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Building a Knowledge-Based Economy to Boost Growth: The Role of Export Diversification in Qatar

Ken Miyajima

SIP/2025/017

IMF Selected Issues Papers are prepared by IMF staff as background documentation for periodic consultations with member countries. It is based on the information available at the time it was completed on January 8, 2025. This paper is also published separately as IMF Country Report No 25/048.

2025
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IMF Selected Issues Paper
Middle East and Central Asia Department

Building a Knowledge-Based Economy to Boost Growth: The Role of Export Diversification in Qatar

Prepared by Ken Miyajima

Authorized for distribution by Ran Bi
March 2025

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ABSTRACT: Motivated by Qatar's Third National Development Strategy, this note discusses ingredients for boosting export diversification and growth potential. Drawing on cross-country experiences and empirical analyses, we shed light on how successful policies supported building human capital and economic complexity, the type of strategy that could best suite Qatar's circumstances, and pitfalls to avoid.

RECOMMENDED CITATION: Miyajima, Ken. 2025. "Building a Knowledge-Based Economy to Boost Growth: The Role of Export Diversification in Qatar." IMF Selected Issues Paper (SIP/2025/017). Washington, D.C.: International Monetary Fund.

JEL Classification Numbers:	J24, L16, O24, O30, O53
Keywords:	Economic complexity, export diversification, human capital, innovation, Qatar, Third National Development Strategy
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SELECTED ISSUES PAPERS

Building a Knowledge-Based Economy to Boost Growth: The Role of Export Diversification in Qatar

Qatar

Prepared by Ken Miyajima[1]

[1] The author would like to thank the participants of the 2024 Staff Visit Workshop at the Ministry of Finance, and the IMF's Chile, Korea, and Malaysia county teams for their very helpful suggestions and comments.

A. Introduction

1. The Third National Development Strategy (NDS3) lays out plans to build a knowledge-based economy to boost growth potential, focusing on the role of export diversification. Export diversification is an important pillar of broader economic diversification given the small size of domestic markets in Qatar. However, compared to the progress made in diversifying output and fiscal revenue, export diversification has been more limited. Declining productivity and other impediments have held back the pace of export diversification.[1] Against this backdrop, NDS3 stresses the importance of building a knowledge-based economy by strengthening the business environment, labor markets, fiscal and institutional frameworks to close important gaps in innovation, human capital, and the regulatory environment. It also identifies "diversification clusters" to build comparative advantages, setting ambitious targets both at the sectoral level and on macroeconomic outcomes (Figure 1).[2] NDS3 focuses on harmonizing economic zone to help attract FDI, boosting international trade including thought additional agreements with key target markets, and Public-Private partnership (PPP) to facilitate private sector participation.

2. Motivated by NDS3, this paper discussed options for Qatar to build a knowledge-based economy with a focus on boosting export diversification in complex products. Section B reviews Qatar's progress in export diversification and sketches the role of product and economic complexity in lifting export diversification and output. Section C econometrically establishes the role of economic complexity, and human and physical capital for boosting export diversification and non-hydrocarbon output. Section D discusses cross-country experience of strategies to diversify exports. Following the literature we focus on three economies (Korea, Malaysia, and Chile) that have followed different diversification strategies. Korea is a frontier country in this analysis, and its case helps us analyze how its diversification strategy to jump into high value-added sectors could achieve very strong growth performance. Malaysia and Chile's cases represent distinctively different growth strategies. These two countries also share characteristics with Qatar—both of them export commodities and Malaysia relies on expatriate workers even though less than Qatar does. Section E takes a closer look at Korea's case. Section F draws lessons for Qatar, while Section G discusses policy priorities. Section H concludes.

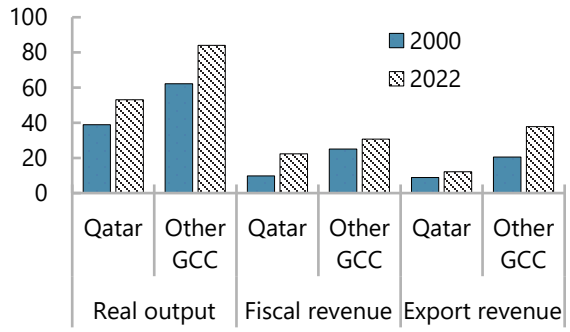
[1] The growth rate of total factor productivity over the past 4 decades were negative in Qatar, similar to its peer GCC countries. Other impediments include barriers to market entry and FDI, various regulatory impediments, an immature innovation ecosystem, and insufficient human capital.

[2] Selected priority sectors include manufacturing (petrochemicals, plastic products, and low-carbon metals), ICT, and education.

Text Figure 1. Qatar: Indicators of Economic Diversification, Human Capital, and Productivity

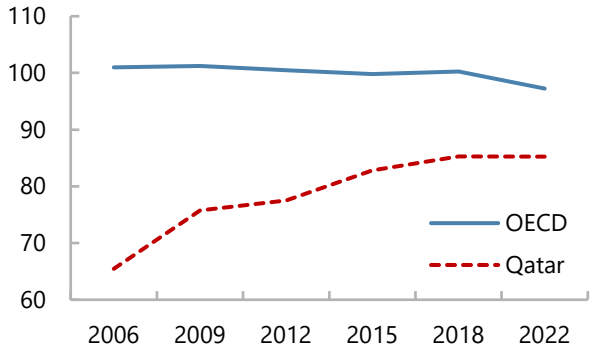
Qatar has made progress in economic diversification…

Economic Diversification
(Percent, non-hydrocarbon sector's share of total)



…and in boosting educational attainment...

PISA Test Scores
(OECD period average = 100)

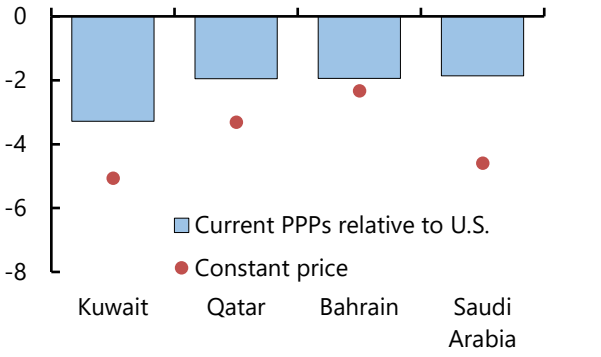


…with room to attract and retain more higher-skilled expatiate workers…

Expatriate Workers in Qatar by Skill
(Percent of total, 2006, 2013, 2020)

…and improve productivity.

Productivity Improvements
(Percent, average annual growth rate of TFP, 1974-2019)



Sources: Haver, IMF WEO, OECD, Qatar Economic Outlook 2020-23 (PSA), and IMF staff calculations.

