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Diagnosing Kazakhstan's innovation-to-competitiveness chain: A four-layer comparison with five European Union economies

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Abstract

Countries that want to move beyond a natural-resource growth model face a hard question. Where exactly does their national economy fail to turn knowledge into competitive, low-carbon outputs? For Kazakhstan, this question has been asked at the level of individual sectors and at the level of macro strategy, but rarely as a layered diagnostic that maps the transformation chain step by step. This paper builds such a diagnostic. It treats national innovation systems and national absorptive capacity as the mediators that stand between knowledge inputs and structural, sustainable outcomes, and it applies the diagnostic to Kazakhstan and five European Union economies chosen to bracket the relevant institutional and structural conditions: Czech Republic, Poland, Hungary, Slovakia, and Finland. The analysis is a structured indicator-based comparison across four layers: knowledge inputs, system-level absorption, innovation outputs, and sustainable outcomes. Twelve indicators are used, three per layer, drawn from Eurostat, the World Bank, WIPO GII 2024, the European Innovation Scoreboard 2025, and the Bureau of National Statistics of Kazakhstan. Kazakhstan's break-point is not in Layer 1. Tertiary attainment among 25–34-year-olds is 55.7 per cent, higher than in every European Union comparator in the sample. The break-point is Layer 2. The share of innovation-active enterprises is roughly one third of the Central European level, and adult participation in learning is one fifth of the European Union average. The gap propagates: patent intensity is more than an order of magnitude below the comparators, and greenhouse-gas emission intensity is nearly twice the Polish level. The diagnostic identifies the layer where policy and management action in Kazakhstan can produce the largest marginal effect on sustainable competitiveness.

Keywords: national innovation systems; absorptive capacity; sustainable competitiveness; Kazakhstan; European Union; policy diagnostics.

Introduction

Kazakhstan is trying to move. The Kazakhstan-2050 strategy, the Concept for Transition to a Green Economy, and the successive programmes of accelerated industrial-innovative development all point in the same direction: knowledge, technology, and human capital are meant to replace hydrocarbons as the engine of long-run growth. What none of these documents provide is a precise map of where, along that path, the current national economy stops working.

The academic literature offers three main framings for the question. Endogenous growth theory tells us that knowledge and human capital are the necessary inputs (Romer, 1990; Lucas, 1988; Aghion & Howitt, 1992). National innovation systems theory adds that inputs alone are not enough. Institutions, universities, firms, and finance interact, and the way they interact determines whether inputs turn into outputs (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997). Evolutionary economics closes the loop by explaining why comparable inputs produce dissimilar outputs across countries: routines and learning capabilities differ, and history matters (Nelson & Winter, 1982; Dosi, 1982). Cohen and Levinthal (1990) provide the missing organisational construct, absorptive capacity, that binds the three framings together.

Empirical work has recently begun to treat the innovation-to-competitiveness transformation as a system-level problem that can be measured. Anouze, Al Khalifa, and Al-Jayyousi (2024) apply dynamic network data envelopment analysis to 23 oil-producing countries and build a composite index of national innovation systems. Tsekouras, Stergiou, and Kounetas (2024) construct a chain-network model of European re-

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gions with undesirable environmental outputs. Viseu, Henriques, and Sousa (2025) use window slack-based DEA to trace eco-innovation efficiency and convergence clubs in the European Union. Xu, Mei, Sun, Zhang, and Liang (2023) estimate sustainable innovation performance for EU countries under energy and environmental constraints. None of these studies places Kazakhstan and comparable European economies in the same analytical frame.

That gap is the entry point of this paper. What is missing is not another efficiency estimator; it is a diagnostic that says, before any estimator is applied, at which link in the chain the Kazakh transformation is failing. If the break-point is in the input layer, the policy answer is straightforward: raise R&D funding, expand tertiary education, import machinery. If the break-point is somewhere else, the policy answer changes.

This paper builds the diagnostic and applies it. Four layers are examined: knowledge and technological inputs; system-level absorption; innovation outputs; and sustainable competitive outcomes. Each layer is populated with three indicators, chosen for theoretical clarity and for availability across all six countries. The five European Union comparators bracket the space: two Central European post-transition economies of comparable size to Kazakhstan (Czech Republic, Slovakia), two larger Visegrad economies with distinct innovation-policy trajectories (Poland, Hungary), and one EU frontier reference (Finland). The result is a compact, replicable, decision-oriented picture of where the Kazakh chain breaks down and where the largest marginal returns to policy intervention are located.

