally, the lack of a complete, harmonised set of explanatory indicators does not allow quantitative determination of each factor's contribution or the establishment of causal relationships.

Future research should focus on developing a comparable annual database of urban indicators, including real output, labour productivity, investment, innovation activity, employment structure, and foreign economic relations. Using panel models with urban and time effects, along with time lags, will allow verification of the stability of the identified patterns and assessment of the effectiveness of individual urban policy tools. Adding indicators of environmental sustainability, housing affordability, and urban infrastructure quality will provide a more comprehensive assessment of the socio-economic consequences of accelerated development.

Thus, the results confirm the feasibility of a comprehensive approach to developing urban economies, in which the key factor is not the absolute scale of investment, population, or research infrastructure, but the effectiveness of the interaction among production, technological, human, and institutional resources. For Kazakhstan, this forms the basis for a transition from a policy of quantitative expansion of urban economies to increasing the productivity and sustainability of the added value generated.

Conclusion. A comparative analysis shows that advanced urban development

requires distinguishing between current and accumulated results. Almaty and Astana increased their real output relative to the 2010 base faster than Kazakhstan as a whole. By 2025, the chain indices had reached 227.2 and 253.4, compared to 177.7 for the country as a whole. However, in the last year, Almaty fell below the national pace, while Astana maintained its lead. Therefore, accumulated advancement does not guarantee annual acceleration.

In the Chinese part, Shenzhen and Chengdu exceeded national growth in all four control years; Xi'an was below the national benchmark in 2025. These results characterise the selected segments and do not establish continuity in outperforming over the entire period.

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