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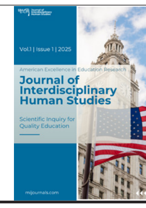

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THE IMPACT OF INNOVATION POTENTIAL ON THE COMPETITIVENESS OF NATIONAL ECONOMIES: A COMPARATIVE ECONOMIC-EMPIRICAL ANALYSIS

Abstract. *This article examines the extent to which national innovation potential explains cross-country differences in economic competitiveness. Innovation potential is measured by the Global Innovation Index (GII) 2025 score, competitiveness is proxied by labour productivity in the Porterian sense (GDP per capita at purchasing power parity), and research intensity is captured by gross domestic expenditure on R&D as a share of GDP. A cross-section of 98 economies (69 with R&D data) is analysed by means of correlation analysis, ordinary least squares estimation with heteroscedasticity-consistent standard errors, quadratic and split-sample specifications, and a residual-based measure of innovation efficiency. Innovation potential and competitiveness are strongly and positively associated ($r = 0.714$; $\rho = 0.750$): a ten-point increase in the GII score corresponds to approximately 55 per cent higher output per capita. When innovation potential and R&D intensity are entered jointly, only the systemic indicator remains statistically significant, which suggests that research spending translates into competitiveness only through the institutional and absorptive capacity that surrounds it. The relationship is concave, and its marginal payoff is roughly twice as large below the sample median as above it, indicating that catch-up economies gain most from incremental improvements in innovation capability. Residual analysis identifies a systematic decoupling of income from capability in resource-rentier economies and confirms Uzbekistan's status as a modest over-performer despite the lowest research intensity in its peer group.*

Keywords: *innovation potential, national competitiveness, Global Innovation Index, R&D intensity, labour productivity, innovation efficiency, resource rents, Uzbekistan, cross-country analysis.*

INTRODUCTION

The question of why some national economies sustain high and rising standards of living while others stagnate has occupied economists since the emergence of modern growth theory. Over the past three decades the answer has converged on a single organising idea: the capacity of an economy to generate, absorb and commercialise new knowledge. Yet the policy debate in many middle-income countries continues to treat innovation as a budgetary line item rather than as a systemic property. Governments announce research spending targets, count patents and publications, and interpret movement in composite rankings as evidence of structural progress. Whether such input-based measures actually correspond to competitiveness outcomes is an empirical question that deserves periodic re-examination with current data.

Competitiveness itself is a contested concept. Porter defined it at the national level as productivity, that is, the value created per unit of labour and capital employed (Porter, 1990), while Krugman warned that treating countries as firms competing for market share is analytically misleading and potentially dangerous for policy (Krugman, 1994:28). Earlier empirical work had already established that international competitiveness is best modelled as the joint outcome of technological capability, capacity to deliver and relative cost, rather than of price factors alone (Fagerberg, 1988:355). The compromise position that has since dominated applied work retains productivity as the substantive criterion and uses composite indices only as diagnostic instruments rather than as scoreboards (Fagerberg, Srholec, & Knell, 2007:1595). This article adopts precisely that position.

The purpose of the study is threefold. First, it quantifies the association between innovation potential and competitiveness across a broad contemporary cross-section of economies. Second, it tests whether research intensity retains independent explanatory power once systemic innovation capability is accounted for, thereby distinguishing the input-based from the systemic interpretation of innovation. Third, it derives a residual measure of innovation efficiency that identifies which economies convert their income level into innovation capability more or less effectively than the cross-country norm, with particular attention to Central Asia and to Uzbekistan.

The contribution is threefold as well. Methodologically, the study combines the most recent editions of three independent international data sources into a single reproducible cross-section and reports heteroscedasticity-robust estimates together with non-linear and split-sample specifications rather than a single headline coefficient. Substantively, it documents that the marginal competitiveness payoff of innovation capability is substantially larger for economies below the sample median, a finding of direct relevance to catch-up strategies. Analytically, it shows that the widely used narrative of resource-rich economies as competitive performers does not survive a capability-adjusted assessment.