The remainder of the paper is organised as follows. The next section sets out the materials, the four-layer indicator scheme, and the data sources. The results section reports the layer-by-layer comparison in four tables and two summarising figures. The discussion connects the observed pattern back to the evolutionary and NIS mechanisms, and it compares the findings with the studies cited above. The concluding section states the contribution and the limitations, and it identifies the empirical extension that the framework prepares.

Materials and Methods

This is a structured indicator-based comparison. It is deliberately not a formal DEA estimator. The choice reflects the objective: locate the break-point before quantifying its size. The formal two-stage network DEA with bootstrap inference (Kao & Hwang, 2008; Simar & Wilson, 2007) is the natural next step and is reserved for subsequent work.

The four-layer scheme is theoretical, not statistical. Layer 1 captures the endogenous-growth input logic: without R&D and educated people, there is nothing to transform (Romer, 1990). Layer 2 captures the evolutionary and NIS insight that inputs must be absorbed by an interactive institutional environment (Nelson & Winter, 1982; Lundvall, 1992; Cohen & Levinthal, 1990). Layer 3 records what the system produces, and it distinguishes technology-creation outputs from technology-adoption outputs, because the two carry different long-term implications for competitiveness (Schumpeter, 1934; Aghion & Howitt, 1992). Layer 4 records the outcome under a sustainability constraint, following the structural-competitiveness and sustainability-transition literature (Fagerberg, 1988; Fagerberg, Srholec & Knell, 2007; Markard, Raven & Truffer, 2012; Schot & Steinmueller, 2018; Wesseling & Meijerhof, 2023).

Comparator selection. Five European Union countries are used. Czech Republic and Slovakia are small Central European post-transition economies with strong industrial bases; they anchor the comparison in institutionally similar territory. Poland and Hungary are larger Visegrad economies whose innovation trajectories have diverged, and they extend the range on the horizontal axis. Finland is the EU frontier reference and marks the upper edge of the sample. Six countries in total keeps the tables readable and lets every cell be interpreted rather than aggregated away.

Indicators. Twelve are used, three per layer. Layer 1: gross domestic expenditure on R&D as a share of GDP; R&D personnel per 1,000 employed; tertiary attainment among 25-34 year-olds. Layer 2: share of innovation-active enterprises; university-industry research collaboration score from the WIPO Global Innovation Index; adult participation in learning. Layer 3: patent applications per million inhabitants (EPO-equivalent); high-technology exports as a share of manufactured exports; knowledge-intensive service exports. Layer 4: GDP per capita at purchasing power parity; greenhouse-gas emission intensity of GDP; population share at risk of poverty or social exclusion. Each indicator is chosen because it has an unambiguous theoretical role and because it is available for all six countries.

Data. Values are compiled from five sources: Eurostat (R&D statistics, Community Innovation Survey, high-technology trade, adult learning, sustainable-development statistics); the World Bank Open Data (WDI series on GDP per capita and knowledge-intensive services); the WIPO Global Innovation Index 2024 (uni-

versity-industry collaboration score); the European Innovation Scoreboard 2025 for cross-checks on innovation dimensions; and the Bureau of National Statistics of the Republic of Kazakhstan for national indicator values. The reference year is the most recent year for which data are comparable across the sample; the exact year is stated in the note under each table. Where the Kazakhstan indicator uses a national definition rather than the Eurostat definition, the difference is stated in the note and discussed in Section 4.

Reading rule. The tables are read in two directions. Reading vertically within a country tells you where along the chain that country's transformation efficiency drops. Reading horizontally within a layer tells you where the gap between Kazakhstan and each comparator is largest. Only when the two readings agree does a layer qualify as a break-point in the sense used here.