B. Qatar's Progress in Export Diversification

3. Qatar has made progress in diversifying services exports but less so in goods exports. During the last two decades, the share of services exports increased notably, including transport, tourism, and ICT (Figure 2, upper panels). In particular, ICT could generate high value added and sustained productivity gains. The "*product space*", which visualizes the structure of goods exports with a particular focus on the *distance* between products of different levels of complexity, has remained broadly unchanged

(middle panels).[3] Notably, Qatar's main export product minerals are relatively isolated from other products (mostly shown as empty dots, which are not produced by Qatar), and especially from products with higher complexity that are located to the left of the product space. Qatar's global shares of relatively complex products (electronics and machinery) are low compared to GCC peers and other selected economics that are discussed in detail later (lower panels).

4. Producing goods with higher complexity is important for boosting export diversification and non-hydrocarbon output. The literature highlights that countries with greater economic complexity, or a more diverse and sophisticated production structure requiring advanced knowledge and technology, tend to experience greater economic growth than those with simpler economies focused on basic goods (Balland et al., 2022; Hassanein et al, 2024).[4] Producing and exporting goods with greater complexity creates learning and make investment and labor more productive. High levels of economic growth might in turn facilitate the development of a more complex economy through increased investment in research and development, creating a virtuous cycle (Stojkoski and Kocarev, 2017; You et al., 2022). Qatar and other GCC counties are in the middle of the pack as for economic complexity (Figure 3). Given their economic complexity, technology-intensive manufacturing exports are relatively low while per-capita income is relatively high.[5] Section C further explores how economic complexity is associated with per-capita real GDP growth.

[3] The distance represents relatedness to existing know-how, capabilities, and inputs in order to enter production. Every two products have a globally defined proximity between them as measured by the probability of co-export, that if a country exports product A, what is the probability they also export product B.

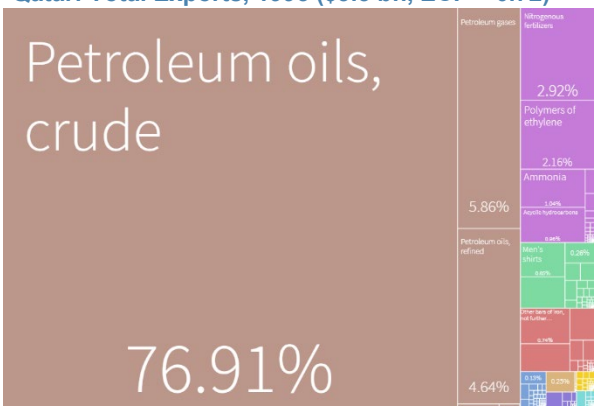
[4] The economic complexity index is calculated from equations for diversity and ubiquity to express the recursion (Hidalgo and Hausmann, 2009).

[5] The key message remains unchanged when total GDP is used.

Text Figure 2. Qatar: Export Diversification in Qatar and Selected Economies

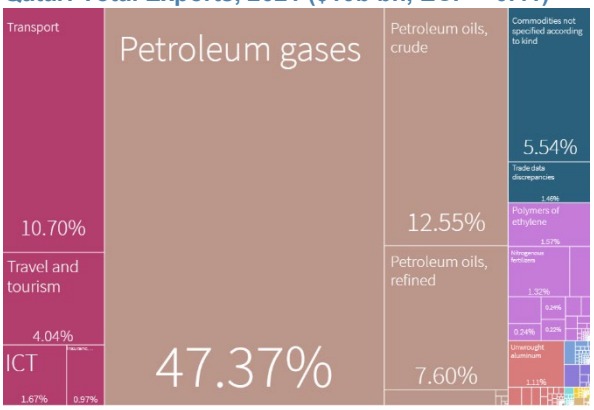
Qatar's total export diversification from 1995…

Qatar: Total Exports, 1995 ($3.5 bn, ECI = -0.72)



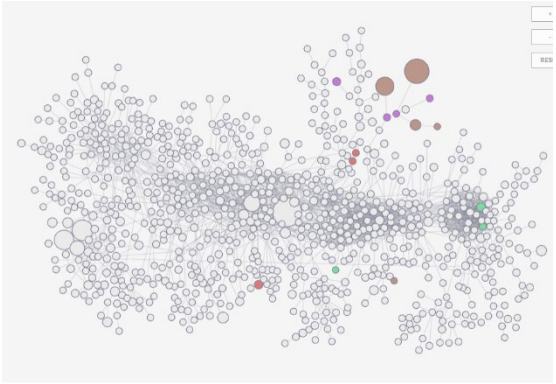
…to 2021 progressed due to services (red area below)…

Qatar: Total Exports, 2021 ($10b bn, ECI = -0.41)



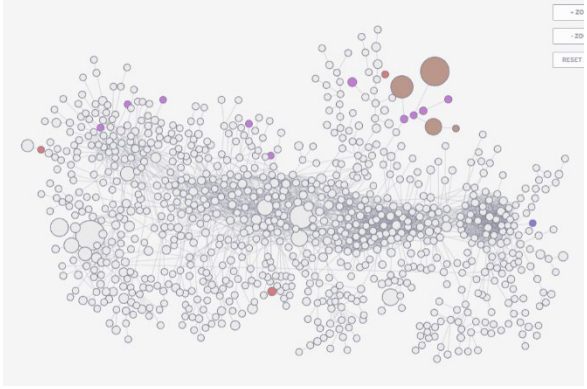
…while goods exports have largely been unchanged...

Qatar: Goods Exports, 1995



…mainly minerals (in brown) and chamicals (in purple).

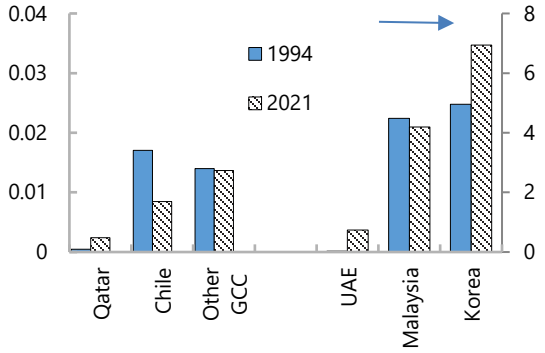
Qatar: Goods Exports, 2021



Qatar's exports of high value-added and complex products including electronics…

Electronics Exports 1/

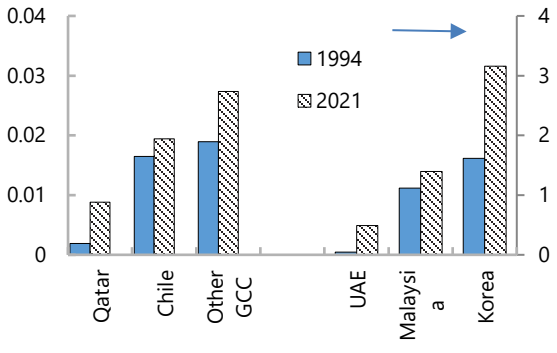
(Percent of global exports)



…and machinery have been relatively low.