The remainder of the article is organised as follows. Section 2 reviews the theoretical and empirical literature and formulates four hypotheses. Section 3 describes the data, variables and estimation strategy. Section 4 reports the results. Section 5 discusses their interpretation and policy implications, and Section 6 concludes.

LITERATURE REVIEW AND HYPOTHESES

From residual to system

The modern treatment of innovation as the principal engine of long-run growth begins with Schumpeter's account of development as the recombination of productive resources through entrepreneurial initiative (Schumpeter, 1934) and his later argument that large firms internalise the innovation process (Schumpeter, 1942). Neoclassical growth accounting subsequently established that factor accumulation alone explains only a minor share of output growth, leaving a large unexplained residual attributed to technical change (Solow, 1957:312). Endogenous growth theory converted that residual into an object of economic choice by modelling knowledge as a non-rival input produced by profit-seeking research activity (Romer, 1990:S71), and by formalising growth as a sequence of quality improvements that destroy the rents of incumbents (Aghion & Howitt, 1992:323).

Parallel to this formal literature, the national innovation systems tradition argued that the productivity of research effort depends on the institutional architecture in which it is embedded: the density of university–industry linkages, the quality of technical education, the financial system and the interaction between users and producers of technology (Freeman, 1987; Lundvall, 1992; Nelson, 1993). Furman, Porter and Stern integrated the endogenous-growth, cluster and systems perspectives into the concept of national innovative capacity, showing empirically that the common innovation infrastructure and the cluster-specific environment jointly determine the flow of internationally protected inventions (Furman, Porter, & Stern, 2002:899). The composite indices used today, including the Global Innovation Index, are direct descendants of this synthesis.

Empirical evidence on research effort and performance

Empirical work on the returns to research has been broadly supportive but consistently qualified. Griliches emphasised the measurement difficulties that beset any attempt to attribute productivity growth to research spending (Griliches, 1979:92); a later survey of the field concluded that estimated private returns are substantial but that social returns and spillovers are far harder to pin down (Hall, Mairesse, & Mohnen, 2010:1033). Coe and Helpman demonstrated that foreign research stocks affect domestic productivity through trade, so that a country's technological performance is not confined to its own laboratories (Coe & Helpman, 1995:859). Ulku found a positive relationship between research activity and per capita output across a wide country sample, but observed that the effect is markedly weaker in economies below the technological frontier (Ulku, 2004).

A separate strand shows that what a country produces matters as much as how much it spends: export baskets associated with higher productivity levels predict subsequent growth (Hausmann, Hwang, & Rodrik, 2007:1); and the appropriate innovation strategy varies with distance to the frontier, imitation being optimal far from it and frontier innovation optimal close to it (Acemoglu, Aghion, & Zilibotti, 2006:37). Competition itself relates to innovation in an inverted-U fashion rather than monotonically (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005:701). At the level of the developing economy, the evidence is more cautionary: innovativeness improves international competitiveness in Turkish manufacturing only where complementary capabilities exist (Özçelik & Taymaz, 2004:409); and the World Bank's account of the innovation paradox attributes the low returns to research subsidies in middle-income countries precisely to deficient managerial, organisational and institutional capabilities (Cirera & Maloney, 2017).

Capability-based comparative work reaches the same conclusion from the opposite direction. Fagerberg and Srholec show that the dimensions of national innovation systems associated with development are dominated by governance and the quality of institutions rather than by research spending as such (Fagerberg & Srholec, 2008:1417), and the survey by Fagerberg, Srholec and Verspagen confirms that technological capability accumulation is an institutionally mediated process (Fagerberg, Srholec, & Verspagen, 2010:833). Evolutionary approaches to industrial competitiveness reach a similar verdict (Castellacci, 2008:984). Finally, the methodological literature on composite indices cautions that competitiveness rankings blend outcome and determinant variables in ways that can mislead policy-makers in developing countries (Lall, 2001:1501); and the determinants of national competitiveness are best modelled as the joint product of social infrastructure, monetary and fiscal policy, and the microeconomic business environment (Delgado, Ketels, Porter, & Stern, 2012).