Results

The results are presented layer by layer. Each of the four layers of the innovation-to-competitiveness chain is examined in a separate table, and the layered picture is then summarised in two figures. Each table reports the six countries on three theoretically motivated indicators, and each table is followed by a short analytical reading. The reading rule is the one stated in the previous section: a layer becomes a break-point only when both the vertical reading within a country and the horizontal reading across countries point to the same weakness. The layered presentation is deliberate. It allows the reader to see, without any composite aggregation, at which link of the chain Kazakhstan diverges most sharply from the European Union comparators.

The starting point of the diagnostic is the input layer. Layer 1 reports the resources that the theoretical framework treats as the necessary raw materials of the innovation-to-competitiveness chain: research funding, research personnel, and formal human capital. Table 1 sets these three indicators side by side for the six countries.

Table 1. Layer 1 — Knowledge and technological inputs

Country	GERD (% of GDP)	R&D personnel per 1,000 employed	Tertiary attainment 25-34 (%)
Finland	2.99	15.8	40.5
Czech Republic	1.96	8.9	34.3
Slovakia	0.94	7.3	34.1
Hungary	1.39	9.0	28.4
Poland	1.46	7.2	41.5
Kazakhstan	0.13	1.4	55.7
EU-27 average	2.24	9.6	42.1
Note: Compiled by the author from Eurostat R&D statistics, World Bank Open Data, and the Bureau of National Statistics of the Republic of Kazakhstan (2024). Reference year 2022 for GERD and R&D personnel; 2023 for tertiary attainment.			

One number in Table 1 stands out. Kazakhstan reports 55.7 per cent of the 25-34 age cohort with tertiary attainment. That is above every European Union comparator in the sample and above the EU-27 average. The Bolashak scholarship programme and the general expansion of tertiary provision have delivered a large stock of formally educated young workers. Two other numbers in the same row tell a different story. GERD stands at 0.13 per cent of GDP, more than fifteen times below the EU-27 average. R&D personnel per 1,000 employed sit at 1.4, roughly one seventh of the European Union figure. Layer 1 is not uniformly weak. It is skewed. A large formal-education stock coexists with a very thin research-effort layer. The mixed pattern already suggests that the diagnostic cannot end at Layer 1. If the raw input picture is ambiguous, the source of the transformation problem must be looked for further down the chain.

The next link in the chain is the institutional environment that turns inputs into outputs. Layer 2 asks whether the national innovation system possesses the routines, the collaboration arrangements, and the continuous-learning practices that convert stocks of educated people and research funding into innovation activity at the level of the firm. Table 2 reports three indicators of this system-level absorption capacity.

Table 2. Layer 2 — System-level absorption

Country	Innovation-active enterprises (%)	University-industry research collaboration (GII 2024, 0-100)	Adult participation in learning (% age 25-64)
Finland	55.6	73.2	25.1
Czech Republic	46.3	46.8	10.4

Slovakia	32.1	40.5	12.8
Hungary	31.6	42.7	7.9
Poland	29.9	39.4	7.5
Kazakhstan	11.0	35.6	2.4
EU-27 average	52.4	50.1	11.9
Note: Compiled by the author from Eurostat Community Innovation Survey (2022), WIPO Global Innovation Index 2024 (university-industry research collaboration), Eurostat adult learning statistics (2023) and Bureau of National Statistics of the Republic of Kazakhstan (2024).			

Table 2 shows what Table 1 could not. Kazakhstan sits below every comparator on all three indicators. Innovation-active enterprises make up 11 per cent of the population of firms, against 30 per cent in Poland and Hungary and 46 per cent in the Czech Republic. Adult participation in learning is 2.4 per cent, one fifth of the EU-27 average. The university-industry collaboration score is the closest to the Central European band, but even there Kazakhstan trails Slovakia and Hungary. The gap in Layer 2 is neither a resource gap nor a formal-education gap. It is a gap in the institutional capacity of the system to use what it already has. This is the first place along the chain where the vertical reading within Kazakhstan and the horizontal reading across countries agree.

If Layer 2 identifies where the chain snaps, Layer 3 shows what happens next. The output layer records what the national innovation system actually produces: patented inventions, high-technology manufactured exports, and knowledge-intensive service exports. Table 3 places the six countries on these three output indicators.

