UNITED ARAB EMIRATES

SELECTED ISSUES

June 2023

This Selected Issues paper on United Arab Emirates was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on January 10, 2023.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
PO Box 92780 • Washington, D.C. 20090
Telephone: (202) 623-7430 • Fax: (202) 623-7201
E-mail: publications@imf.org   Web: http://www.imf.org
Price: $18.00 per printed copy

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

UNITED ARAB EMIRATES

SELECTED ISSUES

January 10, 2023

Approved By
Middle East and Central Asia Department

Prepared by Yevgeniya Korniyenko, Nadia Mounir, Dorothy Nampewo, and Charlotte Sandoz

UAE REFORMS FOR MORE PRODUCTIVE AND GREENER GROWTH

Executive Summary

Since the GFC, the marginal productivity of investment in the UAE has declined along with total factor productivity (TFP) and employment growth. The impacts from the COVID-19 crisis have reinforced these trends.[1]

To reverse this path, the UAE government has embarked on an ambitious reform strategy under the umbrella of UAE 2050 Strategy and Climate Neutrality Goal by 2050. Reform efforts have been undertaken to boost trade and FDI, further modernize labor markets, and increase digitalization and investments into green and sustainable initiatives to facilitate growth, energy transition, and diversification of the UAE non-oil sector. These efforts and ongoing climate initiatives are commendable and should be sustained to ensure the UAE's resilience to long-term vulnerabilities from global risks and decarbonization efforts. However, it is crucial to understand the potential gains and complementary benefits from various reforms and investments to ensure their efficient sequencing and prioritization.

This paper aims to quantify the potential long-term growth and productivity gains from ongoing structural reform efforts. The work is based on the IMF's Flexible System of Global Models (FSGM), Factor Augmented Vector Autoregressive (FAVAR), DIGNAR-19 model, and scenario analysis. The main conclusion is that ongoing reform efforts, as detailed in the IMF Article IV Reports in 2021-22, could boost long-term non-hydrocarbon growth by around 4 percent above the projected baseline while allowing the UAE to achieve its Net Zero, digitalization, and sustainability objectives. Importantly, this result depends on fully harnessing the potential productivity and growth gains from evolving economic partnerships, achieving planned ICT investment outcomes, and fully implementing planned green investments. Facilitating green and sustainable private finance would reduce the direct fiscal burdens of investment needs and help promote a smooth transition to a lower carbon future. The paper is organized into three chapters:

Chapter 1. Quantifying gains from trade liberalization. The UAE has recently signed or started negotiations for Comprehensive Economic Partnership Agreements (CEPAs) with eleven countries. Depending on the UAE's ability to further attract FDI, the reduction of tariffs, especially on intermediate inputs, can significantly lift long-term growth through stronger competition, access to a higher number of varieties and quality of inputs, and transfer of technology. Results indicate significant medium-term gains from ongoing CEPAs, ranging from 0.25 to 2.0 percent for total factor productivity and 0.3 to 2.1 percent for the level of real GDP, with the range depending on the attractiveness of the UAE's FDI environment. Given the FDI restrictiveness index estimated for the

---

[1] For details see UAE 2021 Selected Issues Paper on "Fostering UAE Productivity Growth After COVID."

UAE, gains from the reduction of tariffs on intermediate inputs are assessed to be closer to the lower end of these ranges.

Chapter 2. Assessing the impact of ICT investments on growth. Digitalization can have a significant multiplier effect on economic growth. The UAE's Digital Economy strategy aims to double the contribution of the digital economy to non-oil GDP to 20 percent by 2031 by adopting digitalization across both the public and private sectors. This should increase efficiency in factor markets and ease the delivery of services in the public sector. Model results show a large multiplier of 1.8 for ICT investments on non-oil GDP (about double the impact of non-ICT spending), underscoring the potential for significant positive effects of ICT investments to support economic diversification. Investment multipliers are negligible in the oil sector.

Chapter 3. Growing Green and Sustainable. As the global economy seeks to decarbonize, the UAE faces twin challenges of reducing its reliance on hydrocarbon activity and adapting its economy and policy frameworks to climate risks. In line with global decarbonization efforts, the UAE announced a set of structural reforms and green investments to reduce its emissions and energy intensity, while diversifying away from fossil fuels. Using the IMF's DIGNAR model (Aligishiev, Melina, and Zanna, 2021) we show that the combination of green investments and the full implementation of reforms under the 2050 Strategies could almost double potential long-term non-oil GDP growth. Despite the UAE's agile approach to the energy transition, the costs are large, and the implementation need is urgent. Therefore, developing and scaling up private green and sustainable finance, as well as creating an enabling environment for smooth energy transition, would reduce direct fiscal costs, increase efficiency of green investments, and preserve public financial wealth while delivering on growth and Net Zero ambitions.
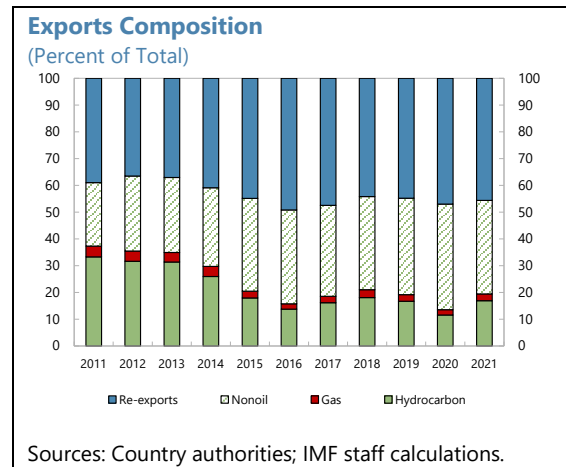
QUANTIFYING GAINS FROM TRADE LIBERALIZATION[1]

As part of the ambitious reform agenda of the "Projects of the 50'" to promote economic diversification and sustainable growth, the UAE has recently signed or started negotiations for CEPAs with 11 key partners. Depending on the UAE's ability to further attract FDI, the reduction of tariffs especially on intermediate inputs can significantly lift long-term GDP through stronger competition, access to higher number of varieties and quality of inputs, and transfer of technology. Results indicate significant medium-term gains, ranging from 0.25 to 2.0 percent for total factor productivity and 0.3 to 2.1 percent for the level of real GDP, with the range depending on the attractiveness of the UAE's FDI environment. Given the FDI restrictiveness index estimated for the UAE, we assess the gains to be closer to the lower end of the range.

A. Introduction

1.   The UAE is establishing various agreements in economic, trade, investment, and technical fields with key economic partners as part of the ambitious reform agenda of the "Projects of the 50'". The overall objective is to boost the country's integration in the global value chains, expand employment of nationals in the private sector, and incentivize advanced technology creation and adoption. Gains are potentially large, including from trade liberalization.

2.   Over the past decades, the UAE has been open to trade, but less to foreign direct investment (FDI), until recently. The share of non-oil exports in total exports has doubled over the past 20 years (Text Figure). The robust non-oil trade expansion has been supported by relatively low tariffs and non-tariff barriers on goods. The UAE is part of three free trade zones cooperating with 19 countries.[2] In 2019, the aggregate tariffs weighted by partner imports was 3.20 percent. While FDI inflows remained constant around 0.6 percent of global inflows before the COVID crisis, they have started to pick up lately to reach about 1.5 percent of global inflows (about USD 21 billion, 5 percent of GDP) in 2021, supported by recent policy measures taken to ease restrictions on foreign ownership of businesses (Table 1).

Exports Composition
(Percent of Total)

Re-exports   Nonoil   Gas   Hydrocarbon

Sources: Country authorities; IMF staff calculations.

---

[1] Prepared by Nadia Mounir and Charlotte Sandoz.

[2] The UAE joint the EFTA with Liechtenstein, the Kingdom of Norway and the Swiss Confederation; the GCC with the Kingdom of Bahrain, the Kingdom of Saudi Arabia, the Sultanate of Oman, the State of Qatar and the State of Kuwait; and the League of Arab States (GATFA) with Algeria, Bahrain, Egypt, Iraq, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen.

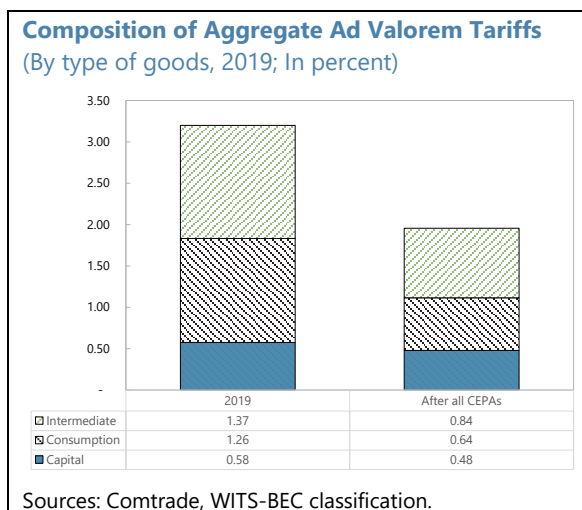### Table 1. United Arab Emirates: FDI Inflows as a Share of Global FDI Flows

	2000 - 2009		2010 - 2012		2013 - 2015		2016 - 2018		2019 - 2021	
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
Bahrain	0.09	84	0.04	118	0.12	69	0.06	88	0.11	82
Kuwait	0.01	147	0.16	67	0.06	97	0.02	131	0.01	145
Oman	0.08	87	0.10	84	0.03	118	0.22	49	0.27	52
Qatar	0.21	60	0.14	75	0.02	131	-0.01	205	-0.16	208
Saudi Arabia	1.00	23	1.31	22	0.52	37	0.26	48	0.73	34
United Arab Emirates	0.56	37	0.58	39	0.62	31	0.59	32	1.45	19
Canada	3.26	8	2.48	13	3.70	8	1.88	15	3.30	10
Indonesia	0.21	61	1.16	24	1.22	23	0.88	23	1.55	18

Source: UNCTAD, FDI/MNE database (https://unctad.org/fdistatistics); IMF staff calculations

3.   As part of the ongoing ambitious reform agenda, the UAE has recently signed or started negotiations for CEPAs with 11 key partners. The first agreement was signed with India in February 2022. It was the UAE's first CEPA with any country and India's first Free Trade Agreement (FTA) in a decade.[3] It means no tariffs on nearly 80 percent of goods, easier access to markets for trade and investment, new opportunities in sectors such as aviation, environment, hospitality, logistics, building and construction, financial services, and digital trade. The UAE also signed CEPAs with Indonesia and Israel, and has initiated negotiation with Australia, Georgia, Kenya, Philippines, South Korea, Turkey, Ukraine, Uzbekistan. Those 11 CEPA-related countries represented about 15 percent of UAE total imports in 2019 (Text Figure). If there are no tariffs after signing CEPA with those 11 countries, aggregate tariffs will be reduced by 0.5 ppt for intermediate inputs, 0.6 ppt for consumption goods and 0.1 ppt for capital goods (Text Figure).
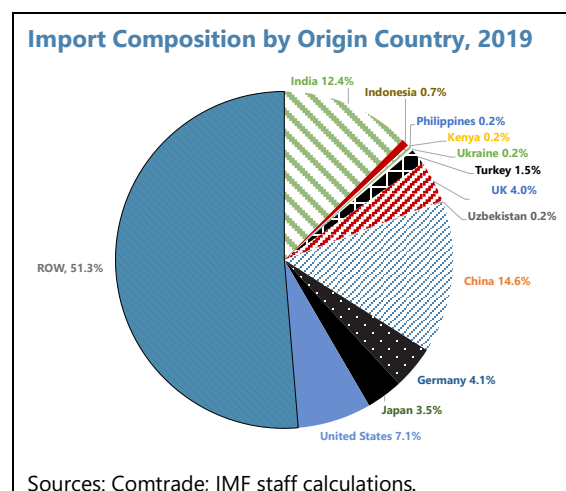
4.   Significant gains are expected from these free trade agreements but their materialization depends on the UAE's ability to attract complementary FDI. The UAE authorities are expecting that the removal of tariffs between the UAE and India would increase bilateral non-oil

Import Composition by Origin Country, 2019

India 12.4%, Indonesia 0.7%, Philippines 0.2%, Kenya 0.2%, Ukraine 0.2%, Turkey 1.5%, UK 4.0%, Uzbekistan 0.2%, China 14.6%, Germany 4.1%, Japan 3.5%, United States 7.1%, ROW, 51.3%

Sources: Comtrade; IMF staff calculations.

Composition of Aggregate Ad Valorem Tariffs
(By type of goods, 2019; In percent)

	2019	After all CEPAs
Intermediate	1.37	0.84
Consumption	1.26	0.64
Capital	0.58	0.48

Sources: Comtrade, WITS-BEC classification.