Machinery Exports 1/

(Percent of global exports)



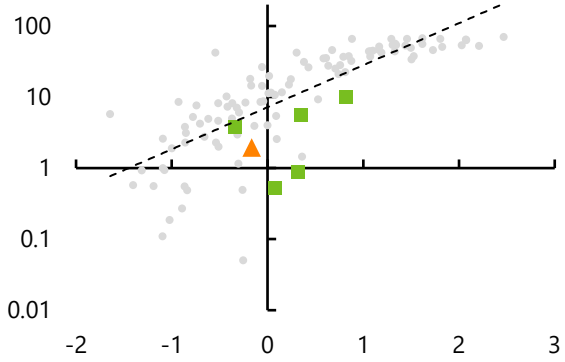
Sources: Atlas of Economic Complexity and IMF staff.

1/ Other GCC = Bahrain, Kuwait, Oman, Saudi Arabia. The UAE is on the right scale, with Malaysia and Korea.

Text Figure 3. Qatar: Economic Complexity and Macroeconomic Performance

Higher economic complexity is assocaited with greater export diversification to high-tech. manufacturing…

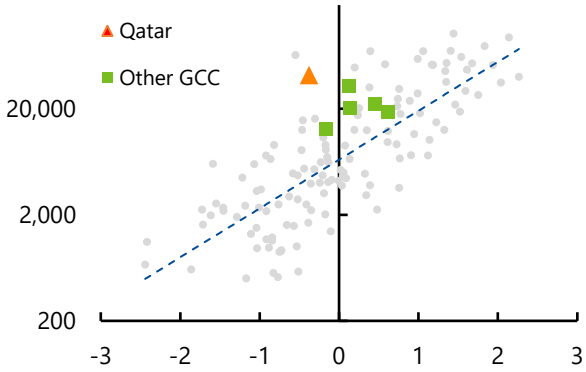
Medium and High Tech. Manufacturing Exports
(In percent of total goods exports, 2019, log scale)



Economic complexity index, 2019

…and with greater per-capita non-hydrocarbon output.

Per-Capita Non-Hydrocarbon Output
(In US dollars, 2021, log scale)



Economic complexity index, 2021

Sources: Penn World Table and IMF staff calculations.

C. Determinants of Export Diversification and Economic Growth

5. The role of economic complexity in boosting export diversification and per-capita income is econometrically explored. The dependent variables are medium and high-tech exports in percent of total goods exports, and per-capita real income, both in logarithm similar to in Figure 3. The explanatory variables are indicators of economic complexity, human capital, physical capital, and employment-to-population ratio. Additionally, interaction terms between economic complexity and human capital or physical capital are included to explain per-capita real income. Annual data spanning 1960–2019 are used for export regressions, while non-overlapping 5-year averages are used for per-capita real income regressions to capture long-term effects as standard in the literature employing growth regressions (that is, 1960-64, 1965-1969, …, 2010-19). Both data are collected for the same panel of 133 countries. Pooled, fixed-effects panel, and random-effects panel models are estimated to check robustness. Estimated coefficients from the pooled models, broadly corresponding to the trend line in Figure 3, and those from fixed-effects and random-effects models are reported in Annex Tables 1 and 2. Random-effects results are comparable to fixed-effects results. Hausman test results suggest fixed-effects models are preferred.

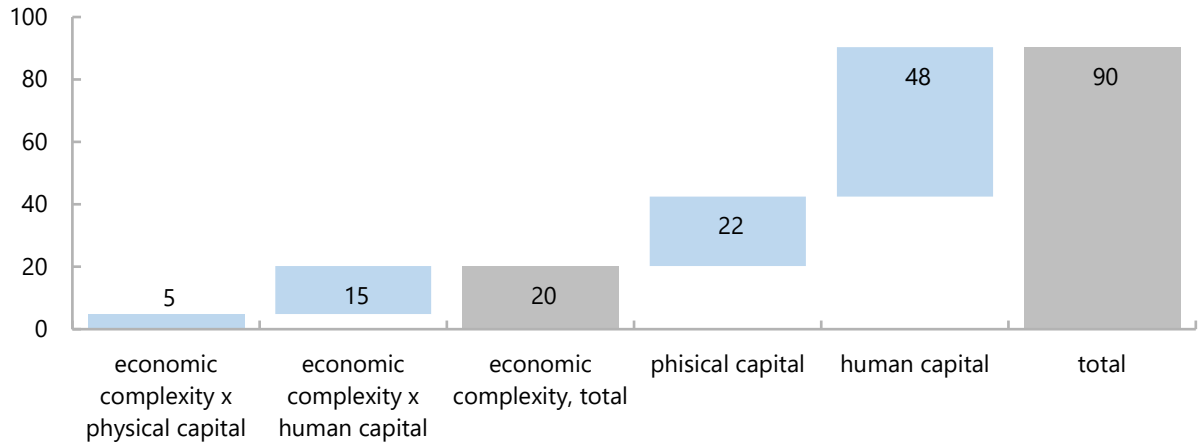
6. Results highlight that economic complexity is positively associated with medium- and high-tech exports. Results from pooled, fixed-effects, and random-effects regressions summarized in Annex Table A1 suggest higher economic complexity promotes export diversification into medium and high-tech. manufacturing exports. Equally notable is the importance of human capital in supporting export diversification (while physical capital does not come out as an important factor). Applying statistically significant coefficients from model 6, if Qatar's economic complexity improves by one unit, which equals to one standard deviation in the sample, the nation's medium to high-tech manufacturing exports would increase by 8–9 percentage points of total goods exports (from around 2 percent in 2019). Increasing economic complexity to the level of

Malaysia's, one of the successful country cases discussed later, would imply a more significant increase, by 12–13 percentage points, in Qatar's export share.