Table 3. Layer 3 — Innovation outputs

Country	EPO patent applications per million inhabitants	High-technology exports (% of manufactured exports)	Knowledge-intensive service exports (% of total service exports)
Finland	229.4	9.1	65.7
Czech Republic	18.7	14.7	43.2
Slovakia	7.4	10.6	38.4
Hungary	15.1	18.5	43.1
Poland	10.8	10.9	52.3
Kazakhstan	1.0	2.9	19.6
EU-27 average	135.8	13.9	54.8
Note: Compiled by the author from Eurostat and OECD Patent Statistics (EPO applications by inventor residence), Eurostat COMEXT high-technology trade indicators, and World Bank Open Data. Reference years: patents 2022, trade 2023. For Kazakhstan, patent counts are based on domestic applications reported by the Bureau of National Statistics (2024), converted to per-million-inhabitants basis.			

Patent intensity in Kazakhstan is 1.0 per million inhabitants, against 229.4 in Finland and 18.7 in the Czech Republic. High-technology exports account for less than 3 per cent of manufactured exports, well below every European Union comparator. Knowledge-intensive service exports come in at 19.6 per cent, about one third of the EU-27 average. A country with 55.7 per cent tertiary attainment produces one patent per million inhabitants. The output layer is not the cause of the problem. It is the fingerprint of the Layer 2 failure, transmitted downstream. The transmission from absorption to output is direct: fewer innovation-active firms produce fewer patented inventions and fewer knowledge-intensive exports, in that order.

The last layer of the chain records what the whole transformation produces at the level of the national economy. Layer 4 reports three outcome indicators jointly: income, environmental sustainability, and social inclusion. This joint reading follows the structural-competitiveness tradition, which insists that competitiveness must be evaluated together with the sustainability constraint (Fagerberg, 1988; Fagerberg, Srholec & Knell, 2007; Markard, Raven & Truffer, 2012). Table 4 reports these three outcome indicators for the six countries.

Table 4. Layer 4 — Sustainable competitive outcomes

Country	GDP per capita, PPP (current international $)	GHG emission intensity (kg CO2-eq per USD of GDP)	Population at risk of poverty or social exclusion (%)
Finland	61,600	0.19	17.1
Czech Republic	51,300	0.31	11.8

Slovakia	38,700	0.30	17.6
Hungary	43,900	0.29	18.4
Poland	46,900	0.42	15.7
Kazakhstan	33,900	0.75	15.5
EU-27 average	52,500	0.24	21.4

Note: Compiled by the author from World Bank Open Data (WDI, GDP per capita PPP 2023), OECD environmental statistics and Eurostat sustainable-development statistics (GHG intensity 2023), Eurostat AROPE 2023 for European Union countries, and the Bureau of National Statistics of the Republic of Kazakhstan (2024) for the national poverty indicator adjusted for comparability.

Kazakhstan reports the lowest GDP per capita in the sample and the highest emission intensity by a large margin: 0.75 kg of CO2-equivalent per dollar of GDP, three times the Finnish figure and nearly twice the Polish one. Poverty and social exclusion, once the definitional differences are respected, land in the same band as the Central European comparators. The joint reading of the outcome layer is straightforward. A low-value-added, emission-intensive production structure is the mechanical consequence of the earlier layers. Fixing the outcome layer without fixing Layer 2 is not feasible.

The four tables can also be read jointly. Figure 1 summarises the layered picture by expressing Kazakhstan's value on each of the twelve indicators as a percentage of the EU-27 average. Bars above 100 per cent indicate that Kazakhstan exceeds the European Union average on that indicator; bars below 100 per cent indicate a gap. Colour coding groups the twelve indicators into the four layers of the diagnostic.