---

[3] While a traditional FTA focuses mainly on goods, a CEPA is more ambitious in terms of regulatory aspects and has a holistic coverage of areas like services, investment, IPR, government procurement, disputes etc.

trade flows by 65 percent to reach USD100 billion over a 5-year period, based on the Global Trade Analysis Project model developed by the UAE authorities. Similar gains are expected from other CEPAs. Results from the IMF FSGM model suggests significant gains in terms of total factor productivity (0.25 to 2.0 percent) and real GDP (0.3 to 2.1 percent), with the range depending on the FDI environment as shown in empirical studies in trade literature (described in the next section). Given the FDI restrictiveness index estimated for the UAE, we assess the gains to be closer to the lower end of the range.

5.   The UAE has substantially reduced restrictions on FDI in its latest set of reforms, but continued efforts are needed to enhance competitiveness. In September 2021, the UAE took further steps towards FDI liberalization by introducing a new commercial companies' law that codified past changes to foreign investment and ownership requirements**.**[4] These were significantly relaxed in the 2020 Commercial Companies Law, which removed a longstanding requirement for onshore local companies to be 51 percent owned by UAE nationals.[5] The recent changes follow from the 2018 "FDI Law" which represented an initial shift away from strict foreign ownership restrictions by opening certain activities, as dictated by a "Positive List", to 100 percent foreign ownership through an approval process.[6] Following the OECD methodology, we estimate a FDI restrictiveness index for the UAE. The results show significant enhancement of the FDI environment with the index improving from around 0.7 in 2018 to around 0.12 in 2021. However, the UAE is still far from the best practices compared to OECD countries and other emerging market economies. It remains closer to the 70th percentile of the index distribution in terms of regulatory restrictions. Continued efforts and additional incentives might be needed to keep the UAE in step with its peers and remain comparatively attractive for FDI inflows.

B. Potentially Large Economic Gains from Trade Openness

6.   CEPA agreements are expected to achieve economic benefits for the UAE through the cancellation of customs tariffs leading to stronger competition, access to a higher number of varieties and quality of inputs, and transfer of technology. Lower output tariffs can increase productivity by inducing tougher competition in the domestic market, whereas cheaper imported inputs can raise productivity via learning, variety, and quality effects. Amiti and Koning (2007) show

---

[4] Federal Decree Law No. 32 of 2021 concerning Commercial Companies Law (CCL 2021) was issued on September 20, 2021 and came into effect on January 2, 2022, repealing the Federal Decree Law No. 2 of 2015 and its amendments (CCL 2020). Federal Decree Law No. 26 of 2020 was issued on September 27, 2020, introducing significant amendments to the Federal Decree Law No. 2 of 2015 (CCL) and repealing Federal Law No. 19 pf 2018 (FDI Law). Published in the Official Gazette. https://dlp.dubai.gov.ae/en/Pages/OfficialGazette.aspx

[5] Companies engaged in activities that are considered to have a "strategic impact" remain subject to a certain licensing process and some ownership restrictions. Cabinet Decision No. 55/2021 Concerning the Determination of the List of Strategic Impact Activities was issued on May 30, 2021.

[6]Limitations on foreign ownership were still imposed on certain economic sectors included in a "Negative List". In September 2018, the Cabinet issued the Federal Decree Law No 19 of 2018 regarding foreign direct investment ("FDI Law"). Later in early 2020, the UAE Cabinet issued Resolution No. 16 of 2020 concerning the determination of the Positive List of economic sectors and activities eligible for FDI and percentage of their ownership. https://www.gccfintax.com/files/21363226_cabinet_resolution_no_16_of_2020.pdf

for Indonesia that productivity gains from reducing tariffs on intermediate goods are at least twice as high as from reducing output tariffs. Topalova and Khandelwal (2011) also finds a larger effect of input tariffs on firm-level productivity and observes complementarities between trade liberalization and additional industrial policy reforms in India.

ECI in UAE, CEPA-related Countries, US and China, 2020
(Less complex, lower ranking)

Sources: Observatory of Economic Complexity (OEC).

7. **For instance, the economic complexity index (ECI) of UAE is relatively weak compared to the 11 CEPA-related partner countries, and the UAE could benefit from their knowledge and know-how to raise its aggregate productivity.** ECI measures the knowledge and technological density of a particular economy by studying the level of knowledge concentration in exported products. Countries that can sustain a diverse range of productive know-how, including sophisticated, unique know-how, are found to be able to produce a wide diversity of goods, including complex products that few other countries can make. This means that countries with better knowledge accumulation and more diversified exports

Aggregate TFP Trend Growth Rate
(In percent)

Source: Penn World Table 10.0 and IMF staff calculations.
Note: A Cobb-Douglas production function with constant labor share is used to decompose GDP into labor, capital and TFP and Hodrick-Prescott filter (with a lambda of 300) is applied to estimate trend growth of labor, capital and TFP.

enjoy greater levels of complexity. Despite the clear progress in economic diversification, UAE exports continue to have weak technology content. Countries with CEPAs signed or under discussion with the UAE have higher ECI (Text Figure), and potentially use more complex technologies. Intensifying trade with those countries could lead to technology transfers and boost aggregate productivity that has been on a declining trend over the past twenty years (Text Figure, Korniyenko, 2021).
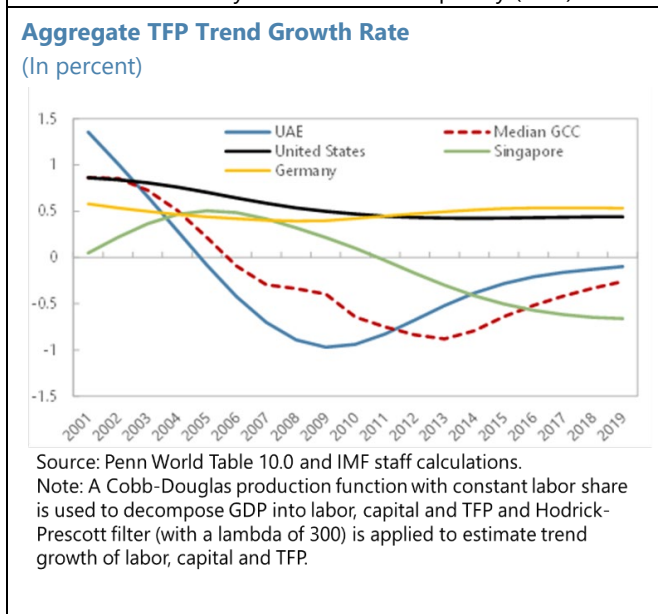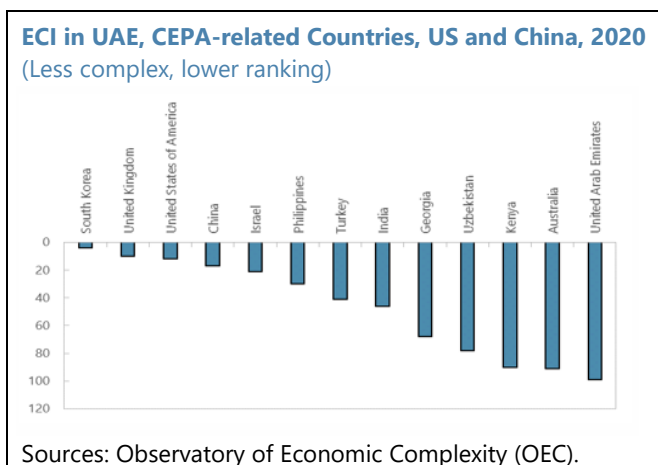
8. **However, productivity gains from trade liberalization can vary substantially depending on the FDI attractiveness of a country, including investor friendly regulations.** The extent that a country benefits, in terms of increased FDI inflows and in turn productivity gains, from relaxing barriers to foreign investments can vary with country-specific elements, but on average benefits from FDI regulatory reforms can be significant. Based on a study of 60 advanced and emerging countries over the period 1997-2016, Mistura and Roulet (2019) estimates an average increase of

2.1 percent in bilateral FDI inward stocks to every 10 percent reduction in FDI restrictiveness.[7] Using panel data for a broad range of countries over two decades, Ahn et al. (2016) finds a dominant role of tariff reduction on intermediate goods in fostering productivity gains and a strong complementarity between trade and FDI liberalization. A similar finding was established in Halpern et al. (2015) using firm-level data for Hungary which showed productivity gains from lower input tariffs doubling with a higher foreign firms' presence. These studies suggest that lower FDI barriers could amplify the productivity gains from tariff liberalization.

C. Methodology

9.   **The macroeconomic gains from trade liberalization are evaluated using the Flexible System of Global Models (FSGM) developed by the IMF Research Department.** Flexible System of Global Models (FSGM) is used to quantify potential gains from UAE trade liberalization from signed as well as under discussion CEPAs. In this analysis, we use the MCDMOD module of FSGM which contains individual blocks for the countries in the Middle East and Central Asia regions, and additional regions to cover the remaining countries in the world. The model is presented in greater detail in Andrle et al. (2015). MCDMOD is an annual, multi-region, forward-looking, model of the global economy combining both micro-founded and reduced-form formulations of economic sectors. Private consumption and investment have microeconomic foundations (OLG and LIQ households; a Tobin's Q model for firms' investment). Trade is pinned down by reduced-form equations. They are a function of a competitiveness indicator (relative prices) and domestic or foreign demand. Supply is determined by an aggregate Cobb Douglas production function. Equilibrium labor is determined by equilibrium rate of unemployment, given the labor force. Consumer price and wage inflation are modeled by forward-looking Phillips' curves. Monetary policy is governed by an interest rate reaction function. Countries are largely distinguished from one another in MCDMOD by their unique parameterizations to reflect policy regime, individual country characteristics, and data availability.

10.   **The UAE's FDI environment is assessed using an in-house proxy indicator of FDI restrictiveness based on the OECD's methodology proposed by Golub (2003) and last updated in Kalinova, et al. (2010).** The degree of FDI restrictiveness is evaluated in four areas: (i) foreign equity restrictions, (ii) screening and prior approval requirements, (iii) restrictions on the employment of foreigners as key personnel, and (iv) operational restrictions, including restrictions on branching, on capital repatriation and on land ownership. The index ranges between 0 and 1 where the higher the score the more restrictive the FDI regulations. We have adopted the same scoring methodology as in Kalinova, et al. (2010) to estimate the recent change in the UAE's FDI restrictiveness following the most recent changes to the Commercial Companies Law.[8]

---

[7] as measured by the OECD's FDI restrictiveness index.

[8] Official national publications and sources, including the respective laws and relevant ministries, were used to identify restrictions on activities of non-residents. This coincides with the OECD's methodology adopted for non-member, non-adhering countries, to the Declaration on International Investment and Multinational Enterprises, Enhanced Engagement, in constructing the FDI restrictiveness index.

Table 2. United Arab Emirates: Scoring Methodology of OECD's FDI Restrictiveness Index 1/

			UAE's Proxy Indicator 2/	
			2018	Present
Measure I:	**Foreign Equity Restrictions**	**Scores**		
	Start-ups and acquisitions			
	No foreign equity allowed	1.0		
	Foreign equity < 50% of total equity	0.5	0.00	0.00
	Foreign equity > 50% but < 100% of total equity	0.25		
	Acquisitions			
	No foreign equity allowed	0.5		
	Foreign equity < 50% of total equity	0.25		
	Foreign equity > 50% but < 100% of total equity	0.125		
Measure II:	**Screening and Prior Approval Requirements** 3/			
	Approval required for new FDI/acquisitions of < USD 100mn or if corresponding to < 50% of total equity	0.2	0.00	0.00
	Approval required for new FDI/acquisitions above USD100mn or if corresponding to > 50% of total equity	0.1		
	Notification with discretionary element	0.025		
Measure III:	**Rules for Key Personnel**			
	Foreign key personnel not permitted	0.1	0.00	0.00
	Economic needs test for employment of foreign key personnel 4/	0.05		
	Time bound limit on employment of foreign key personnel 4/	0.025		
	Nationality/residence requirements for board of directors			
	Majority must be nationals	0.075	0.075	0.00
	At least one must be national	0.02		
Measure IV:	**Other Restrictions on the Operation of Foreign Enterprises**			
	Establishment of branches not allowed/local incorporation required	0.05	0.05	0.00
	Reciprocity requirement	0.1		
	Restrictions on profit/capital repatriation	1 - 0.1		
	Access to local finance	0.05		
	Acquisition of land for business purposes 5/	0.1		
	Land ownership not permitted but leases possible	0.05 - 0.01	0.010	0.010
TOTAL		**Up to 1**	**0.135**	**0.010**

1/ Source: Kalinova et al (2010): OECD's FDI Restrictiveness Index: 2010 Update
2/ UAE's proxy indicator is based on IMF staff estimates following methdology outlined in Kalinova et al (2010)
3/ Excludes reviews of foreign investment based solely on national security grounds.
4/ If both restrictions apply, 0.05 is added to score.
5/ Score scaled by 1/3 when the measure applies only to border and coastal areas and by a factor of 5 for agriculture and forestry.

11.   We estimate the current FDI restrictiveness index to be around 0.12 compared to 0.7 in 2018 (Table 2). This is a significant improvement but in reference to other countries the UAE remains closer to the 70th percentile in terms of regulatory restrictions. In 2020, the OECD average was 0.07 and the global average (based on 85 countries) was about 0.1 (Text Figure).