Hypotheses

Taken together, this literature supports four testable propositions:

H1. Innovation potential is positively and significantly associated with the competitiveness of national economies.

H2. The association is concave: the marginal competitiveness gain from an additional unit of innovation capability declines as an economy approaches the technological frontier.

H3. Research intensity does not retain independent explanatory power for competitiveness once systemic innovation capability is controlled for; its influence operates through the system rather than alongside it.

H4. Economies whose income derives predominantly from natural-resource rents display systematically negative innovation-efficiency residuals, that is, their measured prosperity overstates their underlying capability.

MATERIALS AND METHODS

Data and variables

The analysis draws on three independent international sources, each in its most recent available edition. Innovation potential is measured by the Global Innovation Index 2025 score, a composite of roughly eighty indicators grouped into seven pillars – institutions, human capital and research, infrastructure, market sophistication, business sophistication, knowledge and technology outputs, and creative outputs –covering 139 economies (WIPO, 2025). Competitiveness is proxied by gross domestic product per capita at purchasing power parity in constant 2021 international dollars for 2025 (World Bank, 2025). Research intensity is measured by gross domestic expenditure

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on research and development as a percentage of GDP for 2023 (UNESCO Institute for Statistics, n.d.). A supplementary comparison uses the ranks published in the IMD World Competitiveness Ranking 2025 (IMD, 2025).

The choice of output per capita as the competitiveness variable follows directly from the productivity definition of competitiveness and avoids the circularity that would arise from regressing one composite index on another, since both the GII and survey-based competitiveness rankings share input indicators. Table 1 summarises the variables.

Table 1. Variables, definitions and data sources

Variable	Definition and measurement	Source	Reference year
GII	Global Innovation Index composite score, 0–100 scale	WIPO	2025
GDPpc	GDP per capita, PPP, constant 2021 international $	World Bank	2025
lnGDPpc	Natural logarithm of GDPpc (dependent variable)	Author's calculation	2025
R&D	Gross domestic expenditure on R&D, % of GDP	UNESCO Institute for Statistics	2023
lnR&D	Natural logarithm of R&D intensity	Author's calculation	2023
IMD rank	IMD World Competitiveness Ranking position	IMD World Competitiveness Center	2025

Note. Compiled by the author from the sources indicated.

Sample

The sampling frame is the set of economies published in the GII 2025 ranking for which a matching output per capita observation exists. This yields a working sample of 98 economies spanning the full income distribution, from approximately 4,669 to 139,593 international dollars per capita, and the full range of innovation performance, from a GII score of 22.0 to 66.0. Research-intensity data are available for 69 of these economies, which defines the reduced sample used wherever R&D enters the specification. Two economies present in the GII ranking were excluded because a comparable output series was unavailable, and Taiwan was excluded from the index comparison because it is not covered by the GII. No other exclusions or adjustments were made.

Estimation strategy

Four specifications are estimated by ordinary least squares. Model 1 regresses the logarithm of output per capita on the innovation index, providing a baseline semi-elasticity. Model 2 adds the logarithm of research intensity to test whether research effort retains independent explanatory power. Model 3 reverses the mapping and regresses the innovation index on research intensity in order to quantify how much of measured innovation capability is accounted for by research spending alone. Model 4 regresses the innovation index on the logarithm of output per capita; the residuals from this specification constitute the innovation-efficiency measure, since they express the extent to which an economy's innovation capability exceeds or falls short of the level predicted by its income.

All models are estimated with HC3 heteroscedasticity-consistent standard errors, which perform well in the small and moderate samples typical of cross-country work (Long & Ervin, 2000:217). Two further specifications assess robustness: a quadratic extension of Model 1 that tests H2 directly, and a re-estimation of Model 1 after excluding seventeen economies whose income is dominated by hydrocarbon rents or by offshore financial and corporate-domiciliation activity, whose per capita output is known to be a poor proxy for domestic productive capability (Sachs & Warner, 1995). The sample is additionally split at the median GII score to compare marginal effects below and above the middle of the distribution.