Text Figure 4. Qatar: Impact of Economic Complexity and Human & Physical Capital on Per-Capita Output
(Percent)

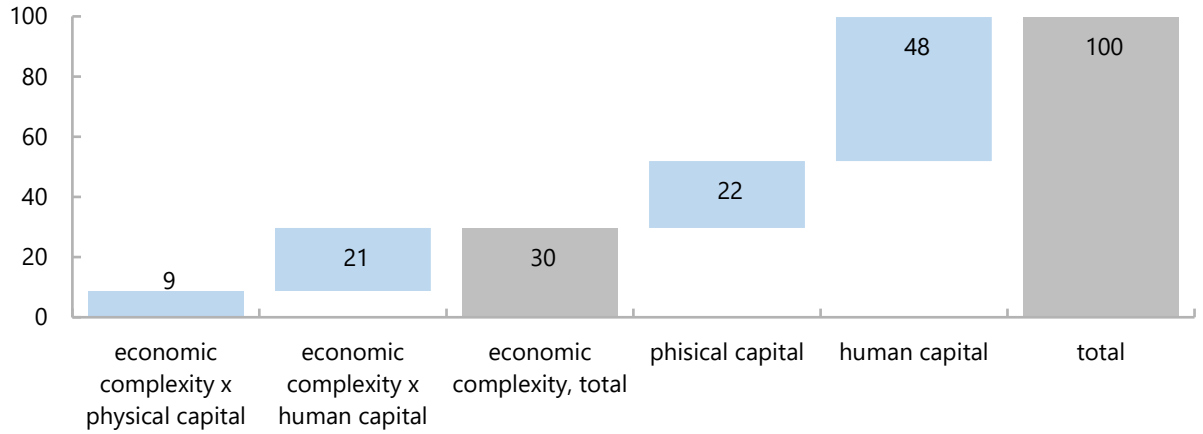
Economic complexity, and human & physical capital are key determnants of per-capital output…

When Human and Physical Capital = Mean



…and higher economic complexity boosts the gorwth imapct of human & physical capital.

When Human and Physical Capital = Mean + One Standard Deviation



Source: IMF staff calculations.

7. Results also show how the association of economic complexity with per-capita real income is amplified by the physical and human capital. Based on regressions results summarized in Table A2, illustrative scenarios using a hypothetical average economy is shown in Figure 4. The upper panel shows the impact of one standard deviation increase in human capital, physical capital, and economic complexity index on per-capita real output. First, human capital is very important, making the largest contributor to per-capita real output. Second, physical capital is also important, even though its contribution to per-capita real output is smaller. Given the simulation is for an average country, and Qatar's physical capital is already large in volume and of high quality, the marginal impact of a rise in physical capital would be smaller for Qatar. Third, the

impact of an increase in economic complexity on per-capita real output is stronger when the starting levels of human and physical capital are higher. In other words, for a given level of technology, its growth impact is larger when the population is more skilled and when infrastructure is of higher quality. Numerically, the impact of a one standard deviation increase in economic complexity is 20 percentage points when human and physical capital are at the average levels across country and time. The growth impact of economic complexity increases to 30 percentage points when the starting levels of human and physical capital are above the average by one standard deviation (Figure 4, lower panel).

D. Technology and Innovation Policies to Boost Economic Complexity: Selected Country Cases

8. Technology and Innovation Policy can help boost economic complexity and eventually per-capita income durably. Qatar already has a high level of top-notch capital stock, and a clear strategy to boost human capital. To complement, we focus on policies that can boost economic complexity, or Technology and Innovation Policy (TIP). The thrust of TIP echoes the strategic priorities of NDS3, that is, to support domestic sophisticated industries, sometimes beyond comparative advantage with export orientation, especially when domestic markets are small like in Qatar. Fierce competition with strict accountability supports productivity gains.

9. In this context, we draw lessons from more successful country cases in improving economic complexity. These examples are intended to serve at least two purposes. First, they help shed light on the type of strategy that suites Qatar's circumstances the best. Drawing on Cherif et al. (2024) and other papers by the authors, in what follows we focus on Chile, Korea, and Malaysia, which relied on different strategies to boost economic and export complexity and achieved different degrees of success (Figure 5). The strategies pursued by Korea, Malaysia, and Chile are sometimes characterized as “Moonshots”, “Leapfrog”, and “Snail crawl”, where Moonshots delivered the greatest growth gains. Two of them also export commodities, and in one of them expatriate workers play an important role, making these countries’ experiences and lessons particularly relevant for Qatar. We use country experiences and tools from the Atlas of Economic Complexity to illustrate different strategies. Second, country examples provide lessons as to how successful policies including TIP supported boosting human capital and economic complexity, and pitfalls to avoid for commodity exporters to diversify.

- **Korea**. Earlier the nation’s comparative advantage was in low tech sectors. Yet, the nation managed to lift its real per-capital income from less than 10 percent of the US to nearly 70 percent of the US. It registered 8 percent average growth over and above the US over the period. This experience is sometimes baptized as “Moonshots”. During the transformation Korea became more tech intensive and increased its economic complexity. How did it do?

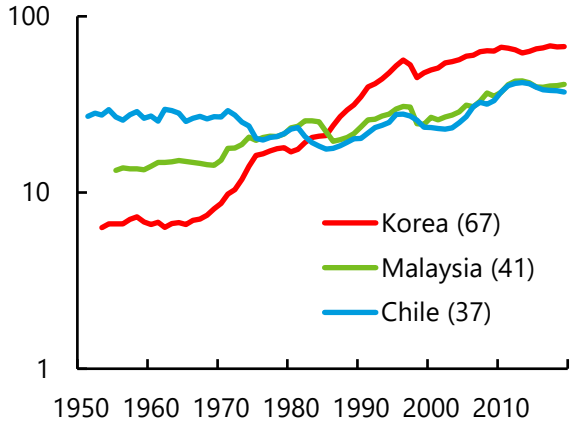
- **Malaysia**. It still exports hydrocarbon, but also managed to create higher value-added exports and growth. Its economic complexity did not rise as much as Korea’s. Its average annual growth rate was 6 percent over the US, which was strong, but not as strong as Korea’s. This case is called as “leapfrog”. So, what did Malaysia do well to grow that fast? What did Malaysia do less well?

- **Chile**. Its main exports currently include copper, and agricultural products. Its economic complexity stagnated. Its average annual growth rate was 4.5 percent over the US. Why is that Chile's growth did not take off as much?

Text Figure 5. Selected Country Cases of Economic Growth

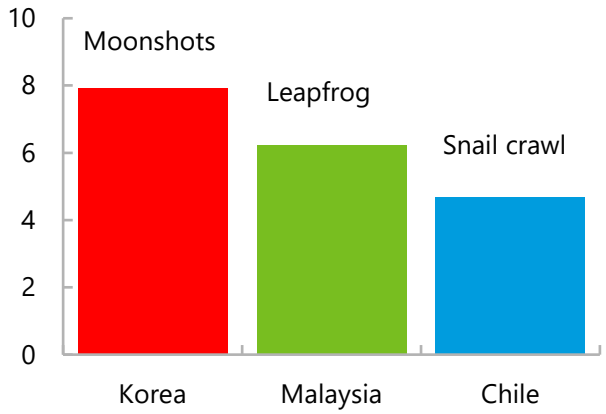
Korea, Malaysia, and Chile have delivered strong economic growth over the past decades...