OECD's FDI Regulatory Restrictiveness Index (2020)[9]

Sources: OECD, IMF staff estimates.

D. Results

Zero Tariffs on Imported Inputs Under CEPAs Only

(Gains in terms of Real GDP, Percent)

- Range for UAE's gains given current FDI environment
- Elimination of tariffs on all imported inputs
- Elimination of tariffs on all imported inputs in an FDI friendly environment

Zero Tariffs on All Imported Inputs

(Gains in terms of Real GDP, Percent)

- Range for UAE's gains given current FDI environment
- Elimination of tariffs on all imported inputs
- Elimination of tariffs on all imported inputs in an FDI friendly environment

Source: FSGM model, staff estimates.

Notes:

- FDI friendly environment is defined as FDI restrictiveness at the 25th percentile of its cross-country distribution based on the OECD FDI restrictiveness index of 2020.
- Include signed agreements with India, Indonesia, and Israel and in-negotiations agreements with Australia, Georgia, Kenya, Philippines, South Korea, Turkey, Ukraine, and Uzbekistan.

12.   As intermediate goods represent a large share of UAE net imports, the 11 ongoing CEPAs could lead to a 0.5 ppt reduction in aggregate tariffs. In 2019, intermediate inputs represented 48 percent of net imports (after excluding imports for re-exports); 15 percent of which were from India and other CEPA-related countries. Aggregate tariffs were at 3.2 percent. Assuming no tariffs on intermediate goods after signing CEPA with 11 countries, the aggregate tariffs will be

---

[9] OECD (2022), FDI restrictiveness (indicator). doi: 10.1787/c176b7fa-en (Accessed on 28 November 2022); UAE index is based on IMF staff estimates

reduced by about 0.5 ppt. If we expand our assumption to zero tariffs on all imported intermediate goods, not just CEPA-related, the aggregate tariffs will be reduced by about 1.4 ppt.

13.   The reduction of tariffs on intermediate inputs following CEPAs can lift medium-term real GDP by 0.2 to 2 percent, depending on the UAE's ability to attract FDI (Text Figure). Using empirical evidence from Amiti and Koening (2007), Topalova and Khandelwal (2011) and Ahn et al. (2016), a reduction of aggregate tariffs by 0.5ppt following the implementation of CEPAs would increase TFP by a range of 0.25 to 2.0 percent – with the range depending on the FDI environment as shown in Ahn et al. (2016). Using the IMF FSGM model, we find that the increase of TFP will lead to a rise of real GDP by a range of 0.3 to 2.1 percent over 7 years. If all tariffs on intermediate inputs are removed, TFP is estimated to increase by a range of 0.7 to 5.6 percent and real GDP by a range of 0.7 to 5.9 percent over 7 years.

14.   Following OEDC methodology to compute the FDI restrictiveness index, gains from trade liberalization in the UAE are estimated to be closer to the lower end of the estimated gains. We define FDI friendly environment as FDI restrictiveness at the 25th percentile of its cross-country distribution based on the OECD FDI restrictiveness index of 2020. We use our proxy for the UAE FDI restrictiveness to reduce the uncertainty around our estimates. For simplification, we assume that gains vary linearly with the FDI environment. Given our assessment of the current FDI environment in the UAE relative to other countries, we estimate the gains from the reduction of tariffs on intermediate inputs to be closer to the lower end of the range (within the shaded area in the graphs).

E. Conclusion

15.   To promote economic integration and widen trade ties, the UAE has signed or started negotiations on CEPAs with key partners which could significantly lift medium-term real GDP. Ongoing CEPAs are expected to achieve significant economic benefits for the UAE and partner countries through the cancellation of customs tariffs, facilitating access to markets and increased competition. Based on empirical literature and the IMF's FSGM model, results indicate significant gains in terms of total factor productivity (0.25 to 2.0 percent) and medium-term real GDP (0.3 to 2.1 percent). Given the FDI restrictiveness index estimated for the UAE, we assess the gains to be closer to the lower end of the range.

16.   An evaluation of behind-the-border barriers to FDI could complement the results highlighted in this note and narrow the uncertainty in assessing gains from trade and FDI liberalization. The FDI index only evaluates regulatory restrictiveness but not the overall business environment which will play a significant role in determining FDI levels that a country can attract. These include the size of a country's market, the extent of its integration with neighboring countries or those it has trade agreements with, which can amplify market access and in turn provide a larger investment opportunity for foreign investors. On the policy and institutional fronts, entry barriers can also arise for several reasons, including the way the FDI regulations are implemented and state ownership in key sectors.

17.   Gains from trade and FDI liberalization would also need to be supported by other reforms, including labor and product market reforms, to fully materialize. The UAE has one of the most favorable business environments in the region and has undertaken substantial reforms to support SME development. Recent reforms to promote private sector growth—including expanding residency permits, supporting private sector employment of nationals, increasing scope for personal choices, and encouraging growth of start-ups—should be fully implemented (Korniyenko, 2021). Enhancing ongoing education system reforms is also needed to ensure more efficient and inclusive investment in education and training in emerging fields to raise human capital and innovation. Legislative initiatives to encourage business dynamism, together with well targeted assistance to the most vulnerable, reforms of unemployment benefits and pension schemes and sufficient social safety nets, including for expatriates, could help attract and retain skilled professionals, further boosting productivity gains.

18.   Gains might be underestimated because of the exclusion of other CEPA provisions and trade in services. In addition to tariffs elimination on goods, the CEPA includes other key provisions that will benefit exporters and importers of goods, as well as service providers. Some of these benefits include further cooperation in relation to the agreement on technical barriers to trade, promotion of trade opportunities for small and medium-sized enterprises, provisions to regulate cross-border trade in services, and agreement on transparency and impartiality on government procurement. Those additional benefits are not included in the analysis but could further lift trade and real GDP, especially from services.

References

Ahn J., C.-G. Park, and C. Park (2016), "Pass-Through of Imported Input Prices to Domestic Producer Prices: Evidence from Sector-Level Data", IMF Working Paper, 2016/023.

Amiti, M., and J. Konings (2007), "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia." American Economic Review, 97 (5): 1611-1638.

Andrle, M., P. Blagrave, P. Espaillat, K. Honjo, B. Hunt, M. Kortelainen, R. Lalonde, D. Laxton, E. Mavroeidi, D. Muir, S. Mursula, and S. Snudden (2015), "The Flexible System of Global Models – FSGM", IMF Working Paper, WP/15/64.

Halpern, L., M. Koren, and A. Szeidl (2015), "Imported Inputs and Productivity." American Economic Review, 105 (12): 3660-3703.

Golub, Stephen S. (2003), "Measures of Restrictions on Inward Foreign Direct Investment for OECD Countries." OECD Economic Studies, No. 36.

Kalinova, B., A. Palerm and S. Thomsen (2010), "OECD's FDI Restrictiveness Index: 2010 Update", OECD Working Papers on International Investment, 2010/03, OECD Publishing.

Korniyenko, Y. (2021), "Fostering UAE Productivity growth after COVID", IMF Selected Issues Paper.

Koyama, T., and S. Golub (2006), "OECD's FDI Regulatory Restrictiveness Index: Revision and extension to more economies", Working Paper on International Investment.

Mistura, F., and C. Roulet, (2019), "The determinants of Foreign Direct Investment: Do statutory restrictions matter?" OECD Working Papers on International Investment 2019/01, OECD Publishing.

Topalova P., and A. Khandelwal (2011), "Trade Liberalization and Firm Productivity: The Case of India", The Review of Economics and Statistics, 93 (3): 995–1009.

ASSESSING THE IMPACT OF ICT INVESTMENTS ON GROWTH[1]

The UAE's Digital Economy strategy aims to double the contribution of the digital economy to non-oil GDP to 20 percent by 2031. The UAE government is taking concrete steps to establish a strong digital economy and has adopted digitalization across both the public and private sectors as a key growth pillar, with the aim also of becoming the regional and global leader in digitalization. Through its potential to increase efficiency in factor markets and easing of the delivery of services in the public sector, digitalization can have significant multiplier effects on economic growth. Results indicate a higher multiplier of ICT investments on non-oil GDP compared to non-ICT investments, indicating the propagation effects of ICT investments in the non-oil sector with a potential to support diversification of the economy.

A. Introduction

1.   Digitalization has gained increased momentum and is changing societies globally. The digitalization of economic activity can be broadly defined as the incorporation of data and the internet into production processes. It also entails new forms of household and government consumption, fixed-capital formation, cross-border flows, and finance (IMF, 2018). The rapid pace of digitalization, which gained increased momentum since the early 2000s, has significant multiplier effects on economic activity, productivity, employment, and other economic outcomes (World Bank, 2016). The digital economy was estimated to contribute 15.5 percent of global GDP by 2016, having achieved growth rates that were more than twice the global GDP growth rate in the preceding decade (Huawei & Oxford Economics, 2017).

2.   The UAE is at the forefront of the digitalization revolution in the GCC (Gulf Cooperation Council) region. With the aim of becoming the regional and global leader in digitalization, the UAE government is taking concrete steps to establish a strong digital economy and has adopted digitalization across both the public and private sectors as a key growth pillar. The creation of a new ecosystem that encourages innovation, investment, and cybersecurity through partnerships between the government and the private sector, together with continued government participation, is expected to accelerate the achievement of these targets.

3.   The UAE aims to increase the contribution of the digital economy, consistent with the Digital Economy Strategy. The recently launched Digital Economy Strategy (DES) aims to anchor the UAE's digitalization agenda. With this strategy, the authorities aim to increase the contribution of the digital economy from 9.8 percent of non-oil GDP in 2022 to around 20 percent by 2031. The strategy focuses on six key areas including (i) digital infrastructure, (ii) unified digital platform, and common digital enablers, (iii) integrated, easy, and fast digital services, (iv) digital capabilities and

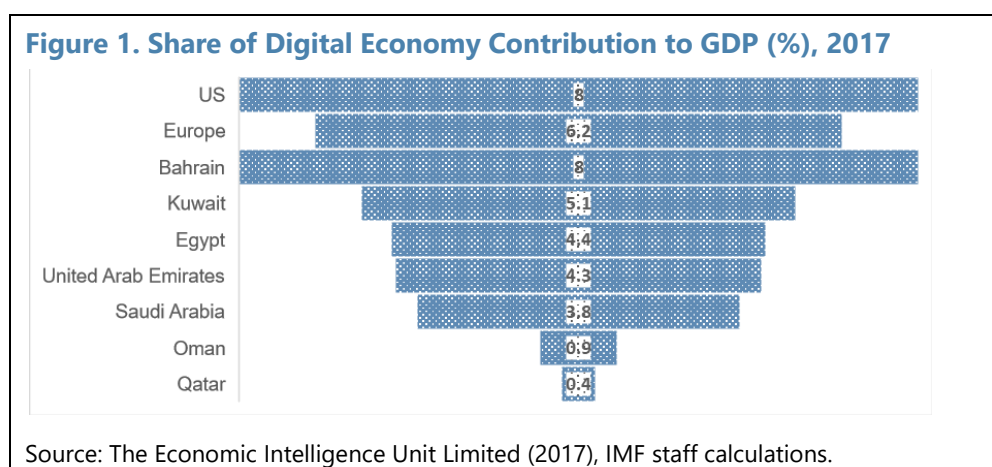---

[1] Prepared by Dorothy Nampewo.

skills, (v) legislation and (vi) raising efficiency of government work. The strategy also aims at defining and measuring the size of the digital economy to track its growth and contribution to economic growth. Prior to the publication of the DES, the frameworks for the development of the digital economy were covered under two strategies: the Emirates Artificial Intelligence Strategy (2017), and the "Abu Dhabi Economic Vision 2030" strategy (2007). These two strategies, respectively, aimed to boost investment in artificial intelligence (AI) across different sectors of the economy, and to increase internet penetration by ensuring enhancement of investment in the telecommunications infrastructure. These, along with several other strategies are helping to fast track the growth of UAE's digital economy.