Two limitations must be stated at the outset. First, the design is cross-sectional and the estimates are associational; the two-way causality between prosperity and innovation capability cannot be resolved without instrumentation or a panel structure. Second, the innovation index is itself a composite whose pillars include institutional and infrastructural variables that also enter the determination of income, so a share of the estimated association reflects common institutional foundations rather than innovation narrowly defined. The results are interpreted accordingly.

RESULTS

Descriptive patterns

Table 2 reports the descriptive statistics. The dispersion of research intensity is far greater than that of the innovation index: the highest-spending economy devotes 127 times the share of GDP to research that the lowest-spending economy does, whereas the innovation scores differ by a factor of three. This asymmetry is itself informative, since it indicates that innovation capability is a considerably more compressed and more slowly moving quantity than the budgetary effort devoted to it.

Table 2. Descriptive statistics

Variable	N	Mean	SD	Min	Median	Max
GII score	98	37.01	11.84	22.0	33.35	66.0
GDP per capita, PPP ($)	98	39,907	27,492	4,669	35,802	139,593
R&D, % of GDP	69	1.406	1.279	0.05	1.05	6.35

Note. Author's calculations based on WIPO (2025), World Bank (2025) and UNESCO Institute for Statistics (n.d.).

The bivariate gradient is monotone and steep. Dividing the sample into quartiles of the innovation index, mean output per capita rises from 20,408 international dollars in the lowest quartile to 25,776, then 43,579, and finally 70,525 in the highest quartile; mean research intensity rises in parallel from 0.31 to 0.80, 1.67 and 2.96 per cent of GDP. Mean innovation-efficiency residuals rise across the same quartiles from −5.06 to −3.48, −0.06 and +8.81, indicating that the leading group is not merely richer but converts its income into capability more effectively than the rest of the distribution.

Correlation structure

Table 3 reports the pairwise associations. Innovation potential is strongly correlated with competitiveness, and even more strongly with research intensity. Notably, the correlation between innovation potential and research intensity (0.857 in logarithms, 0.898 in ranks) exceeds the correlation between research intensity and output per capita (0.706), which already suggests that research spending reaches competitiveness indirectly, through the innovation system, rather than directly.

Table 3. Pairwise correlations

Variable pair	Pearson r	Spearman ρ	N	p-value
GII – lnGDP per capita	0.714	0.750	98	< 0.001
GII – R&D intensity	0.826	0.898	69	< 0.001
GII – lnR&D intensity	0.857	—	69	< 0.001
lnGDP per capita – lnR&D	0.706	—	69	< 0.001
GII rank – IMD rank	—	0.482	11	0.133

Note. Author's calculations. Spearman coefficients for the index-rank comparison are computed on the eleven economies covered by both the GII 2025 and the IMD World Competitiveness Ranking 2025 for which ranks were verifiable; the coefficient is not statistically significant at conventional levels and is reported for completeness only.

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Regression results

Table 4 presents the estimated models. Model 1 supports H1 unambiguously: the innovation index enters positively and is significant at any conventional level, and the specification accounts for slightly more than half of the cross-country variance in the logarithm of output per capita. The coefficient of 0.0439 implies that a ten-point increase in the innovation score is associated with output per capita higher by approximately 55 per cent, and a one standard deviation increase (11.84 points) with output higher by approximately 68 per cent.

Table 4. OLS estimates of the innovation–competitiveness relationship

	Model 1lnGDPpc	Model 2lnGDPpc	Model 3GII	Model 4GII	Model 5lnGDPpc
GII score	0.0439*** (0.0043)	0.0263*** (0.0079)	—	—	0.0471*** (0.0039)
lnR&D intensity	—	0.1395(0.0997)	9.103*** (0.644)	—	—
lnGDP per capita	—	—	—	11.631*** (1.197)	—
Constant	8.732*** (0.182)	9.510*** (0.311)	41.351*** (0.790)	−83.438*** (12.082)	8.471*** (0.162)
N	98	69	69	98	81
R^2	0.510	0.570	0.734	0.510	0.652

Note. Author’s calculations. HC3 heteroscedasticity-consistent standard errors in parentheses. *** $p < 0.01$. Model 5 replicates Model 1 after excluding seventeen hydrocarbon-rent and offshore-hub economies. Model 4 residuals define the innovation-efficiency measure used in Table 5.