Per-Capita Real GDP over U.S.[1/]
(Percent of U.S. in log, 2017 PPP US$)



… with annual average per-capital growth rates being 4–8 above that of the U.S.

Per-Capita Real GDP Growth over U.S.
(Percent, year on year, average over 1965-2019)



Sources: Penn World Table and IMF staff calculations.
1/ 2019 values in parentheses.

10. In the following sections, we take a closer look at Korea' case, draw key lessons for Qatar also from experiences of Malaysia and Chile, and discuss policy priorities. Korea's case (Section E) provides a strong narrative as to how reaching for complex products beyond comparative advantage supported by the right policies (Section F) could boost economic complexity and growth potential to the extent that not many had expected ex-ante. This and experiences of Malaysia and Chile provide important insights for policy priorities for Qatar (Section G) whose export diversification opportunities are relatively "distant", even when compared with Malaysia, which relies on expatriate workers and exports commodities and has greater similarity than Korea with Qatar.

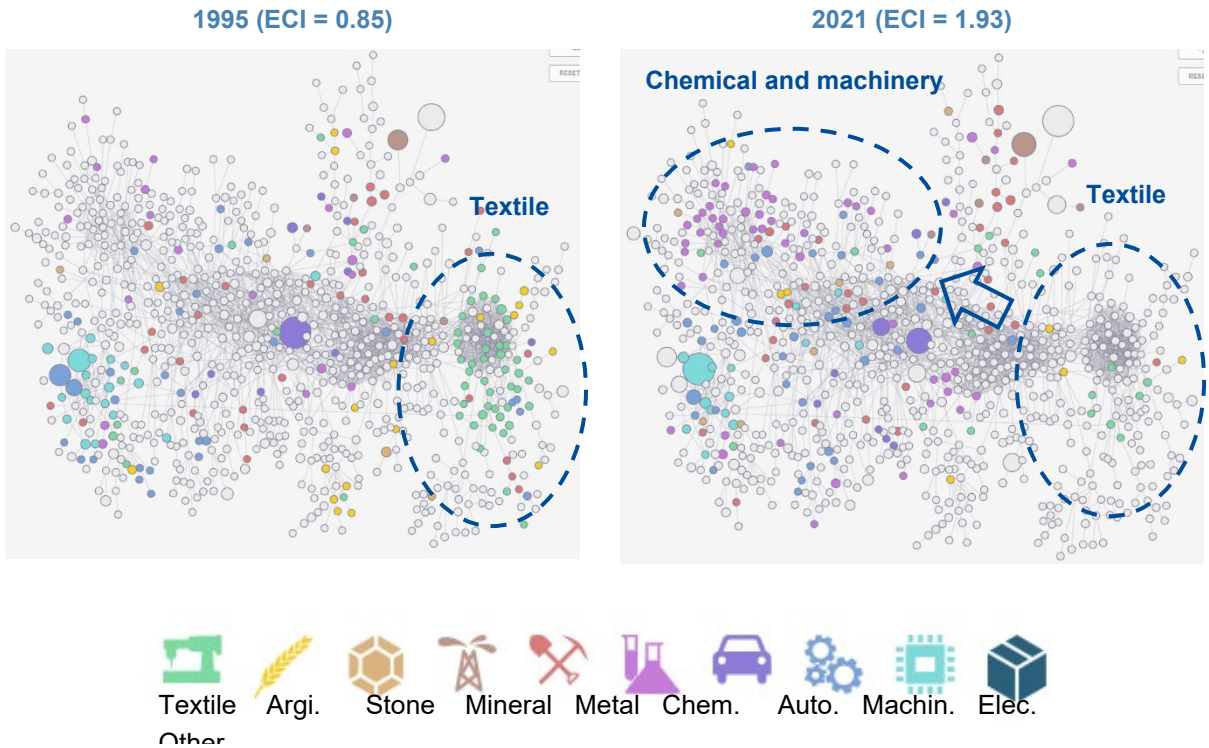
E. Closer Look at Korea's Goods Export Diversification

11. Korea journey of export diversification into more complex products is analyzed relying on the Atlas of Economic Complexity. The "*product space*" shows how Korea's export mix evolved over time, and the "*feasible opportunities*" helps analyze the direction of export diversification. The data go back to 1995 and excludes the earlier period of acceleration in per-capita income growth.

Text Figure 6. Increasing Complexity of Korea's Product Space [1/]

Korea's export mix shifted away, for instnace, from textile (lower complexity)…

…to chamical and machinery (higher complexity).



Sources: Atlas of Economic Complexity and IMF staff.

1/ Goods exports. ECI = economic complexity index. Total goods trade rose from $150 billion in 1995 to $803 billion in 2021.

12. Korea's product space became more complex from 1995 to 2021 (Figure 6).

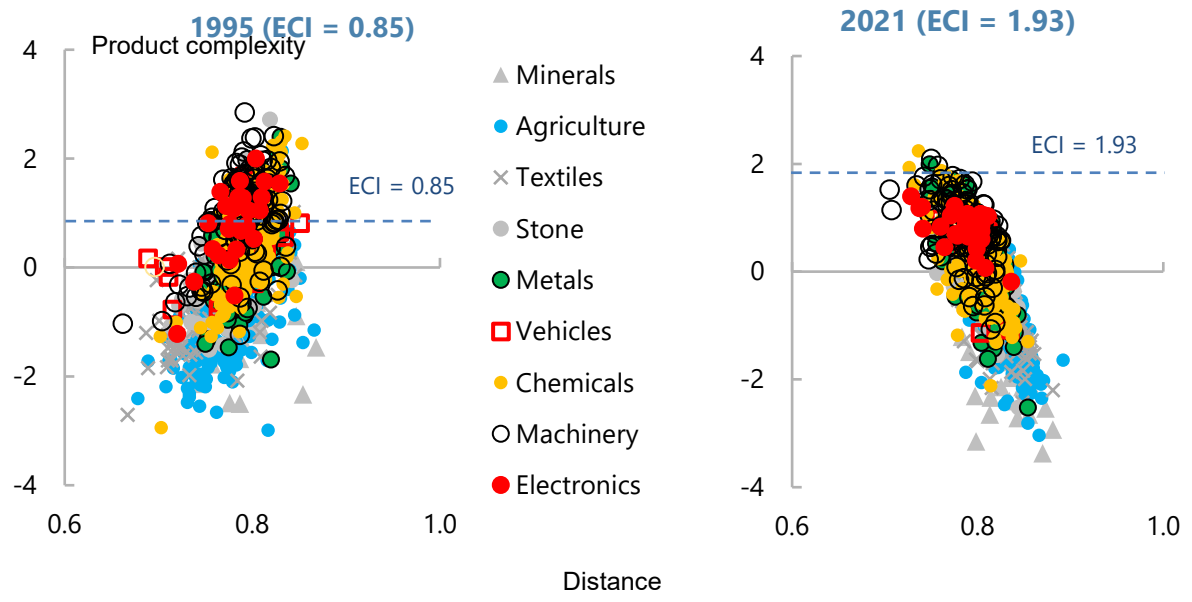
- **In Figure 6, the little circles represent several hundreds of key export products by all countries.** The circles are colored when Korea exported the goods. The size of each circle represents the relative amount traded globally and therefore change from 1995 to 2021. The distance between two circles represents similarity in production capabilities—circles next to each other share similar capabilities to produce them, therefore easier to diversify into. The distance, or ease of diversification, is measured by the probability of a country producing two particular products based on actual trade data over decades across all countries.