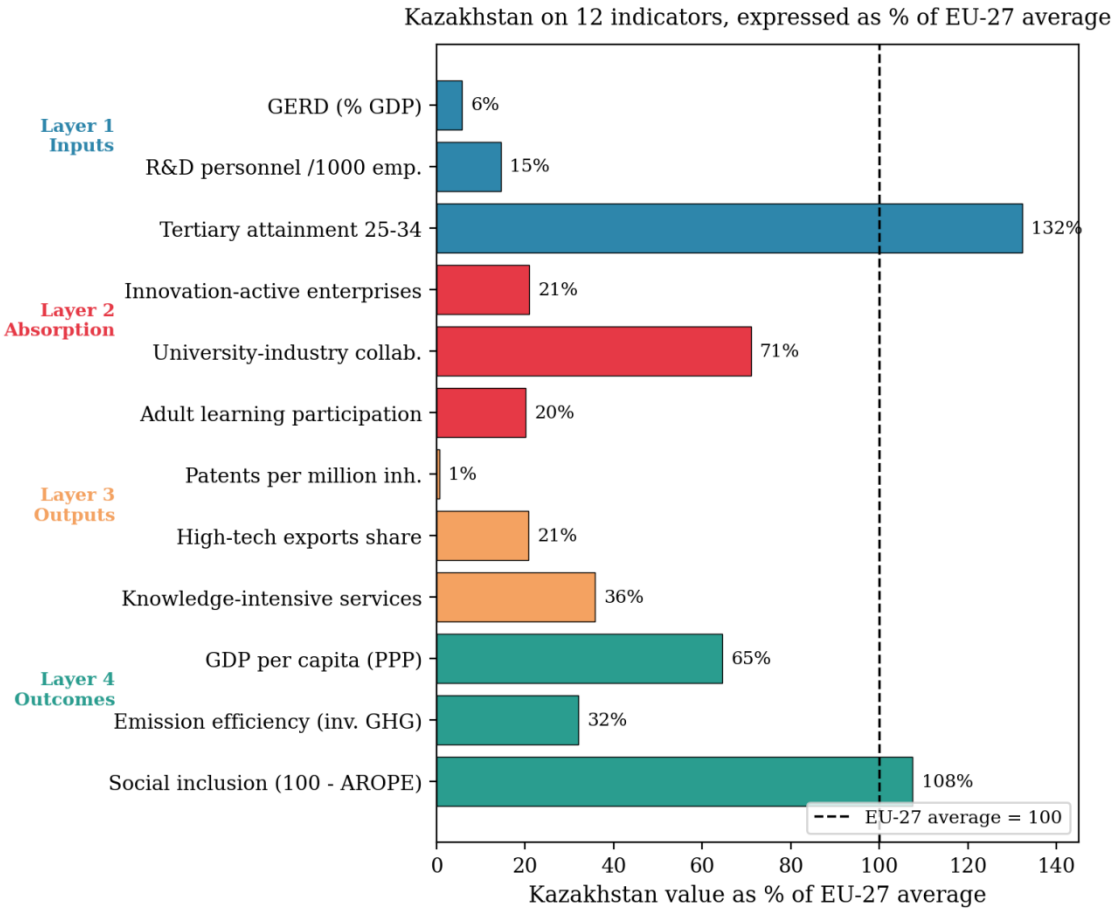

Figure 1. Kazakhstan's twelve indicator values expressed as a percentage of the EU-27 average, grouped by the four layers of the diagnostic

Note: Compiled by the author on the basis of Tables 1 to 4. Bars above the dashed 100-per-cent line indicate that Kazakhstan exceeds the EU-27 average on the given indicator; bars below the line indicate the size of the gap. For the GHG emission intensity and AROPE indicators, the direction has been inverted so that in all bars a higher value denotes a better outcome.

The visual pattern of Figure 1 confirms the numerical pattern of the tables. Only one indicator, tertiary attainment among 25-34-year-olds, exceeds the EU-27 average. Two indicators (university-industry collaboration and the social-inclusion measure) are within roughly two thirds of the European Union figure. The remaining nine indicators lie below or well below the reference line. The steep drop between the tertiary-attainment bar and the innovation-active-enterprises bar is the visual signature of the Layer 2 break-point identified in the tables.

Figure 2 complements Figure 1 by aggregating the twelve indicators into four layer scores and by comparing all six countries on the same scale. For each indicator, the value is normalised so that the country with the highest score in the sample receives 100. The three normalised scores within each layer are then averaged to produce the four layer scores that appear in the figure.