Model 2 provides the central analytical result of the study and supports H3. When innovation potential and research intensity are entered jointly, the innovation index retains its significance while the coefficient on research intensity, although positive, is statistically indistinguishable from zero ($p = 0.162$). The magnitude of the innovation coefficient falls by approximately forty per cent relative to Model 1, which is consistent with research intensity being a component of, rather than a substitute for, systemic innovation capability. Model 3 quantifies this overlap directly: research intensity alone accounts for 73.4 per cent of the variance in the innovation index, leaving a substantial but not dominant residual for the institutional, market and human-capital pillars.

The quadratic extension of Model 1 supports H2. The linear term is positive (0.1299) and the squared term negative (−0.00105), both significant, with an implied turning point at a GII score of approximately 61.9 –a level attained by only two economies in the sample. The interpretation is not that innovation ceases to matter at the frontier, but that the competitiveness payoff to a further point of innovation capability diminishes as capability accumulates. The split-sample estimates point the same way: below the median innovation score the slope is 0.0687 (standard error 0.0245), whereas above the median it is 0.0296 (standard error 0.0087), a difference of more than a factor of two.

Innovation efficiency: over- and under-performers

Table 5 reports the ten largest positive and the ten largest negative residuals from Model 4. A positive residual means that an economy displays greater innovation capability than its income level predicts; a negative residual means the opposite.

Table 5. Innovation efficiency: ten largest positive and negative residuals (Model 4)

№	Over-performer	Residual	№	Under-performer	Residual
1	China	+22.22	1	Brunei Darussalam	−23.23
2	Sweden	+17.43	2	Qatar	−17.00
3	Switzerland	+17.32	3	Bahrain	−14.66
4	Republic of Korea	+16.33	4	Kuwait	−13.80
5	United Kingdom	+15.80	5	Panama	−13.17
6	India	+14.46	6	Kazakhstan	−12.87
7	United States	+14.28	7	Dominican Republic	−11.53
8	Finland	+14.03	8	Belarus	−11.24
9	Japan	+11.60	9	Russian Federation	−10.18
10	Estonia	+10.83	10	Azerbaijan	−10.13

Note. Author’s calculations. Residuals are expressed in GII score points and measure the deviation of observed innovation capability from the level predicted by the logarithm of output per capita.

The composition of the two columns is striking and supports H4. Every one of the six most negative residuals belongs either to a hydrocarbon-rent economy or to a transit and financial-services hub. The four Gulf economies in the list combine per capita incomes in the upper decile of the sample with innovation scores in the middle or lower half of the ranking. Conversely, the over-performing column is dominated by economies whose income was itself built on the accumulation of technological capability, and it includes two large lower- and lower-middle-income economies, China and India, whose innovation scores exceed the level implied by their income by more than fourteen points.

Robustness

Model 5 in Table 4 re-estimates the baseline after excluding the seventeen rent-based and offshore economies identified above. The coefficient on innovation potential rises from 0.0439 to 0.0471, the standard error falls, and explanatory power increases substantially, from 0.510 to 0.652, with the simple correlation rising from 0.714 to 0.807. The exclusion therefore strengthens rather than weakens the central finding, which confirms that the residual noise in the full sample is generated principally by economies whose income is decoupled from domestic productive capability.

DISCUSSION

Innovation as a system rather than an expenditure

The most consequential result of this study is the disappearance of research intensity as an independent predictor of competitiveness once systemic innovation capability is controlled for. This finding aligns closely with the national innovation systems tradition (Freeman, 1987; Lundvall, 1992; Nelson, 1993) and with the capability-based comparative evidence showing that governance and institutional quality dominate expenditure measures in explaining development outcomes (Fagerberg & Srholec, 2008:1417). It also provides cross-sectional corroboration of the innovation paradox: additional research subsidies yield disappointing returns in middle-income countries because the complementary managerial, organisational and institutional capabilities required to absorb them are missing (Cirera & Maloney, 2017).