B. Developments in the UAE's Digital Economy

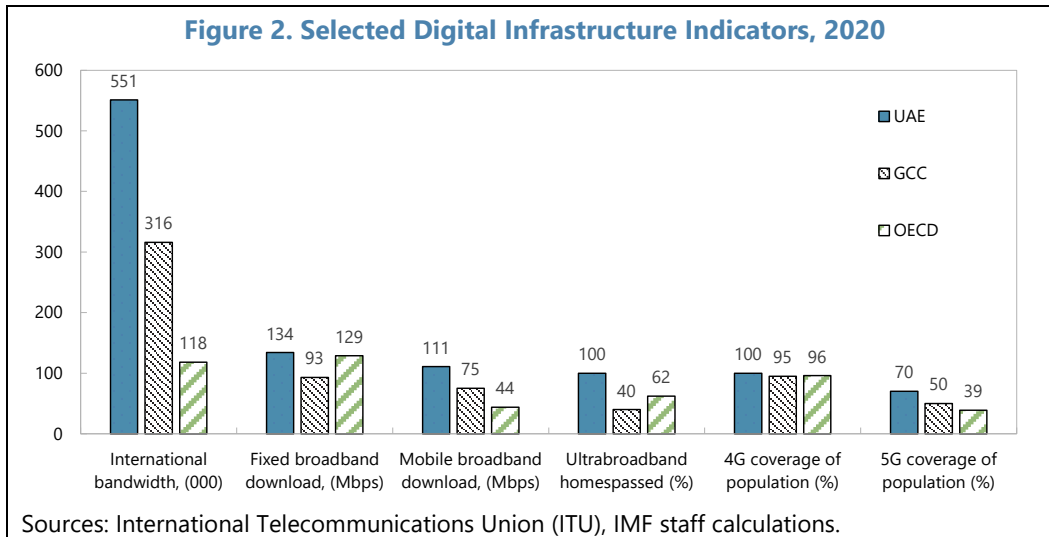**4.   The UAE's digital economy is growing, but there is still significant scope for expansion.** The UAE's digital economy contribution to overall GDP was estimated at 4.3 in 2018 (Ministry of Economy, 2018) percent, lower than the estimate for the United States of America (8 percent) and Europe (6.2 percent). It is also lower than Bahrain, Kuwait, and Egypt among GCC countries (Figure 1). Consequently, the digital economy in the UAE has significant scope for growth consistent with the recently launched Digital Economy Strategy. The UAE is expected to further reinforce its position in the digital economy, supported by investments in eCommerce, information technology infrastructure, capacity development, local production, increased coverage of internet services, expansion of electronic payment systems, as well as significant government and private sector collaboration to support digital transformation. Nevertheless, the UAE has made tremendous progress in many areas of digital transformation as discussed below.

Figure 1. Share of Digital Economy Contribution to GDP (%), 2017

US	8
Europe	6.2
Bahrain	8
Kuwait	5.1
Egypt	4.4
United Arab Emirates	4.3
Saudi Arabia	3.8
Oman	0.9
Qatar	0.4

Source: The Economic Intelligence Unit Limited (2017), IMF staff calculations.
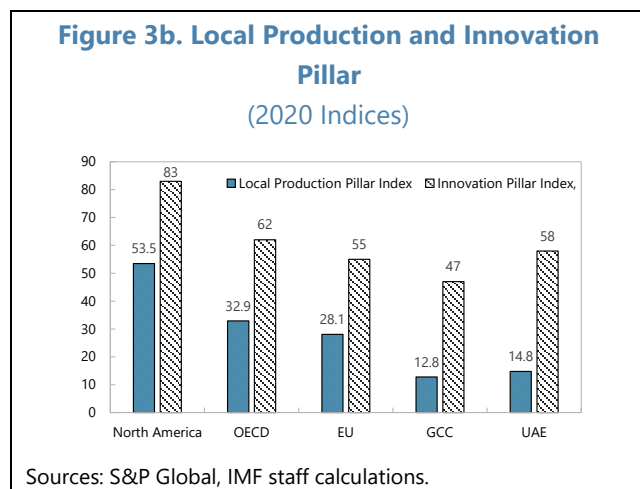
C. Digital Infrastructure

5.   The UAE has invested strongly in the digital economy and remains at the forefront of upgrading and developing its digital infrastructure. Investments in digital infrastructure aim to expand digital connectivity and coverage, raise broadband service quality, and improve affordability. By 2020, the UAE matched or even exceeded the OECD and the GCC in terms of some digital infrastructure indicators, including the percentage of the population using the internet, ultra-broadband home speed, international bandwidth, as well as fixed and mobile broadband. The UAE

was among the top countries with the fastest mobile broadband download speed in the world, at 118.42 Mbps in August 2022. In addition, the UAE has achieved 100 percent 4G coverage and 70 percent 5G coverage by 2020 (Figure 2).

Figure 2. Selected Digital Infrastructure Indicators, 2020

Sources: International Telecommunications Union (ITU), IMF staff calculations.

D. Digital Capacity Development

 6.   **The UAE is committed to enhancing digital capacity development across the labor force, particularly federal government workers.** The UAE Digital strategy targets 100 percent of the federal government workforce trained in basic and intermediate digital skills and at least 10 percent of the workforce trained in advanced technologies such as blockchain, artificial intelligence, bot processing, among other technologies by 2025. This places skilling of the labor force among the relevant indicators in digitalization in UAE and is also a critical indicator used to monitor SDG (Sustainable Development Goals) Target 4.42. By 2020, the share of Internet users with basic and intermediate skills was high at 85 percent and 69 percent, compared to SDG targets of 70 and 50 percent, respectively. Although low at 17 percent, the share of the internet users with standard skills was well above the strategy's target of 10 percent (Figure 3a).

Figure 3a. Individuals with ICT Skills, 2020
(By type of skills, in percent of internet users)

Sources: International Telecommunications Union (ITU).

Figure 3b. Local Production and Innovation Pillar
(2020 Indices)

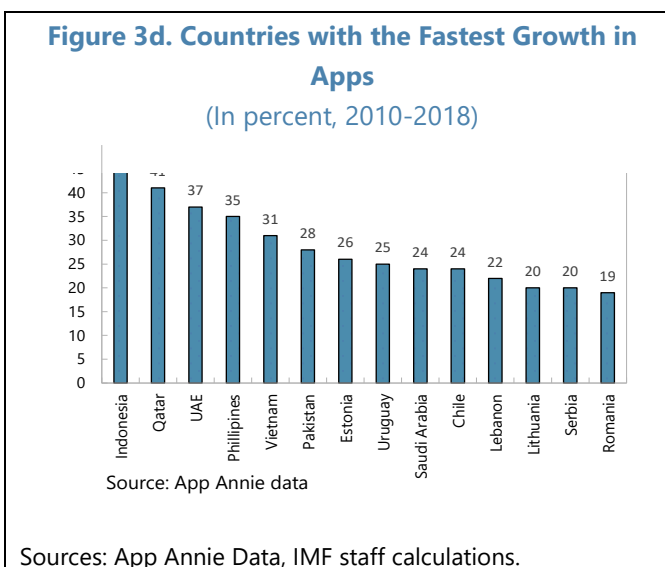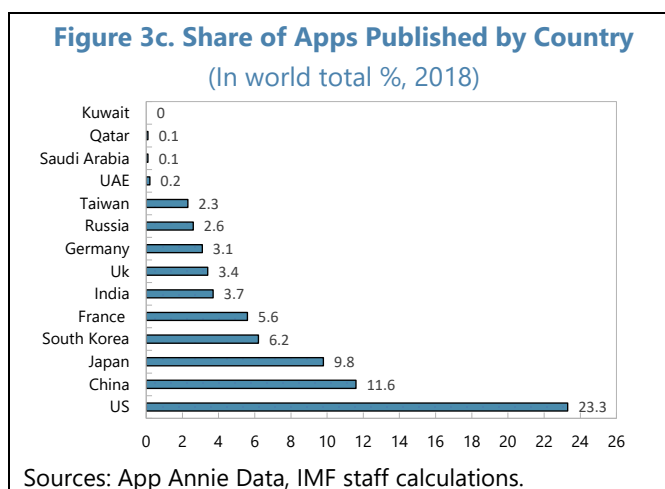Sources: S&P Global, IMF staff calculations.
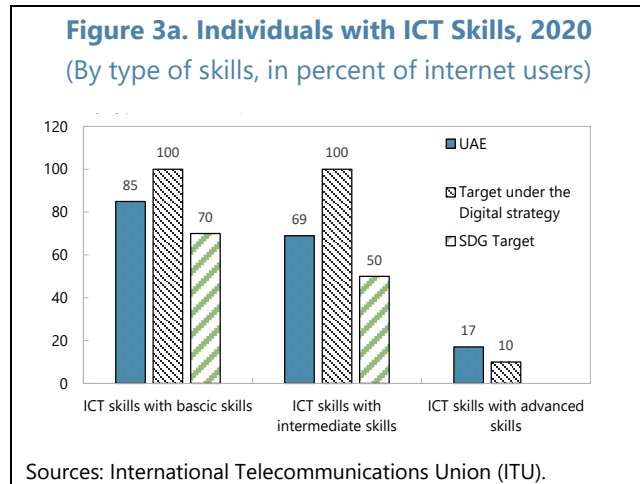
E. Digital Regulation

7.   The UAE is putting in place several regulations aimed at advancing efficiency in the digital economy. In 2021, the authorities introduced a new data law designed to protect the privacy of people and institutions and limit entities, such as private companies, from using personal data for profit. The Information Assurance Regulation which calls for a broad range of best practices in protection and management, including business continuity, disaster recovery, compliance, certification, and accreditation was initiated as a key element of the UAE's National Cybersecurity Strategy (NCSS). These have been followed by other regulations including those targeted at digital trade and blockchain, among others.

F. Digital Innovation and Local Production

8.   The UAE continues to invest in R&D to support digital innovation and ranked above the GCC in 2020. The UAE continues to pursue ICT-led reforms in different sectors of the economy to enhance digitalization. This has partly supported the growth of locally produced digital services compared to other countries in the GCC region, reflected in a higher local production index of 14.8 (El-Darwiche et al. 2021) compared to 12.5 for the GCC region (Figure 3b). Although the local production index remains below advanced market levels, available data suggests that local output in the UAE's digital innovation is increasing rapidly. Between 2010 and 2018, the UAE was among the top 10 countries with the fastest growth in published Apps, although their share remains low globally (Figures 3c and 3d). This presents an opportunity to further develop local skills and talent which would not only boost total factor productivity but diversify the economy through enhanced hi-tech exports.

Figure 3c. Share of Apps Published by Country
(In world total %, 2018)

Country	Value
Kuwait	0
Qatar	0.1
Saudi Arabia	0.1
UAE	0.2
Taiwan	2.3
Russia	2.6
Germany	3.1
Uk	3.4
India	3.7
France	5.6
South Korea	6.2
Japan	9.8
China	11.6
US	23.3

Sources: App Annie Data, IMF staff calculations.

Figure 3d. Countries with the Fastest Growth in Apps
(In percent, 2010-2018)

Country	Value
Indonesia	
Qatar	41
UAE	37
Phillipines	35
Vietnam	31
Pakistan	28
Estonia	26
Uruguay	25
Saudi Arabia	24
Chile	24
Lebanon	22
Lithuania	20
Serbia	20
Romania	19

Source: App Annie data

Sources: App Annie Data, IMF staff calculations.

9. **Investment in the digital economy contributes significantly to economic growth**.
Productivity gains from digital investments can lead to an increase in economic growth, with ICT
related investments having as much influence on growth as non-ICT investment (Seo et al., 2009).
The digital economy's positive effect on economic growth acts through its impact on reducing
frictions in the factor markets and enabling government delivery of services through improved
connectivity and innovation (Dahlman, Mealy, and Wermelinger, 2016; Myovella, Karacuka, and
Haucap, 2020). Moreover, these contributions can be enhanced if digital technologies act to
complement rather than substitute other production factors (World Bank, 2016). At the same time,
countries with solid economic and digital infrastructure and open trade regimes experience more
active ICT investments.

G. Empirical Evidence of the Impact of Digitalization on UAE Economy

10. The paper aims to estimate the impact of UAE's digital investment on economic growth.
Using a Factor Augmented Vector Autoregressive (FAVAR) model, the analysis aims to compute the
multipliers of digital investment on growth following the representation shown in equation (1)

$$Y_t = \emptyset(L)Y_{t-1} + \epsilon_t \quad (1)$$

Where Y_t is a vector of endogenous variables, L is the lag operator and is a vector of reduced form
residuals. To recover structural shocks from estimated residuals, we apply a Cholesky identification
scheme, assuming that investment spending impacts GDP with a lag, and that the latter reacts
contemporaneously to each spending variable shock. This implies that investment spending is
assumed to be more exogenous than GDP. This is likely to happen when investment is driven by a
multi-year strategy which may prevent investment from being influenced by swings in economic
cycles within the same year (IMF, 2021).