- **Korea's export mix was focused more on products with lower complexity**, such as textile and agriculture on the right, in 1995. By 2021, the nation's export mix moved away into products with higher complexity, such as electronics and machinery on the left. At the same time, Korea's economic complexity more than doubled from 0.9 in 1995 to 1.9 in 2021. On would conjecture that back in 1995 Korea could diversify into lower complexity products more easily, while in 2021, diversifying into more complex products become easier.

Text Figure 7. Korea's Goods Exports Diversification Opportunities [1/]

For Korea, export diversification to products with lower compelxity was "easier" in 1995…

…while diversification to products with higher complexity became "easier" in 2021.



Sources: Atlas of Economic Complexity and IMF staff.

1/ ECI = economic complexity index. Total goods trade rose from $150 billion in 1995 to $803 billion in 2021.

13. Korea's feasible opportunities suggest that the country's capabilities to diversify into more complex goods have increased over time (Figure 7). This puts Korea in a favorable position where it is easier to expand into higher value-added products.

- **In the figure, the horizontal axis shows the distance, measuring ease of diversification.** Empirically the minimum value is around 0.4-0.5 (e.g., for Germany) and the shortest distance of around 0.7 for Korea is relatively short. The vertical axis represents each product's complexity—product complexity rises from textile and agriculture to electronics and machinery.

- **In 1995, when Korea's economic complexity was still not as high, low complexity products (textile, agriculture) were easier to diversify into and less distant, more complex products (electrical, machinery) were less easy to diversify into and more distant.** Thus, the feasible opportunity was tilted to the right. Fast forward to 2021, as Korea's economic complexity rose (the broken horizontal line moved up), more complex products because less distant than less complex products. The dots were tilted to the left. The existing product mix, thus know-how and production capabilities were more conducive to diversify into electronics and machinery.

F. Key Lessons for Qatar

14. Cross-country experiences highlight the importance of human capital and high value-added manufacturing exports, while leveraging existing comparative advantage.

- **Human capital.** Korea invested in human capital development through general, vocational education, and health care. Malaysia crated the Human Resources Development Fund and programs to study abroad which were extensively used. Given the importance of foreign workers, albeit at a smaller scale than in Qatar, Malaysia put in place policies to attract and retain skilled workers. For instance, a government agency (TalentCorp) implemented programs including a 10-year renewable visa for highly skilled expatriate workers.

- **TIP/economic zones.** In Korea, strict accountability was required for receiving government support. Intense competition domestically and abroad amid pressure to export created conditions for extensive productivity improvements. Local technology creation helped build comparative advantages (over several decades). Malaysia put strong emphasis on technology transfers, upgrades, and international competition. Multinational corporations (MNC) supported export sophistication, but some believe that technology diffusion was not extensive in Malaysia partly as MNC were "not keen" on sharing technology with local partners. Also, linkages of FDI and free trade zones with the broader onshore economy were not very strong (Cherif and Hasanov, 2015). Malaysia was less successful in developing comparative advantage in high value-added goods.

- **Services.** Some services exports can bolster the non-hydrocarbon economy but would not generate sustained productivity and therefore growth gains (e.g., tourism). Others can play a more significant role in the longer run, including to support high value-added manufacturing exports (e.g., logistics, transportation). Highly productive services, such as modern tradable services (telecommunications, logistics and delivery, and financial services) reduce transaction costs, provide infrastructure for digital transactions, and elevate growth potential, especially when supported by competition-enhancing policies (IMF, 2024b). Chile's diversification strategy focusing mainly on agriculture worked as intended but the long-term growth dividends are more limited.[6] In Qatar, where visitor arrivals have risen structurally, tourism can leverage existing high-quality infrastructure and make the country more attractive to high-skilled expatriate workers but does not obviate the need to diversify into more complex manufacturing and service exports to durably lift growth potential. The existing logistics infrastructure would support manufacturing exports.

G. Policy Priorities for Qatar

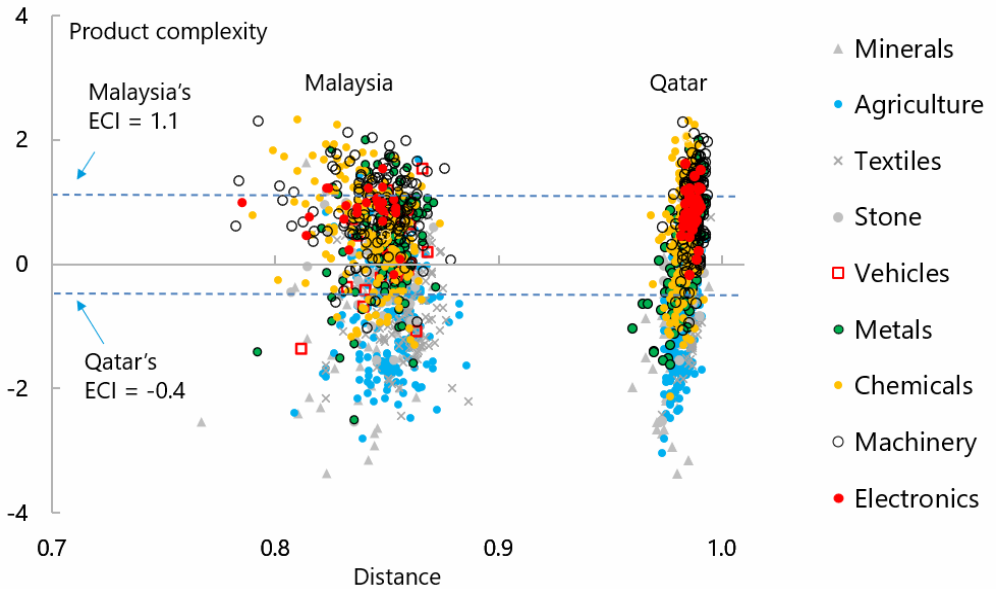
15. To diversify goods exports, Qatar could consider products with higher complexity (Figure 8). Malaysia's feasible opportunities plotted for comparison are less distant than Qatar's from own export mix, and somewhat tilted to the left, that is, diversifying into products with higher complexity is in some cases easier than those with lower complexity. By contrast, the opportunities to diversify goods exports for Qatar are relatively distant, close to 1 (the maximum in the framework). NDS3 focuses on downstream products from hydrocarbon, such as petrochemical (a "Snail crawl" or at most "Leapfrog" type of strategy). However, given most products are similarly distanced, suggesting that efforts required are similarly significant, reaching for products with higher complexity (akin to "Moonshots") would generate greater productivity and growth gains. In doing so one important consideration is complementarity—given Qatar's comparative advantage in logistics

[6] Lebdioui (2019) discusses how this comparative advantage in agriculture was the outcome of proactive export diversification policy rather than free-market policy.

and connectivity through seaports and airports, sectors that can leverage them could deliver greater gains. Regionally, diversifying into sectors that are somewhat different from, or those that complement those targeted by other GCC countries could generate greater gains.