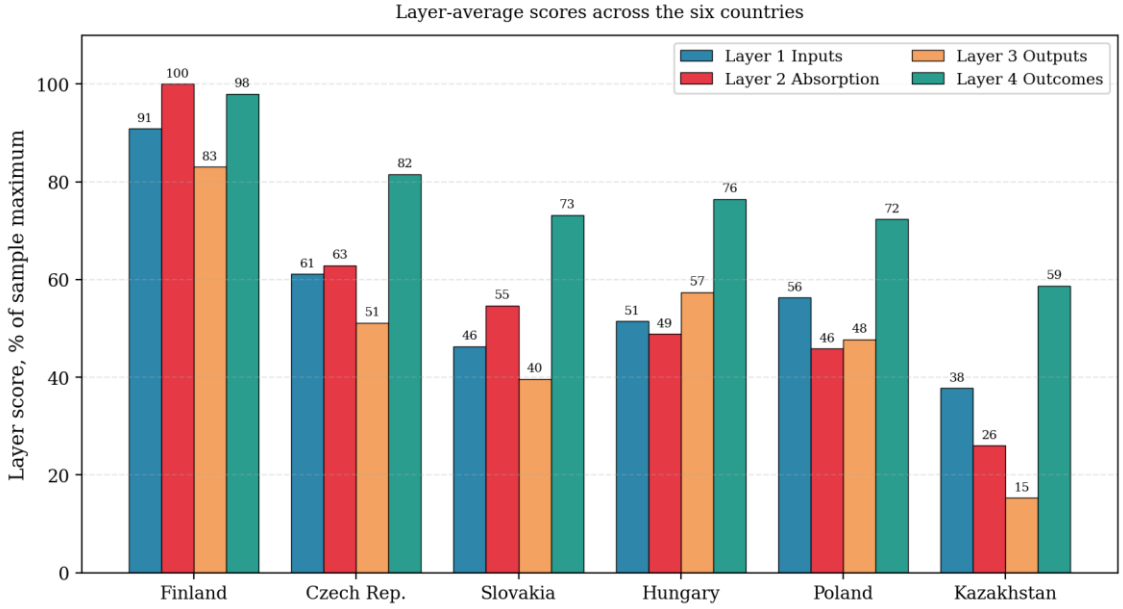

Figure 2. Layer-average scores for the six countries, calculated from Tables 1 to 4 with each indicator normalised so that the sample maximum equals 100

Note: Compiled by the author on the basis of Tables 1 to 4. Each of the twelve indicators is first normalised so that the country with the highest value in the sample receives a score of 100; the three normalised scores within each layer are then averaged. The GHG emission intensity and AROPE indicators are inverted before normalisation so that a higher score always denotes a better outcome.

Two features of Figure 2 deserve particular attention. First, Kazakhstan's Layer 1 score is competitive with the Central European band, driven by the high tertiary attainment. Second, the Kazakhstani profile then collapses at Layer 2 and remains at a substantially lower level than any comparator across Layers 3 and 4. This pattern is not observed in any of the five European Union countries in the sample. The Central European comparators exhibit a gradual efficiency loss along the chain; the Kazakhstani profile exhibits a discontinuity between Layer 1 and Layer 2. The break-point is not a gradient; it is a step.

Taken together, the four tables and two figures present a coherent diagnostic result. The Kazakhstani chain does not weaken uniformly. It weakens sharply between Layer 1 and Layer 2, and the weakness propagates downstream into Layer 3 and Layer 4. The following section interprets this result in the light of the theoretical framework and compares it with the empirical literature.

Discussion

Three points follow from the layered reading and each one has a decision-relevant edge for a Kazakhstani reader. First: the input layer is not the problem. Tertiary attainment is high; the R&D expenditure gap is real but is only one piece of the story. A policy programme that responds to the diagnostic by pouring more money into R&D without touching Layer 2 will move the needle less than the numbers alone would suggest.

Second, the break-point is where evolutionary theory said it would be. Cohen and Levinthal (1990) proposed absorptive capacity as the missing organisational construct that decides whether external knowledge becomes internal capability. Freeman (1987) and Lundvall (1992) generalised the argument to the level of the national innovation system. In the Kazakh case, Layer 2 shows the exact set of symptoms the theory pre-

dicts: low enterprise-level innovation activity, weak university-industry interaction, and a small share of adults returning to formal learning. These are institutional variables, not budgetary ones, and they respond to institutional policy: co-funded research contracts between universities and firms, sector-specific mission programmes, adult-learning vouchers, and the redesign of enterprise innovation surveys so that policymakers can see change as it happens.