11. **In the UAE, investment in the digital economy is driven by a multi-year Digital
Strategy, and thus, it is assumed not react to any changes in the economic cycle within the
same year**. To overcome the limitation of non-fundamentalness which arises when current and past
values of the observables do not contain enough information to recover structural vector
autoregressive (SVAR) disturbances, we use the FAVAR approach which entails summing up the
information contained in a large dataset through a subset of latent, unobserved factors (see, e.g.,
IMF 2021; Forni et al., 2009; and Canova and Sahneh, 2018). Suppose Y_t is a (M × 1) vector of
observable variables and F_t is a (K × 1) is a vector of latent unobserved variables. The latent
unobserved vector, F_t, is extracted from a large set of macroeconomic variables, denoted by the
(N × 1) vector X_t

$$X_t = \Lambda_f F_t + \Lambda_Y Y_t + \xi_t \quad (2)$$

Where Λ_f is a (N × K) matrix of factor loadings and Λ_Y is an N × M matrix ξ_t are idiosyncratic errors
assumed to be normal and uncorrelated or to display a small amount of cross-correlation,
depending on whether the estimation uses likelihood methods or principal components. The
principal component method assumes that the errors will vanish asymptotically with an appropriate
linear combination (Roulleau-Pasdeloup,2012). The co-movements of (F_t and Y_t) are summarized in
the transition equation 3:

$$[F_t Y_t]' = \emptyset(L)[F_{t-1} Y_{t-1}]' + \varepsilon_t \qquad (3)$$

Where $\emptyset(L)$ is a conformable lag polynomial of finite order d, which may contain a priori restrictions as in the structural VAR literature. The error term ε_t is assumed to be white noise with a mean of zero and covariance matrix Σ. Transition equation 3 was expanded to include the relevant digital investment spending variable, a real GDP variable, and a variable that captures the direct non-ICT investment in the economy. We also include a 1×5 vector of common factors, to control for a wide range of economic shocks that may affect GDP. The vector of endogenous variables is summarized in equation 4.

$$Y_t = [ICT_{t,} NICT_{t,} GDP_{t,} F_{t,}] \qquad (4)$$

To overcome potential challenges arising from transforming the data into log transformations which may lead to potential biases in computing the multipliers, we divide all endogenous variables by the real potential GDP (IMF 2021). The real potential GDP was computed using the conventional HP filter. The FAVAR approach allowed us to exploit valuable information from a large set of macroeconomic variables that could potentially explain variations in GDP growth without concerns on degrees of freedom, overfitting, or increasing parameter uncertainty in the estimations (Rahimov et al. 2020). The common factors used consist of 12 macroeconomic variables (see details in Annex I), using a two-step procedure following Bernanke et al. (2005). In the first step, we extracted the common factors using the principal component analysis based on the Bai and Ng (2007) ICp2 information criterion. These factors explain 87.2 percent of the informational dataset variance. In the second step, we added the factors to the vector of endogenous variables in equation 4 by ordering the digital investment spending variable first through a standard Cholesky ordering procedure and estimated the equation using an optimal lag length of 4 with a constant and no time trends. To account for issues arising from potential shock foresight, we include the forecast of total investments a year before as an exogenous variable, owing to the absence of forecasts for digital investments.

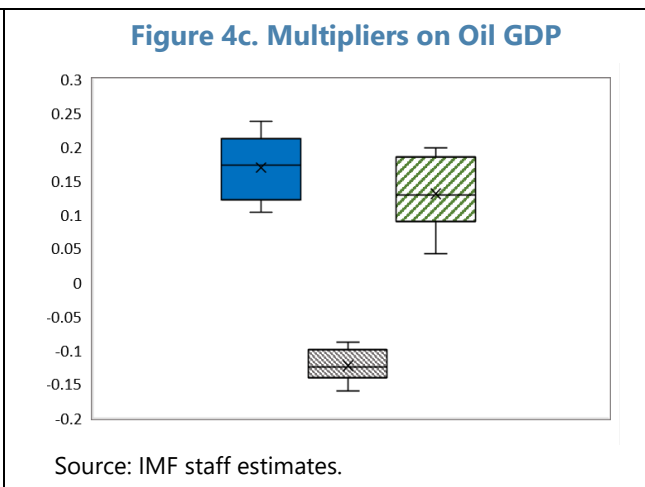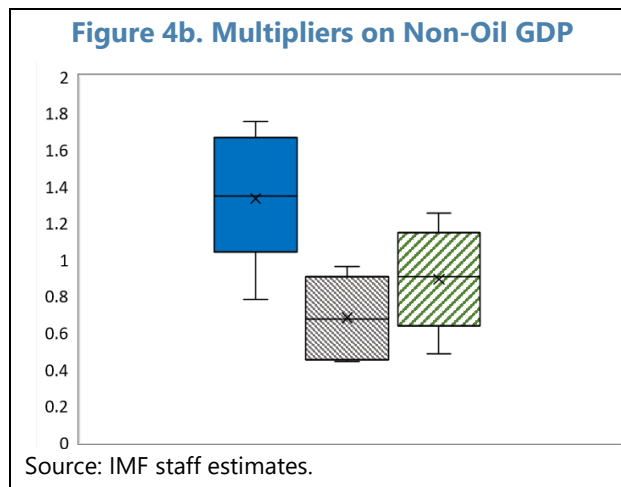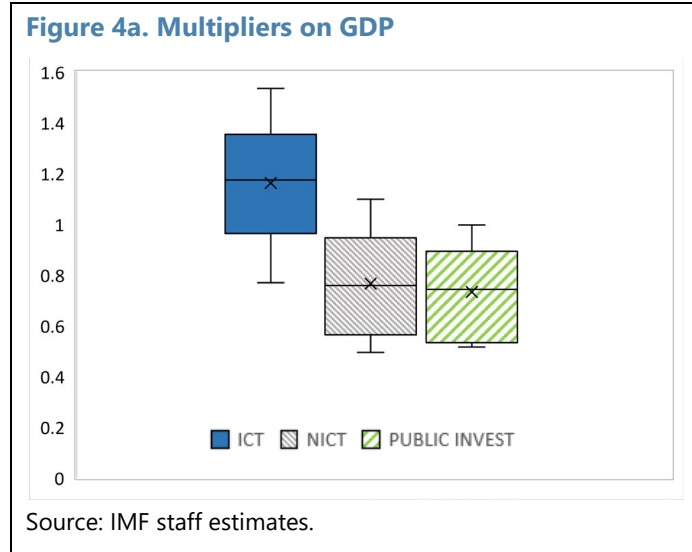**12.   We estimate equation 4 using quarterly data covering the period 1990Q1-2021Q4.**
Owing to data limitations, available annual data was interpolated to generate the quarterly series. Data on digital investment is not readily available. For this analysis, a proxy for digital investment data was built as a share of OECD average ICT investments. This assumption may not be unreasonable as the UAE ranks close to, and in some instances above, the OECD average on most digital economic indicators (DEI). Since the UAE is an oil dependent economy, we conduct the analysis on overall GDP, non-oil GDP and Oil GDP. We report 4-quarter average impulse responses (see Annex II) based on local projections proposed by Jorda (2005). The choice of local projection impulse responses over the conventional VAR impulse responses was because local projections are more robust from the misspecification problems and tend to produce superior results compared with conventional VAR impulse responses especially in small samples (Dime et al, 2021). The impact multipliers were obtained by multiplying the impulse response function (IRF) values by the mean value of the ratio of real GDP to the government spending indicator (IMF, 2018).

H. Results

13.   The FAVAR estimates suggest that the point estimate for public spending multiplier on overall GDP is around 1.0 after the 4th quarter (Figure 4a). This is consistent with other estimates of the overall government spending multipliers in the literature on similar oil exporters, particularly those in the MENA region (IMF, 2018). In addition, a survey of the literature by IMF (2014) and Ramey (2019) found that most estimates of general government spending multipliers range from 0.7 to 1.0 for high multipliers (IMF 2014, Ramey 2019; Coenen et al.

Figure 4a. Multipliers on GDP

Source: IMF staff estimates.

2012). The multiplier of 1.0 for public investment in UAE could be attributable to a greater proportion of the public sector, low debt, and a fixed exchange rate regime (IMF 2014 & IMF 2018). The estimates further suggest that the ICT spending multiplier is about 1.5, higher than that of non-ICT spending at 1.0. The available literature suggests that the economic impact of the digitalization on OECD and non-OECD is 1.4 and 1.0 percent, respectively on overall GDP per capita (ITU, 2019).

14.   The ICT spending multiplier on non-Oil GDP is around 1.8, higher than for non-ICT spending multiplier at about 0.9. This implies that the effect of a dollar spent on ICT investments almost doubles economic activity in the non-oil sector and investments in the ICT sector have propagation effects through the economy leading a cumulative increase in non-oil GDP and digitalization of the economy. With the UAE focusing on diversification of the non-oil economy, further investment in the digital sector would seem to be a viable option to stimulate economic activity.

Figure 4b. Multipliers on Non-Oil GDP

Source: IMF staff estimates.

Figure 4c. Multipliers on Oil GDP

Source: IMF staff estimates.

15. **The multipliers are negligible in the oil sector**. This result is not surprising given that oil production is an enclave extractive sector with limited direct linkages to the rest of the economy. However, indirect linkages can be created through public consumption and private investment and local entrepreneurial activity linked to the domestic oil sector value chain.

I. Conclusion

16. **The recently launched UAE Digital Economy Strategy aims to double the contribution of the digital economy to around 20 percent of GDP by 2031.** Further investments in ICT can generate more non- oil GDP than non-ICT investments. Continued investment in digital infrastructure and advancement in research and development would help to boost the digital sector's contribution to economic growth. At the same time, continued development of local skills and attraction of talent would not only boost total factor productivity but diversify the economy through enhanced hi-tech exports. This, together with further investments in eCommerce, local production, expansion of electronic payment systems, as well as significant government and private sector collaboration, would enhance digital transformation.

References

Batini N., M. Di Serio, G. Melina, M. Fragetta, G. Melina, Waldron, A. 2021. Building Back Better: How Big Are Green Spending Multipliers? IMF Working Paper No. 2021/087. International Monetary Fund, Washington, DC

Batini, N., L. Eyraud, and A. Weber. 2014. A Simple Method to Compute Fiscal Multipliers. IMF Working Paper No. 2014/093. International Monetary Fund, Washington, DC

Bernanke, B.S., J. Boivin, and P. Eliasz, P. 2005. Measuring The Effects of Monetary Policy: A Factor-Augmented Vector Autoregressive (FAVAR) Approach. *The Quarterly journal of economics*, *120*(1): 387-422.

Blaubach, T. 2021. The 5G divide in the Middle East: Further disparity between the Gulf and its neighbors. Middle East Institute, Washington, DC. Accessed: September 15, 2022. https://www.mei.edu/publications/5g-divide-middle-east-further-disparity-between-gulf-and-its-neighbors

Canova, F. and M. H. Sahneh. 2018. Are small-scale SVARs useful for business cycle analysis? Revisiting nonfundamentalness. *Journal of the European Economic Association*, *16*(4), pp.1069-1093.

Coenen, G., C.J. Erceg, C. Freedman, D. Furceri, M Kumhof, R. Lalonde, D. Laxton, J. Lindé, A. Mourougane, D. Muir, and S. Mursula. 2012. Effects of fiscal stimulus in structural models. *American Economic Journal: Macroeconomics*, *4*(1), pp.22-68.

Dahlman, C., S. Mealy and M. Wermelinger 2016. Harnessing the digital economy for developing countries. OECD Development Centre Working Paper 334, OECD Publishing, Paris, https://doiorg/10.1787/4adffb24-en.

Dime, R., E. Ginting, and J. Zhuang. 2021. Estimating fiscal multipliers in selected Asian economies. ADB Economics Working Paper 638. Asian Development Bank, Manila

Elkhdari, M., M. Souissi, and M.A. Jewell. 2018. Empirical estimation of fiscal multipliers in MENA oil-exporting countries with an application to Algeria. IMF Working Paper 18/124. International Monetary Fund, Washington, DC.

El-Darwiche, B., El Zei, T., Sayess, D., Rizk, M., and R. Katz. 2021.Energizing the digital economy in the Gulf countries: From digital adopters to digital disruptors. PriceWaterHouseCoopers, Dubai. Accessed September 3, 2022. https://www.strategyand.pwc.com/m1/en/ideation-center/research/2021/energizing-the-digital-economy-in-the-gulf-countries/energizing-the-digital-economy-in-the-gulf-countries-spread.pdf

Fogg, I. 2021. Benchmarking the Global 5G Experience — September 2021. Open Signal, London. Accessed: September 23, 2022. https://www.opensignal.com/2021/09/09/benchmarking-the-global-5g-experience-september-2021

Forni, L., L. Monteforte, and L. Sessa. 2009. The general equilibrium effects of fiscal policy: Estimates for the euro area. *Journal of Public economics*, *93*(3-4), pp.559-585.

Huawei & Oxford Economics. 2017. Digital Spillover. Measuring the true impact of the Digital Economy. Retrieved from https://www.huawei.com/minisite/gci/en/digital-spillover/files/gci_digital_spillover.pdf

IMF. 2018. Measuring the Digital Economy. IMF Staff Report. International Monetary Fund, Washington, Dc. Accessed: September 15, 2022. https://doi.org/10.5089/9781498307369.007. ITU. 2019. Economic contribution of broadband, digitization and ICT regulation: Econometric modelling for Africa. International Telecommunications Union, Geneva, Switzerland. Accessed September 3, 2022. https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.BDT_AFR-2019-PDF-E.pdf
Jordà, Ò., 2005. Estimation and inference of impulse responses by local projections. American economic review, 95(1), pp.161-182.