The practical implication is direct. A national programme that raises research spending from 0.1 to 0.5 per cent of GDP without simultaneously strengthening the institutional pillars in which that spending must operate should not be expected to move competitiveness outcomes. The relevant policy variable is the productivity of the innovation system, not the size of its budget –although the two are, as Model 3 shows, tightly correlated in practice, so that persistent underfunding is a reliable symptom of a weak system even if funding alone is not the cure.

Diminishing returns and the catch-up opportunity

The concavity of the relationship, and the doubling of the marginal effect below the sample median, carry an encouraging message for middle-income economies.

Improvements in innovation capability appear to be most valuable precisely where capability is currently weakest. This pattern is consistent with the distance-to-frontier argument that imitation and adoption strategies dominate frontier innovation for economies far from the technological boundary (Acemoglu, Aghion, & Zilibotti, 2006:37), and with the finding that technology transmitted through trade raises domestic productivity independently of domestic research effort (Coe & Helpman, 1995:859). For a country at the sample median, the estimated payoff to a five-point improvement in the innovation score exceeds forty per cent in output per capita –an order of magnitude that no plausible reallocation of physical investment could deliver.

This should not be read as a claim that catch-up is automatic. The same literature emphasises that absorbing foreign technology is itself a capability requiring investment in human capital, standards, and firm-level organisational competence, and that the composition of production determines whether such absorption translates into export performance (Hausmann, Hwang, & Rodrik, 2007:1; Özçelik & Taymaz, 2004:409).

Resource rents and the decoupling of income from capability

The systematic clustering of hydrocarbon economies at the negative extreme of the efficiency distribution provides a capability-based restatement of the resource-curse literature (Sachs & Warner, 1995). Per capita income in these economies measures the value of an extracted endowment rather than the productivity of domestic labour and capital, so any competitiveness assessment resting on income alone will overstate their position. This is precisely the interpretive hazard against which the composite-index literature warns (Lall, 2001:1501), and it justifies the use of a residual measure rather than a raw ranking when the analytical object is capability rather than prosperity.

The Central Asian case: Uzbekistan

Table 6 places Uzbekistan in comparative perspective. Uzbekistan ranks 79th of 139 economies in the GII 2025 with a score of 26.5, third in Central and Southern Asia and seventh among thirty-seven lower-middle-income economies, and has been classified as an innovation over-performer for a fourth consecutive year (WIPO, 2025). Its ranking has improved from 93rd in 2020 to 79th in 2025, and it ranks 69th on innovation inputs against 92nd on innovation outputs, a gap of twenty-three positions that identifies conversion rather than mobilisation as the binding constraint.

Table 6. Comparative profile of selected economies, 2025

Economy	GII rank	GII score	R&D, % GDP	GDPpc, PPP $	Residual
Switzerland	1	66.0	3.22	85,732	+17.32
Republic of Korea	4	60.0	4.94	55,697	+16.33
China	10	56.6	2.58	25,067	+22.22
Israel	14	52.3	6.35	48,197	+10.32
Estonia	16	51.1	1.84	41,604	+10.83
India	38	38.2	n/a	10,039	+14.46
Türkiye	43	37.2	1.42	37,301	−1.80
Viet Nam	44	37.1	0.41	15,457	+8.34
Russian Federation	60	30.3	0.94	42,358	−10.18
Uzbekistan	79	26.5	0.11	11,623	+1.06
Kazakhstan	81	26.3	0.14	37,851	−12.87
Kyrgyzstan	96	22.6	0.05	7,878	+1.68

Note. Author's calculations based on WIPO (2025), World Bank (2025) and UNESCO Institute for Statistics (n.d.). Residual from Model 4, expressed in GII score points. The residual for Israel is reported for reference and does not appear among the ten largest in Table 5.