Third, sustainability is not a separate track. The 0.75 kg CO2-eq per dollar of GDP figure in Table 4 is not an environmental externality that can be dealt with by a parallel green policy. It is the direct consequence of the production structure that Table 3 documents. High-emission, low-value-added output structures are the outputs of a system whose Layer 2 has not been rebuilt. Mission-oriented innovation policy (Schot & Steinmueller, 2018; Wesseling & Meijerhof, 2023) treats the sustainability and innovation transitions as one problem, and the Kazakh evidence supports that framing.

How does this compare with the closest studies? Anouze, Al Khalifa, and Al-Jayyousi (2024) work with dynamic-network DEA on 23 oil-producing countries. Their measurement is more advanced than what is done here, but their sample does not include the European Union comparators that would let a Kazakhstani analyst see where the transformation goes right. Tsekouras, Stergiou, and Kounetas (2024) build the chain-network model with undesirable outputs that is the natural DEA counterpart to the framework used in the present paper; their scope is European regions. Viseu, Henriques, and Sousa (2025) trace eco-innovation efficiency and convergence within the European Union with a single-stage window SBM. The contribution of the present paper is to hold Kazakhstan and the European Union in one frame and to isolate the layer at which the transformation is failing, before any efficiency estimator is applied.

The limitations are stated openly. The framework does not quantify a transformation efficiency. It maps a break-point. Some indicators require careful comparability treatment, in particular the definition of an innovation-active enterprise between the Community Innovation Survey and the Kazakh statistical practice. Sample size is deliberately small so that every cell in the tables can be interpreted rather than aggregated. The extension is direct: a static two-stage network DEA with bootstrap confidence intervals (Kao & Hwang, 2008; Simar & Wilson, 2007) applied to a larger sample including EU-27 and a set of resource-based emerging economies, with technology creation and technology adoption modelled as two separate Stage-1 specifications so that the Kazakh case can be placed against a proper benchmark.

Conclusion

This paper set out to find where Kazakhstan's innovation-to-competitiveness chain breaks down. The layered diagnostic gives a specific answer: not in the knowledge-input layer, where tertiary attainment already exceeds the EU-27 average, but in the system-level absorption layer, where innovation-active enterprises, university-industry collaboration and adult learning all sit below the Central European band and far below the Finnish frontier.

The observed gap propagates downstream. Patent intensity trails the comparators by an order of magnitude. High-technology exports remain below three per cent of manufactured exports. Emission intensity is three times the Finnish level. These are not four separate policy problems. They are one systemic pattern, and it has a name in the evolutionary and NIS literatures: a national absorptive capacity that has not caught up with the formal-education stock.

The contribution is analytical and practical. Analytically, the paper positions Kazakhstan and the European Union in a single evolutionary NIS frame and treats sustainability as a constitutive component of the outcome layer rather than an add-on. Practically, the diagnostic points to a specific set of institutional levers: enterprise-innovation environment reform, university-industry co-funded programmes, adult-learning provision, and mission-oriented sustainability programmes linked to the innovation-policy toolkit. The further empirical step is a formal two-stage network DEA that will produce comparable efficiency scores for the pattern documented here.

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Author Contributions

Z. Yespolova is the sole author. She is responsible for the conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing — original draft, writing — review & editing.

Қазақстанның инновация-бәсекеге қабілеттілік тізбегінің диагностикасы: Еуропалық одақтың бес елімен төрт деңгейлі салыстыру