Ministry of Economy (2018). UAE Economy: Laying the Foundations of a Strong & Active Digital Economy. Dubai. Accessed: 15 September 2022: https://u.ae/en/about-the-uae/economy/digital-economy

Myovella, G., M. Karacuka, and J. Haucap, J. 2020. Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecommunications Policy*, 44(2), 101856.

Plagborg-Møller, M. and C.K. Wolf. 2021. Local projections and VARs estimate the same impulse responses. *Econometrica*, *89*(2), pp.955-980.

Rahimov, V., N. Guliyev, and V. Ahmadov. 2020. Modeling Azerbaijan's inflation and output using a factor-augmented vector autoregressive (FAVAR) model (No. 01-2020). Graduate Institute of International and Development Studies Working Paper.

Ramey, V.A. 2019. Ten years after the financial crisis: What have we learned from the renaissance in fiscal research? Journal of Economic Perspectives, 33(2), pp.89-114.
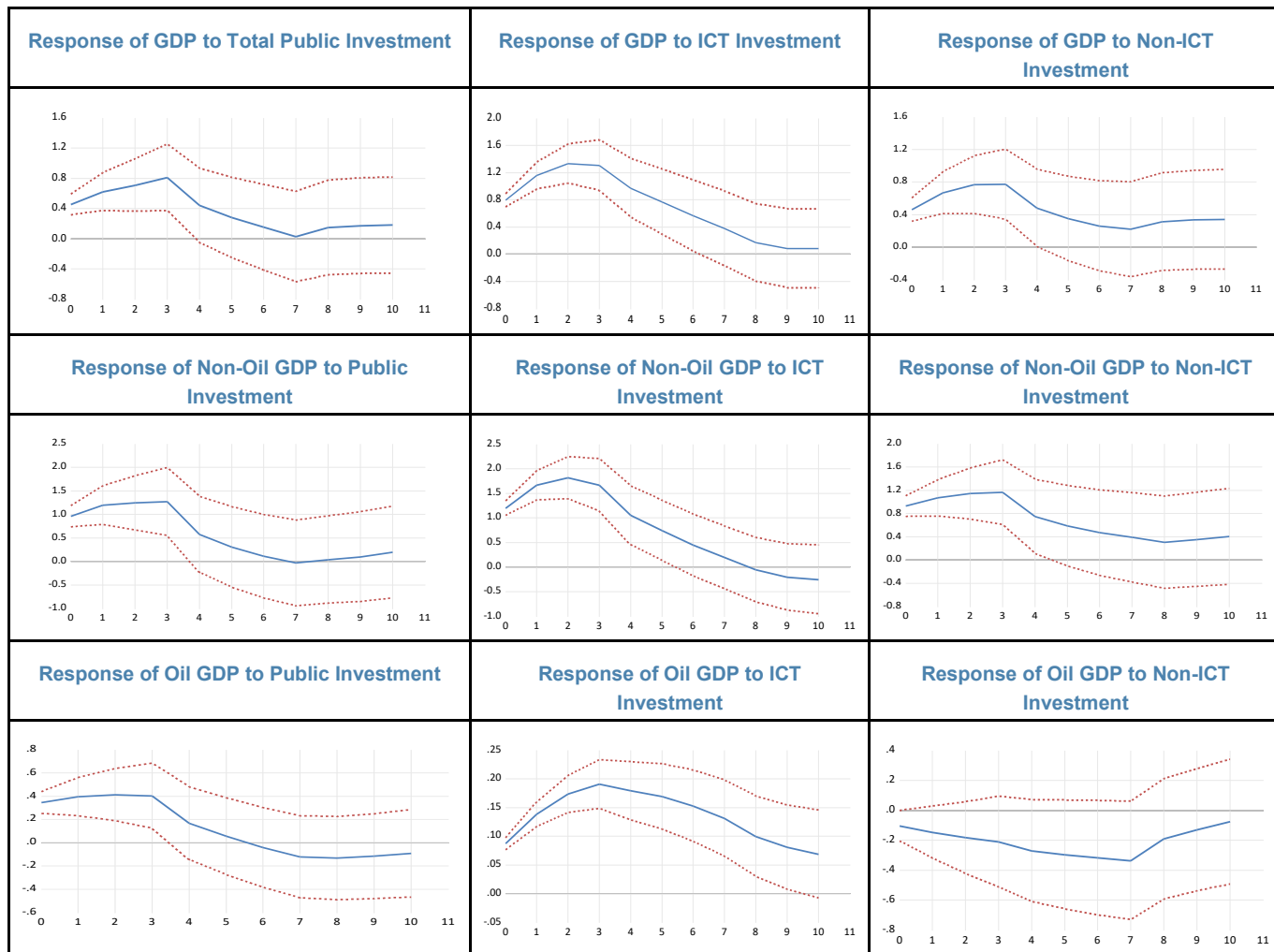
Seo, H.J., Y.S. Lee, J.H. Oh. 2009. Does ICT investment widen the growth gap? Telecommunications Policy, 33(8), pp.422-431.

World Bank. 2016. World Development Report 2016: Digital Dividends, World Bank, Washington, D.C

Annex I. List of Variables in the Information Set

Variable	Source
Public Consumption	IMF WEO Database
Total debt	IMF WEO Database
Exports of goods and services	IMF WEO Database
Imports of goods and services	IMF WEO Database
Oil production	Statista
Oil price	FRED Database
Total government revenues	IMF WEO Database
Real Broad Effective Exchange Rate	FRED Database
Inflation	IMF WEO Database
Broad Money	IMF WEO Database
Gross international reserves	IMF WEO Database
Employment	IMF WEO Database

Annex II. Impulse Response Functions

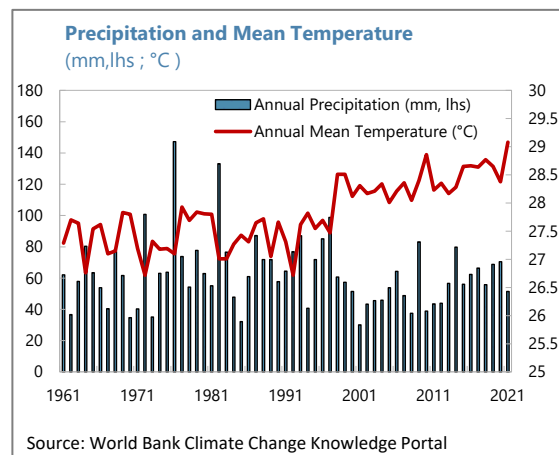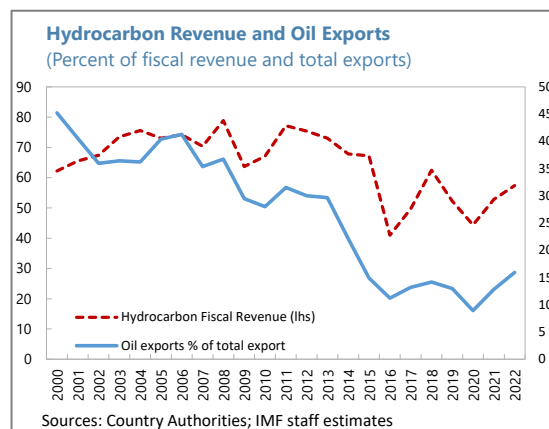| Response of GDP to Total Public Investment	Response of GDP to ICT Investment	Response of GDP to Non-ICT Investment
Response of Non-Oil GDP to Public Investment	Response of Non-Oil GDP to ICT Investment	Response of Non-Oil GDP to Non-ICT Investment
Response of Oil GDP to Public Investment	Response of Oil GDP to ICT Investment	Response of Oil GDP to Non-ICT Investment

GROWING GREEN AND SUSTAINABLE[1]

The UAE remains heavily reliant on hydrocarbon activity as a source of income and economic growth. As the global economy decarbonizes, the UAE faces twin challenges of reducing its reliance on hydrocarbon activity and adapting its economy and policy frameworks, including fiscal frameworks, to climate risks. The UAE announced a set of structural reforms and green investments to reduce emissions and energy intensity of the economy while diversifying it away from fossil fuels. Using the IMF's DIGNAR model[2] we show that green investments and reforms undertaken under the 2050 Strategies could almost double potential non-hydrocarbon GDP growth. Despite the UAE's agile approach to the energy transition, the costs are large, and the implementation need is urgent. Developing and scaling up private green and sustainable finance as well as creating an enabling environment for smooth energy transition would reduce direct fiscal costs, increase efficiency of green investments, and preserve public financial wealth while delivering on growth and Net Zero ambitions.

A. Introduction

1.   The UAE economy is exposed to climate risks, which pose challenges for long-term growth. As a major oil exporter, the UAE is heavily reliant on hydrocarbon activity as a source of income and economic growth. Hydrocarbon revenues amount to around 60 percent of total fiscal revenues, while oil exports are over 15.9 percent of total exports of goods and services (Text Figure). Moreover, indirect economic effects from hydrocarbon activities have a significant contribution to overall growth. As the global economy decarbonizes and demand for fossil fuels declines, the UAE faces twin challenges of reducing its reliance on hydrocarbon activity and adapting its economy and policy frameworks, including fiscal frameworks, to climate risks.

2.   Additionally, the UAE is vulnerable to the physical impacts of climate change. With growing heat stress and rising temperatures (Text Figure), the climate risks could have significant impacts on the UAE non-oil economy and infrastructure, human health, and the natural
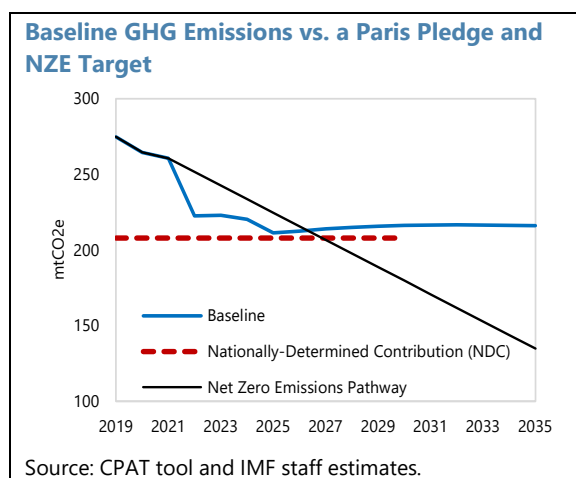

Hydrocarbon Revenue and Oil Exports
(Percent of fiscal revenue and total exports)

Sources: Country Authorities; IMF staff estimates

Precipitation and Mean Temperature
(mm,lhs ; °C)

Source: World Bank Climate Change Knowledge Portal

---

[1] Prepared by Yevgeniya Korniyenko and Dorothy Nampewo.

[2] Aligishiev, Melina and Zanna, 2021.

habitat. For example, both agriculture and urbanization have increased the pressure on non-renewable natural water sources that could result in a growing gap in water availability.[3] Moreover, the UAE's critical infrastructures, such as desalination and power stations, and habitats located on coastal zones, are at risk with rising sea levels. Desertification has also increased the severity of sandstorms.

3. **The authorities have set ambitious climate objectives, including achieving Net Zero emissions by 2050.** The UAE was the first country in the Middle East and North Africa (MENA) region to announce the intention to achieve Net Zero emissions by 2050. In September 2022, the UAE enhanced its voluntary climate commitment under the Paris Agreement to target a 31 percent reduction in greenhouse gas emissions by 2030 (up from 23.5 percent announced previously). The UAE Energy Strategy envisages an investment of AED 600 billion (USD 163 bn, or 52.1 percent of 2021 non-resource GDP) in clean energy and renewables, efforts to modernize infrastructure capable to support energy transition, and increase energy efficiency to reduce energy demand.[4] However, NDC targets must be accelerated to reach long-term Net Zero targets, while ensuring a smooth energy transition will require sustained commitment to ongoing efforts and forward-looking policies to respond to the risks and challenges that could arise from global decarbonization efforts (UAE 2022 AIV, Box I).

Baseline GHG Emissions vs. a Paris Pledge and NZE Target

Source: CPAT tool and IMF staff estimates.

4. **The UAE is committed to climate policies, but the costs are large, and the implementation need is urgent.** The UAE is already investing heavily in clean energy and renewables, implementing green building codes, and building efficient and climate resilient public transportation, among others, as detailed in its updated Second NDCs, the "2030 Agenda for Sustainable Development: Excellence in Implementation - Voluntary National Review", and in the 2021 UAE Article IV.[5] To deliver on climate commitments, the government is working on the UAE Pathway (launched at COP27), which envisages participation of both private and public sectors to cover large implementation needs and reduce direct fiscal costs. The intention is to prioritize low- or zero-carbon investments in projects that have a strong business case, those that require long-term implementation but have potential large gains for energy transition, and the sectors with the highest

---

[3] Agriculture sector represents about 85 percent of total water consumption.

[4] The UAE Energy Strategy 2050 seeks to bring the contribution of clean energy in the total energy mix from 25 percent to 50 percent by 2050, reduce the UAE's carbon footprint of power generation by 70 percent, and reduce final energy demand by 40 percent. These targets are being revised up by the authorities in line with more ambitious NDCs.