Three features of the table deserve emphasis. First, Uzbekistan achieves a marginally positive efficiency residual (+1.06) with the lowest research intensity in the comparison group, 0.11 per cent of GDP. Its innovation performance is therefore being carried by human capital, education spending and labour productivity rather than by research expenditure –a configuration that is sustainable only up to a point, since the output pillars in which the country lags most are precisely those that require a functioning research base. Second, the contrast with Kazakhstan is instructive: at a comparable innovation score (26.3) but more than three times the per capita income, Kazakhstan records a residual of −12.87, the sixth most negative in the sample. Two neighbouring economies at almost identical positions in the innovation ranking therefore occupy opposite ends of the efficiency distribution, which is a direct consequence of the extractive composition of Kazakh income. Third, Viet Nam illustrates the trajectory available to Uzbekistan: a comparable research intensity of 0.41 per cent of GDP combined with an innovation score of 37.1 and a residual of +8.34, achieved principally through integration into global production networks and the resulting technology transfer. The strategic priorities set out in the Uzbekistan–2030 strategy (Decree No. PF-158, 2023) are consistent with this direction, and the present results suggest that their effect on competitiveness will depend less on the research budget than on the institutional and firm-level capacity to convert inputs into outputs.

CONCLUSION

This study examined the relationship between national innovation potential and economic competitiveness using a cross-section of 98 economies constructed from the Global Innovation Index 2025, World Bank output data and UNESCO research-intensity statistics. Four conclusions emerge.

First, innovation potential and competitiveness are strongly and positively associated. The baseline estimate implies that a ten-point improvement in the innovation score corresponds to output per capita higher by approximately fifty-five per cent, and the specification explains half of the cross-country variance in the full sample and almost two-thirds once rent-based and offshore economies are excluded. Hypothesis H1 is supported.

Second, the relationship is concave, and its marginal payoff below the sample median is more than twice that above it. Hypothesis H2 is supported, and the finding is of direct strategic relevance to catch-up economies, for which incremental gains in innovation capability are worth substantially more than for economies already near the frontier.

Third, research intensity loses its independent explanatory power once systemic innovation capability is controlled for, while accounting for nearly three-quarters of the variance in that capability. Hypothesis H3 is supported. Research spending is a necessary component of innovation capability but not a sufficient instrument of competitiveness policy; its returns are conditional on the institutional environment that surrounds it.

Fourth, resource-rent and offshore economies exhibit systematically negative innovation-efficiency residuals, confirming Hypothesis H4 and demonstrating that income-based competitiveness assessments overstate the position of such economies. For Uzbekistan the analysis yields a modestly positive efficiency residual achieved from an exceptionally low research base, together with a twenty-three-position gap between input and output rankings that identifies commercialisation and firm-level absorption, rather than mobilisation of resources, as the binding constraint.

Three directions for further research follow. A panel extension covering the period since the GII became methodologically stable would permit dynamic estimation and partial identification of causal direction. A pillar-level decomposition would establish which components of innovation capability carry the estimated association. Finally, firm-level evidence for Uzbekistan and its regional peers would test whether the aggregate input–output gap identified here reflects deficient commercialisation capacity at the level of enterprises, as the cross-country pattern suggests.