Text Figure 8. Malaysia and Qatar: Feasible Goods Export Opportunities, 2021 [1/]

For Qatar, export diversification to any goods would require extensive efforts.



Sources: Atlas of Economic Complexity and IMF staff.
1/ ECI = economic complexity index.

16. Export diversification to complex products would call for intensifying reforms in key areas. It would involve fostering human capital, FDI, and competitive environment (Figure 9).

- **Human capital.** Qatar has made progress in enhancing education attainment but has further room to enhance human capital especially when compared with the high level of top-notch physical capital. Korea and Malaysia's prominent success hinged on strong fucus on human capital building, and their more aggressive diversification strategies that allowed to leverage high level of human capital. Given expatriate workers represent the large share of total labor in Qatar, measures to attract and retained skilled expatriate workers should be intensified, similar to Malaysia' case.

- **FDI**. In Qatar, FDI in non-hydrocarbon economy is low overall even though inflows in high value-added sectors, such as Chemicals and ICT, are rising. Intensifying effort to boost financial depth, human capital, institution, and labor market flexibility would continue to attract FDI (Yu and Walsh, 2010). In addition, Qatar has put strong emphasis on public-private partnership (PPP) to attract FDI—PPP needs to be mindful of fiscal risk. To leverage the impact of FDI, maximizing domestic spillovers is key, as we saw in Malaysia's case. Building local technology, even though over several decades, contributed Korea's success (also see UNCTAD, 2003; Javorcik et al., 2018). To this end, Qatar's patent application started to increase rapidly and a boost to R&D spending could continue the strong trend.

- **Competitive environment.** Qatar's manufacturing exports are relatively low and may be below potential, leaving a significant upside to grow. Reducing the state's footprint, further upgrading regulatory environment, and ensuring level playing field would facilitate private investment and help Qatar boost production of more complex products. Intense competition domestically and abroad amid pressure to export underpinned Korea success in export diversification to complex products. Meanwhile, Qatar's conditions for trade are favorable, with many trade and other agreements, and generally low trade barriers. Further fostering trade diversification would involve reducing remaining tariff and non-tariff barriers, exploring new trade corridors (Middle Corridor from China to Europe; India-Middle East-Europe Corridor), and investments in the digital economy.

17. Horizontal policies discussed above could be complemented by vertical policies, as appropriate. Vertical policies target specific sectors or industries. Such policies may be justified in the presence of well-identified externalities, coordination failures or under-provision of public input. Using such policies should be mindful of several DOs and DO NOTs (IMF, 2024a):

- **DOs**. Vertical polices should be targeted, time-bound, cost-effective, transparent, and deliver on objectives. Social goals should be clearly identified (e.g., emission reductions). Domestic knowledge spillovers from innovation in targeted sectors should be strong. Sufficient administrative capacity should be in place. Proper cost-benefit analysis and impact evaluation, together with strict exit criteria, claw-back mechanisms, and sunset clauses, would help minimize risks and phase out policies as needed. Importantly, such targeted interventions should not be a substitute for broad-based structural reforms, which should continue to be rolled out.

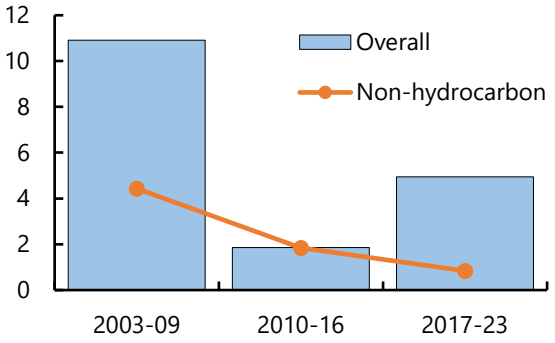
- **DO NOTs**. Vertical policies should avoid creating negative effects on macroeconomic, fiscal, and external sustainability. They should not generate negative cross-border spillovers, including harming trading partners, or violating international commitments.

Text Figure 9. Qatar: Catalysts of Export Diversification and Growth [1/]

Annual FDI commitments to non-hydrocarbon sectors represent small shares of total…

Annual FDI Commitments by Sector

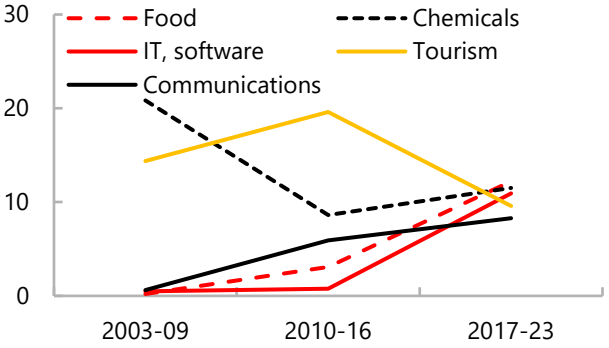
(US$ billions, period average)



…but sectors with higher complexity are gaining in importance as a share of total non-hydrocarbon.

Annual FDI Commitments by Industry

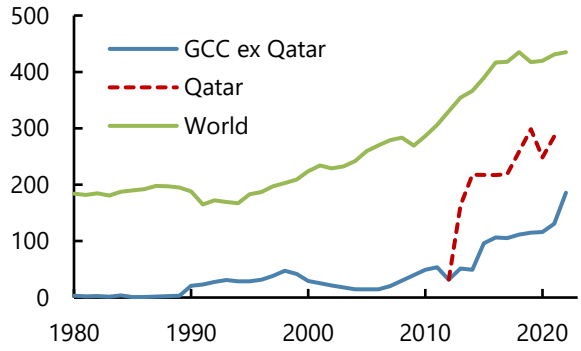
(Period average, percent of total non-hydrocarbon)



Qatar's patent applications jumped in the last decade…

Total Patent Applications

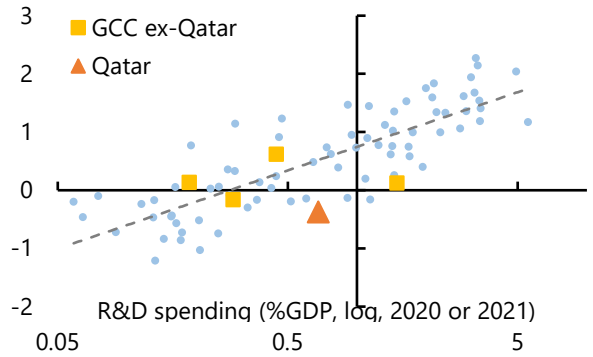
(Per one million population)



…which can continue rising as Qatar is set to boost R&D spending.