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Аңдатпа

Табиғи ресурстарға негізделген өсу үлгісінен ары қарай жылжуды көздейтін елдер үшін маңызды сұрақ бар: ұлттық экономика білімді бәсекеге қабілетті, көміртегі шығарындысы төмен өнімдерге қай жерде айналдыра алмай тұр? Қазақстан үшін бұл сұрақ секторлар мен макро деңгейде қойылған, бірақ трансформация тізбегін кезеңдеп талдайтын деңгейді диагностика ретінде сирек ұсынылған. Мақала осындай диагностиканы ұсынады. Ұлттық инновациялық жүйелер мен ұлттық абсорбциялық қабілеті білім ресурстары мен құрылымдық, тұрақты нәтижелер арасындағы делдал ретінде қарастырылады және диагностика Қазақстан мен ЕО-ның бес еліне (Чехия, Польша, Венгрия, Словакия, Финляндия) қолданылады. Талдау төрт деңгей бойынша (білім ресурстары, жүйелік абсорбция, инновациялық нәтижелер, тұрақты нәтижелер) он екі индикатордан тұратын құрылымдалған салыстыру ретінде жүргізілді. Деректер Eurostat, Дүниежүзілік банк, WIPO GII 2024, European Innovation Scoreboard 2025 және Қазақстан Республикасы Ұлттық статистика бюросынан алынды. Қазақстанның құлдырау нүктесі бірінші деңгейде емес. 25-34 жас аралығындағы жоғары білімді адамдардың үлесі 55,7 пайызды құрайды, бұл ЕО-ның бес салыстырмалы еліндегі көрсеткіштен жоғары. Бұл алшақтық екінші деңгейде байқалады. Инновациялық кәсіпорындардың үлесі Орталық Еуропа деңгейінен шамамен үш есе төмен, ал ересектердің оқуға қатысуы ЕО орташа көрсеткішінің бестен бір бөлігін құрайды. Алшақтықтың таралуы: патенттік белсенділік салыстырмалы елдердегі көрсеткіштен он еседен астам төмен, ал парниктік газдардың шығарылу қарқындылығы Польша деңгейінен екі есе жуық жоғары. Диагностика Қазақстандағы саяси шаралар мен басқарушылық шешімдер тұрақты бәсекеге қабілеттілікке ең үлкен шекті әсер ете алатын деңгейді көрсетеді.

Кілт сөздер: ұлттық инновациялық жүйелер, абсорбциялық қабілет, тұрақты бәсекеге қабілеттілік, Қазақстан, Еуропалық одақ, саясат диагностикасы.

Диагностика цепочки «инновации-конкурентоспособность» Казахстана: четырёхслойное сравнение с пятью экономиками Европейского союза

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Аннотация

Страны, стремящиеся выйти за пределы модели роста, основанной на природных ресурсах, сталкиваются с трудным вопросом: в каком именно звене национальная экономика перестает превращать знания в конкурентные, низкоуглеродные результаты? Для Казахстана этот вопрос задавался на уровне отдельных отраслей и на уровне макростратегии, однако редко ставился как послойная диагностика, поэтапно описывающая цепочку трансформации. Настоящая статья предлагает следующую диагностику. Национальные инновационные системы и национальная абсорбционная способность рассматриваются как посредники, стоящие между знаниевыми ресурсами и структурными, устойчивыми результатами; диагностика применяется к Казахстану и пяти экономикам Европейского союза, подобранным так, чтобы охватить существенные институциональные и структурные условия: Чехия, Польша, Венгрия, Словакия и Финляндия. Анализ представляет собой структурированное индикаторное сравнение по четырем слоям (знаниевые ресурсы, системная абсорбция, инновационные выходы, устойчивые результаты); используются двенадцать индикаторов, по три на слой, из Eurostat, Всемирного банка, WIPO GII 2024, European Innovation Scoreboard 2025 и Бюро национальной статистики Казахстана. Точка разрыва у Казахстана не в первом слое. Доля лиц с высшим образованием в возрастной группе 25–34 года составляет 55,7 процента, что выше показателя каждой из пяти сопоставимых экономик ЕС. Разрыв возникает во втором слое. Доля инновационно активных предприятий примерно втрое ниже уровня Центральной Европы, а участие взрослых в обучении составляет пятую часть от среднего показателя ЕС. Разрыв распространяется дальше: патентная активность отстает более чем в десять раз, а интенсивность выбросов парниковых газов почти вдвое выше польского уровня. Диагностика указывает на слой, в котором меры политики и управленческие решения в Казахстане могут дать наибольший предельный эффект для устойчивой конкурентоспособности.

Ключевые слова: национальные инновационные системы, абсорбционная способность, устойчивая конкурентоспособность, Казахстан, Европейский союз, диагностика политики.

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Conflict of Interest

The author declares no conflict of interest.