REFERENCES

1. Acemoglu, D., Aghion, P., & Zilibotti, F. (2006). Distance to frontier, selection, and economic growth. Journal of the European Economic Association, 4(1), 37–74.
2. Aghion, P., Bloom, N., Blundell, R., Griffith, R., & Howitt, P. (2005). Competition and innovation: An inverted-U relationship. The Quarterly Journal of Economics, 120(2), 701–728.
3. Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. Econometrica, 60(2), 323–351.
4. Castellacci, F. (2008). Innovation and the competitiveness of industries: Comparing the mainstream and the evolutionary approaches. Technological Forecasting and Social Change, 75, 984–1006.
5. Cirera, X., & Maloney, W. F. (2017). The innovation paradox: Developing-country capabilities and the unrealized promise of technological catch-up. World Bank.
6. Coe, D. T., & Helpman, E. (1995). International R&D spillovers. European Economic Review, 39(5), 859–887.
7. Decree of the President of the Republic of Uzbekistan No. PF-158. (2023). "O'zbekiston – 2030" strategiyasi to'g'risida [On the "Uzbekistan – 2030" Strategy]. Lex.uz.
8. Delgado, M., Ketels, C., Porter, M. E., & Stern, S. (2012). The determinants of national competitiveness (NBER Working Paper No. 18249). National Bureau of Economic Research.
9. Fagerberg, J. (1988). International competitiveness. The Economic Journal, 98(391), 355–374.
10. Fagerberg, J., & Srholec, M. (2008). National innovation systems, capabilities and economic development. Research Policy, 37(9), 1417–1435.
11. Fagerberg, J., Srholec, M., & Knell, M. (2007). The competitiveness of nations: Why some countries prosper while others fall behind. World Development, 35(10), 1595–1620.
12. Fagerberg, J., Srholec, M., & Verspagen, B. (2010). Innovation and economic development. In B. H. Hall & N. Rosenberg (Eds.), Handbook of the economics of innovation (Vol. 2, pp. 833–872). Elsevier.
13. Freeman, C. (1987). Technology policy and economic performance: Lessons from Japan. Pinter.
14. Furman, J. L., Porter, M. E., & Stern, S. (2002). The determinants of national innovative capacity. Research Policy, 31(6), 899–933.

15. Griliches, Z. (1979). Issues in assessing the contribution of research and development to productivity growth. The Bell Journal of Economics, 10(1), 92–116.
16. Hall, B. H., Mairesse, J., & Mohnen, P. (2010). Measuring the returns to R&D. In B. H. Hall & N. Rosenberg (Eds.), Handbook of the economics of innovation (Vol. 2, pp. 1033–1082). Elsevier.
17. Hausmann, R., Hwang, J., & Rodrik, D. (2007). What you export matters. Journal of Economic Growth, 12(1), 1–25.
18. IMD. (2025). IMD World Competitiveness Ranking 2025. IMD World Competitiveness Center.
19. Krugman, P. (1994). Competitiveness: A dangerous obsession. Foreign Affairs, 73(2), 28–44.
20. Lall, S. (2001). Competitiveness indices and developing countries: An economic evaluation of the Global Competitiveness Report. World Development, 29(9), 1501–1525.
21. Long, J. S., & Ervin, L. H. (2000). Using heteroscedasticity consistent standard errors in the linear regression model. The American Statistician, 54(3), 217–224.
22. Lundvall, B.-Å. (Ed.). (1992). National systems of innovation: Towards a theory of innovation and interactive learning. Pinter.
23. Nelson, R. R. (Ed.). (1993). National innovation systems: A comparative analysis. Oxford University Press.
24. Özçelik, E., & Taymaz, E. (2004). Does innovativeness matter for international competitiveness in developing countries? The case of Turkish manufacturing industries. Research Policy, 33(3), 409–424.
25. Porter, M. E. (1990). The competitive advantage of nations. Free Press.
26. Romer, P. M. (1990). Endogenous technological change. Journal of Political Economy, 98(5), S71–S102.
27. Shermukhamedov, K. A. (2014). Ideology of tolerance in Islam. Since wars begin in the minds of men, it is in the minds of men that the defences of peace must be constructed, 159.
28. Sachs, J. D., & Warner, A. M. (1995). Natural resource abundance and economic growth (NBER Working Paper No. 5398). National Bureau of Economic Research.
29. Schumpeter, J. A. (1934). The theory of economic development. Harvard University Press.
30. Schumpeter, J. A. (1942). Capitalism, socialism and democracy. Harper & Brothers.
31. Solow, R. M. (1957). Technical change and the aggregate production function. The Review of Economics and Statistics, 39(3), 312–320.
32. Ulku, H. (2004). R&D, innovation, and economic growth: An empirical analysis (IMF Working Paper No. 04/185). International Monetary Fund.
33. UNESCO Institute for Statistics. (n.d.). Research and development expenditure (% of GDP) [Data set]. UNESCO Institute for Statistics.
34. WIPO. (2025). Global Innovation Index 2025: Innovation in a shifting global landscape. World Intellectual Property Organization.
35. World Bank. (2025). World development indicators: GDP per capita, PPP (constant 2021 international $) [Data set]. World Bank.