R&D Spending and Economic Complexity

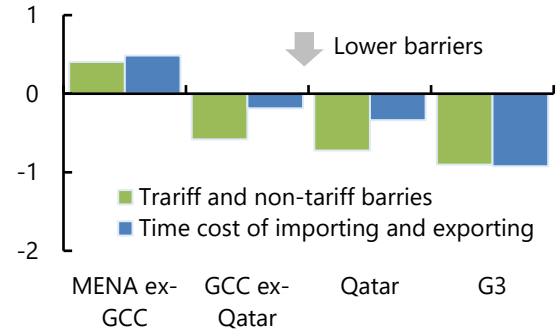
(Economic complexity index, 2021)



Trade barriers are relatively low in Qatar…

Indicators of Trade Barriers, 2021

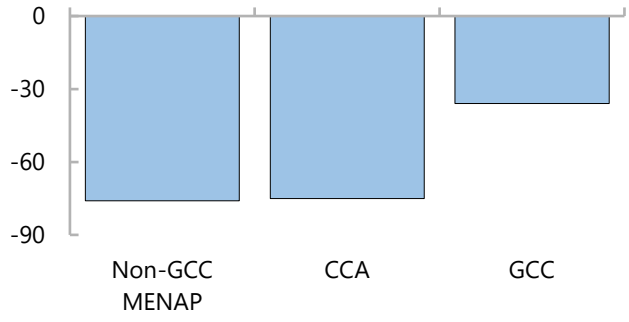
(Deviation from 165 country-mean in standard deviation)



…while IMF's internal analysis suggests room to boost manufacturing exports for the GCC, potentaily for Qatar.

Estimated Manufacturing Export Gaps

(Percent of potential)



Sources: FDI intelligence and IMF staff. The World Intellectual Property Organization, WDI, Fraser Institute Economic Freedom of the World, and IMF staff. The World Intellectual Property Organization, WDI.

1/ Non-hydrocarbon excludes "coal, oil, and gas."

H. Concluding Remarks

18. Empirical analysis and experience from other countries provides lessons Qatar could consider in implementing NDS3. Growth potential could be boosted by building a knowledge-based economy with a focus on enhancing export diversification into higher technology manufacturing products. To achieve this, Qatar could go beyond sectors where it already has comparative advantages by focusing more on developing sectors with high complexity. A strong focus on attracting and developing human capital, technology, private sector investment into high value-added non-hydrocarbon activities, and competitive environment are the key ingredients for a success. The role of services needs to be carefully assessed to leverage them the most to support high value-added manufacturing exports and long-term growth potential. Benefits from vertical policies to complement horizontal policies need to be carefully weighed against a range of pitfalls.

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Annex I. Table 1. Qatar: Determinants of Mid and High-tech Exports 1/

	Pooled	Fixed effects					Random effects				
Model #	1	2	3	4	5	6	5	6	7	8	9
Economic complexity index	1.374***	0.840***	0.723***	0.869***	0.807***	0.764***	1.017***	0.918***	1.010***	1.028***	0.946***
Physical capital	...	...	0.091	...	...	-0.128	...	0.085	...	...	-0.05
Human capital	...	...	...	0.323***	...	0.320**	...	...	0.259***	...	0.289***
Employment to population	...	...	...	...	1.758***	0.549	...	...	...	0.599	-0.405
Constant	1.880***	2.011***	2.042***	1.132***	1.281***	1.080***	1.960***	1.969***	1.261***	1.705***	1.436***
Number of observations	2,080	2,080	1,880	1,960	2,080	1,760	2,080	1,880	1,960	2,080	1,760
R-squared	0.622	0.088	0.077	0.100	0.094	0.086	...	...	...	...	...

Source: Atlas of Economic Complexity, Economic Diversification Index (EDI), Observatory of Economic Complexity (OEC), Penn World Table 10 (PWT10), and IMF staff.

1/ *, **, and *** signify statistical significance at the 15, 5, and 1 percent levels. Dependent variable is mid and high-tech exports as a share of total goods exports in logarithm, from EDI. Economic complexity index from OEC up to 1995 and the Atlas from 1995 and rebased as needed to chain the data from the two sources. PWT10 data for capital stock (constant 2017 national prices, in US$, variable name rkna), human capital (index of years of schooling and returns to education, variable name hc), real output, population, and employment. Annual data spanning 1960–2019 for a panel of 133 countries. Hausmann tests reject random effects.

Annex I. Table 2. Qatar: Determinants of Per-capita Real Income 1/

	Pooled	Fixed effects			Random effects		
Model #	1	2	3	4	5	6	7
Economic complexity index	0.714***	0.134***	0.098***	-0.103	0.328***	0.141***	-0.069
Physical capital	...	...	0.710***	0.671***	...	0.618***	0.587***
Human capital	...	...	0.574***	0.558***	...	0.630***	0.609***
Employment to population	...	...	0.893***	0.936***	...	1.015***	1.030***
Interaction terms							
Economic complexity x physical capital	...	...	...	0.119**	...	...	0.122**
Economic complexity x human capital	...	...	...	0.068*	...	...	0.069*
Constant	8.861***	8.896***	7.080***	7.080***	8.897***	6.896***	6.916***
Number of observations	1,316	1,316	1,037	1,037	1,316	1,037	1,037
R-squared	0.362	0.006	0.673	0.685	...	...	...

Source: Atlas of Economic Complexity, Observatory of Economic Complexity (OEC), Penn World Table 10 (PWT10), and IMF staff.
1/ *, **, and *** signify statistical significance at the 15, 5, and 1 percent levels. Economic complexity index from OEC up to 1995 and the Atlas from 1995 and rebased as needed to chain the data from the two sources. PWT10 data for capital stock (constant 2017 national prices, in US$, variable name rkna), human capital (index of years of schooling and returns to education, variable name hc), real output, population, and employment. Panel of 133 countries for non-overlapping 5-year averages, that is, 1960-64, 1965-1969, …, 2010-19. Hausmann tests reject random effects.