[5] The UAE 2021 AIV, Annex VI has a detail discussion of UAE progress on climate related SDGs and adaptation policies.

emissions and highest energy intensity.[6] The UAE's current approach to energy transition which maintains investments in traditional energy markets while increasing investments in greening fossil fuel extraction processes and renewables provides the balance required to deliver the desirable results while ensuring energy security.

5.   **Managing the UAE's transition to a less carbon-dependent economy is expected to be a key challenge going forward.** While the UAE has made significant progress in reducing dependence on hydrocarbon revenue and exports, its CO2 emissions per capita are high relative to the OECD average, while energy intensity remains significantly above world average. On the upside, the UAE's low oil extraction costs (Figure 1), substantial public financial buffers, ambitious supportive reforms and the move to facilitate green policies and finance make it more resilient to potential price declines than many other fossil fuel exporters. However, it is important to look beyond current high energy prices, as the required financing need could be larger than assessed by the government and complementary policies and significantly larger investments in clean energy and renewables might be required under a faster-than-expected global decarbonization scenario (see Box 1 and 2022 UAE AIV, Box 1).

Box 1. Alternative Policies to Mitigate Climate Change Challenges in UAE

The UAE energy transition may require significantly larger front-loaded investments in green and renewable energy to stay on track to achieve Net Zero by 2050 (as discussed in 2022 UAE AIV, Box 1). This could put additional pressure on public finances, as attracting larger private capital may prove difficult in the short- to medium-term. To mitigate effects on public finances the UAE may consider alternative and supportive fiscal policies.

Tax policies, gradual removal of energy subsidies, and more efficient and green public financial management (PFM) frameworks could further support government efforts to ensure macroeconomic sustainability and meet energy transition challenges. The IMF Carbon Pricing Assessment Tool (CPAT)[1] indicates that the UAE may need larger than announced investments in renewables by 2030 to stay on track to achieve Net Zero emissions by 2050. To contain pressure on public finances, the implementation of the Net Zero Initiative could also be achieved by a combination of policies, such as continuing investments in green and renewable energy, a gradual removal of energy subsidies, the introduction of climate PIMA, green PFM, and budget tagging system, and consideration of climate taxation.
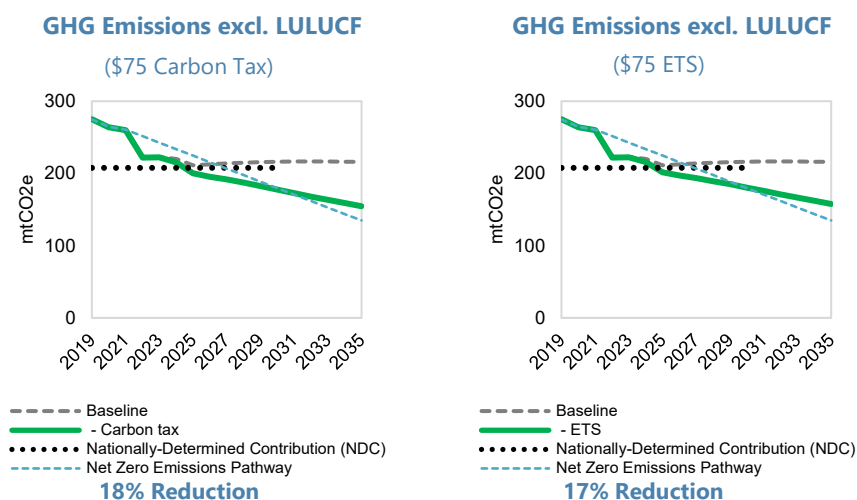
For example, the CPAT tool shows that a carbon tax and emission trading system would be the most efficient (in addition to investment in renewables) in reducing emissions compared to other instruments. An estimated carbon tax (or ETS emissions price) of $75 per ton by 2030 would be consistent with UAE's intermediate emissions objectives, without other mitigation measures (Text Charts). However,

---

1/ CPAT is a tool which allows for rapid, country-specific analyses of carbon pricing reforms on several metrics, e.g., effects on GDP growth and employment. See Simon Black, Victor Mylonas, Ian Parry, Nate Vernon, and Karlygash Zhunussova, 2022, "Climate Policy Assessment Tool (CPAT): A Tool To Help Countries Mitigate Climate Change," IMF forthcoming.

---

[6] The highest contributions to reduction of carbon dioxide are expected to come from the electricity generation sector (66.4 percent), industry (16.6 percent), transport (9.7 percent), carbon capture, utilization, and storage (5.3 percent), and waste (2.1 percent).

Box 1. Alternative Policies to Mitigate Climate Change Challenges in UAE (concluded)

energy subsidies and price reforms would also help to bring electricity and gas prices in line with market prices, reduce fiscal burdens by better targeting subsidies to the most vulnerable, and lower energy demand.[2]

GHG Emissions excl. LULUCF
($75 Carbon Tax)

GHG Emissions excl. LULUCF
($75 ETS)

18% Reduction

17% Reduction

Sources: IMF CPAT tool and IMF staff estimates.

_____

2/ Subsidizing the consumption of fossil fuel has significant negative externalities that can be captured in estimates of the implicit and explicit cost of subsidies Fossil Fuel Subsidies (imf.org).

---

6.   This paper aims to assess the impact of green and sustainable policies on the UAE long-term potential non-oil growth. Full implementation of announced reforms and targets under the UAE 2050 Strategies is expected to have large positive impacts on growth and diversification.[7] The analysis is a partial equilibrium based on the IMF's DIGNAR-19 model and Carbon Pricing Assessment Tool (CPAT). The analysis suggests that achieving the Net Zero emissions target by 2050 may require large investments in renewables and clean energy by 2030 to stay on track to achieve Net Zero emissions by 2050. This may require a combination of policies, such as those that would help to attract private capital in green projects, gradual removal of energy subsidies, the introduction of green PFM and climate-PIMA[8], and consideration of climate taxation to support the transition. Investments in green and sustainable policies reinforced by successful supporting reforms' implementation have the potential to almost double the current projected medium-term non-oil GDP growth of about 4 percent and raise potential non-oil GDP growth and economic diversification in the medium -to- long-term.

_____

[7] Among others, these reforms include: (i) achieving CO2 emissions reduction targets set in the Second NDCs; (ii) developing green and sustainable finance; (iii) fully integrating costs and benefits of climate policies to policy frameworks; and (iv) enhancing disaster risk management strategies to deal with immediate physical risks.

[8] Climate Public Investment Management (PIMA) and green Public Financial Management (PFM) deliver IMF Technical Assistance to incorporate climate considerations into long-term fiscal management. See Strengthening Governance for Climate-Responsive Public Investment (imf.org) for details.
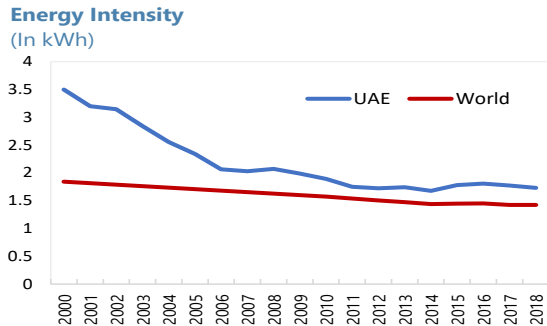
Figure 1. Energy Transition Exposure and Resilience

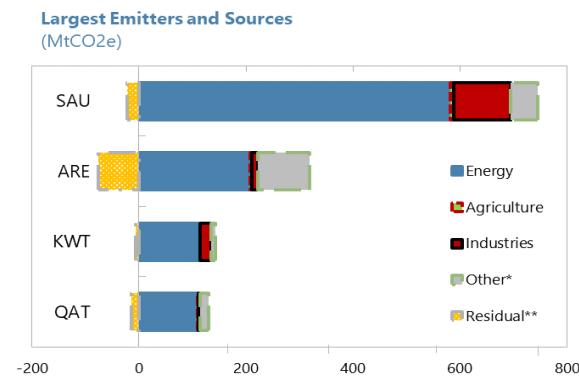*UAE CO2 emissions per capita are high relative to the OECD average...*

Average Emission Levels

■ Absolute (MtCO2e, RHS) ■ Per bln US$ GDP (tCO2e) — Per capita (CO2e)
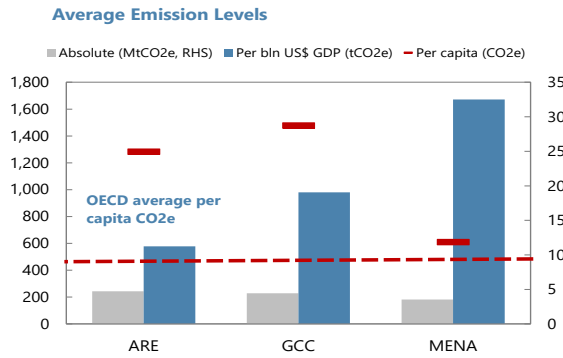
Source: CAIT.

While energy intensity remains significantly above world average.

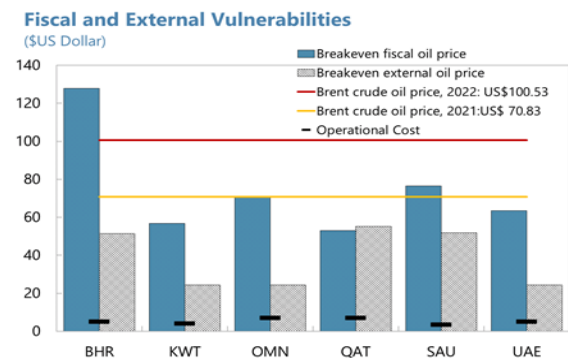**Energy Intensity**
(In kWh)

Source: World Bank, BP, and Madison Project Database.
Note: Energy intensity is measured as primary consumption per unit of gross domestic product. This is measured in kilowatt-hours per 2011 $ (PPP).

Energy sectors are the largest emitters of CO2.

Largest Emitters and Sources
(MtCO2e)

The UAE's energy consumption has begun to shift toward renewables and nuclear.

Direct Primary Energy Consumption
(In percent, from Fosil, Renewable and Nuclear Fuels)

The UAE's extraction costs are low and breakeven prices are favorable.

Fiscal and External Vulnerabilities
($US Dollar)

Note: Operational Cost includes production costs (i.e., salaries, lease costs and maintenance), transport costs (e.g., processing costs and transport fees), general and administrative costs, and production tax.

Sources: CAIT, and IMF staff calculations.

The UAE is one of the least exposed to climate transtion and comparatively resilient to its impacts.

Countries' Preparedness for a Low-Carbon Transition
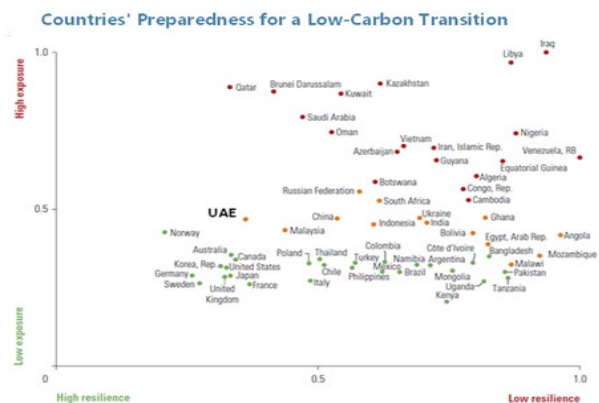
Source: Based on several databases.
Note: Some likely poorly prepared countries are not in the figure because the full data sets were not available to the authors. Examples include Turkmenistan and Papua New Guinea.

7.   The rest of the paper is structured as follows: the next section discusses the literature **on modelling green and sustainable policies.** A scenario assessment of the growth impacts of green and sustainable policies on UAE growth is discussed in section C, while fiscal implications of climate policies in UAE is discussed in section D. Developing and facilitating green and sustainable finance in UAE; and conclusions and further policy considerations are discussed in sections E and F, respectively.

B. Modelling of Green and Sustainable Policies: Literature Overview

8.   Fostering green and sustainable policies helps to tackle climate challenges and contributes to sustainable long-term growth. This would be accompanied by scaling-up investments in renewables and increasing the share of renewables in the total energy mix. Such investments have been shown to have the strongest prospects both for mitigating climate risks and replacing fossil fuels (Moriarty and Honnery, 2016). In addition, they provide potential solutions to environmental challenges (Dincer, 2000) and improve capacity to provide sustainable, cost effective, and user-friendly energy sources (Dincer and Ronsen, 1998).

9.   Energy transition would require sizeable investment that is supported by enabling policies. Required significant green investments may necessitate tapping private sector finance (Semieniuk and Mazzucato, 2019; Bergek et al., 2013). Indeed, recent analysis concludes that financing of green polices needs to double or triple over the next years if countries are to achieve the Net Zero targets by 2050, requiring significant buffers, alternative sources of financing (Semieniuk and Mazzucato, 2019), and a supportive and enabling investment environment. However, these investments may not be attractive to private investors given the long lead times and uncertainty in returns to investments (Semieniuk and Mazzucato, 2019, Bergek et al., 2013).

10.   Innovative financing solutions for the private sector and fiscal policies could support green investments. Alternative policies such as those designed to boost the return on green investments could help attract large scale private investors (Polzin et al, 2015). Innovative financing sources such as the issuance of green bonds (Ando et al., 20229) and carbon pricing or feed-in-tariffs have been found to have a positive and significant impact on green investments (Eyraud, Clements and Wane, 2013). In addition, policies such as boosting domestic revenue mobilization and elimination of subsidies would create fiscal space for green investment (Gurara, Melina and Zanna, 2019).

11.   Strengthening domestic public investment management policy frameworks is critical to ensuring maximum gains from green investments. Recent analysis based on the IMF DIG and DIGNAR models, highlights how growth dividends from public investments could be adversely affected by inefficiencies in public investment. This could arise partly from low absorptive capacity due to weak public investment management frameworks (Gurara, Melina and Zanna, 2019). Strengthening public investment frameworks along with proper sequencing of public investments

---

[9] Sakai, A., Fu, C., Roch, F. and Wiriadinata, U. 2022. "Sovereign Climate Debt Instruments: An Overview of the Green and Catastrophe Bond Markets." IMF Staff Climate Note 2022/004, International Monetary Fund, Washington, DC.

would increase public investment efficiency and ensure maximum gains without exerting pressures on public resources.

12.   **Green and sustainable policies are associated with higher medium-term growth and employment.** Investments in green energy are associated with high growth dividends in the medium- to -long-term. Recent analysis suggests that green and sustainable infrastructure investments have output multipliers ranging 1.1-1.5, higher than traditional infrastructure investments multipliers in the range of 0.5-0.6 (IMF, 2021). In addition, investing in low carbon energy seems to be more labor intensive than brown energy investments revealing the potential of green investments to increase employment. Garrett-Peltier (2017) find that each $1 million shifted from brown to green energy will create a net increase of 5 jobs. Other studies have come to a similar conclusion that investments in green energy are more labor intensive than investing in brown energy (Hepburn et al., 2020; Engel and Kammen, 2009).

C. Growth Impacts of Green and Sustainable Policies in UAE: Scenario Analysis

13.   **Using the IMF's DIGNAR-19 model, we assess the impact of the AED 600 billion planned investments in green energy under the UAE Energy Strategy 2050.** The IMF's DIGNAR model is a partial equilibrium model designed to deliver quantitative macroeconomic assessments and policy scenario analysis in open developing economies (Aligishiev, Melina and Zanna, 2021). The modelling framework abstracts from the full input-output structure of the economy and incorporates three sectors of production that include nontraded goods, non-resource traded goods, and traded natural resources. The model also includes financially and non-financially constrained households. The government has access to several fiscal instruments (productive and unproductive expenditures and various taxes), concessional and non-concessional debt, and assumes a natural resource fund that serves as a fiscal buffer which is drawn down to cover a revenue shortfall or accumulates savings from excessive revenues. The summary of the model structure and key assumptions used for the calibration of the UAE economy are provided in Annex A.1. Using these assumptions, we consider three scenarios as detailed below.

14.   **Announced green investments are assumed to deliver high growth dividends with successful implementation of the UAE's massive reform agenda, including the Projects of the "50".** These projects include reforms of labor and product markets, further trade and FDI liberalization, enhancing digitalization and technology advancement and fostering a sustainable energy transition.

- *Labor market reforms* including enhancement of visa policies, provision of appropriate pension schemes and safety nets (including for expatriates), support of private sector employment, continued support to female labor force participation and more efficient and inclusive investment in education and training in emerging fields would raise human capital, attract, and retain skilled labor force, and contribute to a more dynamic labor market. We assume that these reforms would lead to a 2 percent increase in labor supply relative to the baseline, consistent

with authorities' targets and in line with similar GCC countries (see for example Moreau and Aligishiev, 2022).

- *Trade and FDI liberalization* and leveraging the *benefits of digitalization and advancement of technology and innovation* would enhance efficiency gains and support total factor productivity while improving the business environment and attract private capital.[10] These combined with *reforms in public expenditure management* such as improved coordination of the fiscal framework with the UAE 2050 Strategy to fully account for green investment needs and costs; introduction of climate-PIMA and green PFM would increase public expenditure efficiency and enhance the returns on green investments. We assume that these gains would increase public expenditure efficiency by 20 percent, relative to the baseline, similar to other GCC countries (see for example Moreau and Aligishiev, 2022 for Saudi Arabia).

15.   The baseline scenario is aligned with the assumptions in the macro-framework underpinning the UAE 2022 Article IV Consultations. The scenario assumes that public investment would remain steady at around 10.5 percent of GDP in the long-term. It also assumes a continued implementation of the government's reform agenda, which is expected to contribute to medium-term annual non-oil GDP growth of about 4 percent. The UAE is currently pursuing reforms in the labor and product markets, trade and FDI, and digitalization (as also discussed in Chapters 1 and 2). Although these are expected to deliver gains in the short term, maximum gains would be achieved with full implementation in the medium to long term (Figure 2).

16.   The first alternative scenario considers the impact of additional green investments relative to the baseline. Public investment is expected to grow by an additional 2 percent of GDP per year until 2050 under the UAE Energy Strategy.[11] The additional increase in public investment reflects higher investments in renewables and green energy. The additional expenditure combined with partial implementation of the reform agenda is assumed to encompass both investments in renewables and "greening" of the extraction processes of fossil fuels using advanced technologies. The results indicate that this scenario would deliver non-oil GDP growth of around 6 percent in the medium- to long-term.

17.   The second alternative scenario considers the impact of additional green investments combined with full implementation of the authority's reform agenda.[12] This scenario assumes that additional investments in green energy are combined with a well-coordinated and full implementation of the reform agenda, including trade liberalization and digitalization reforms

---

[10] See SIP Chapters 1 and 2 on "Quantifying gains from trade liberalization" and "Assessing the impact of ICT investments on growth".

[11] In nominal terms, this corresponds to the AED 600 billion (USD$ 163 billion) cumulative new investments by 2050.

[12] For example, in 2021-22, the UAE announced ambitious national strategies including the set of new projects and initiatives "The Project of the 50'", the national plan "We The UAE 2031", Digital Strategy and the Industrial Strategy "Operation 300 bn". The UAE aim's to more than double the manufacturing value added from AED 133 bn to AED 300 bn, double nominal GDP from AED 1,490 bn to AED 3,000 bn, double the contribution of the digital economy to GDP to 20 percent by 2031, generate AED 800 bn in non-oil exports, and attract over USD 150 bn FDI by 2031.

discussed in Chapters 1 and 2. The results reveal that the growth dividends under this scenario would double non-oil growth to around 8 percent by 2050. While high, the results are consistent with the relatively small share of the non-oil sector in total GDP and with findings for other GCC countries (see for example Moreau and Aligishiev, 2022 for Saudi Arabia). Our findings are also consistent with recent IMF analysis which confirms high output multipliers associated with green investments (well within the 1.1 - 1.5 range (Batini et al, 2021)).

Figure 2. Green Investments, Reforms, and Impact on Non-Hydrocarbon GDP
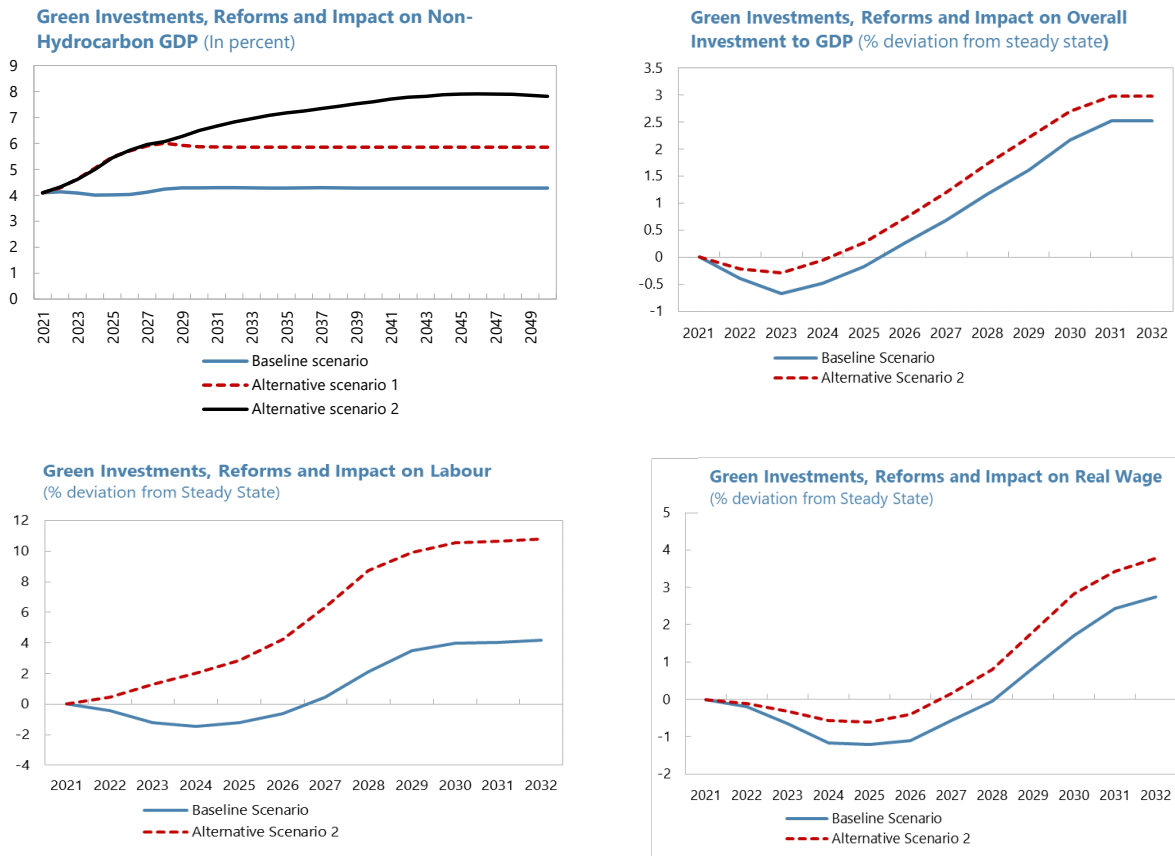
Source: IMF staff calculations.

Notes:

Baseline Scenario: Is aligned with the assumptions in the macro-framework underpinning the UAE 2022 Article IV consultations.
Alternative Scenario 1: Assumes that additional investments in green energy are expected to grow by an additional 2 percent of GDP per year until 2050 under the UAE Energy Strategy.
Alternative Scenario 2: Assumes that additional investments in green energy are combined with a well-coordinated and full implementation of the reform agenda. Full implementation implies that reforms are fully implemented leading to a 20% increase in public investment efficiency & return on investments, increase in skilled labor supply & private investments.
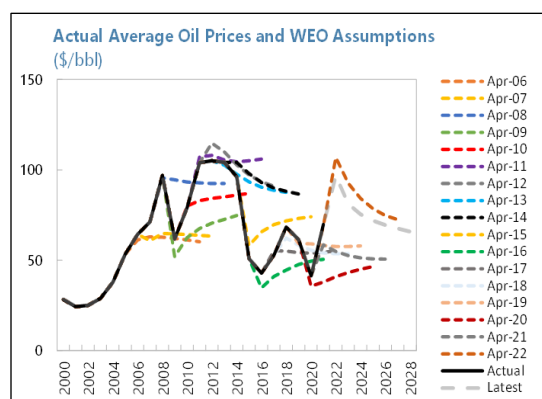
18. **Labor market reforms would enhance productivity and real wages**. Full implementation of the current labor reforms as one of the assumptions in the second alternative scenario, combined with a scale up of green energy investment would lead to an increase in labor supply by around 10 percent by 2027. At the same time real wages would increase by around 4 percent over the same period, reflecting potential gains in productivity. These findings are consistent with the literature suggesting a labor productivity payoff from low carbon energy investments (Garrett-Peltier, 2017 and Hepburn et al., 2020). The findings are also consistent with recent IMF analysis that shows a 7 percent wage premium associated with green-intensive job earns in comparison to pollution-intensive jobs (IMF 2022).

19. **A well-coordinated and prioritized reform agenda would support the growth dividend of larger green investments.** While the growth impact of additional investments would be hump-shaped, implying higher productive gains of public investments in the short-term with diminishing returns, successful implementation of the UAE's ambitious 50-year reform agenda would improve the investment climate for green energy, attract more private investment and skilled labor. The overall improvement in public investment efficiency would transform into a higher rate of return of green investment projects. These findings are consistent with the literature that reform policies would help to improve the investment climate for green energy and boost domestic and foreign investments as well as increase opportunities for growth and employment (see for example Gurara, Melina and Zanna 2019; Hepburn et al., 2020; and Engel and Kammen, 2009).
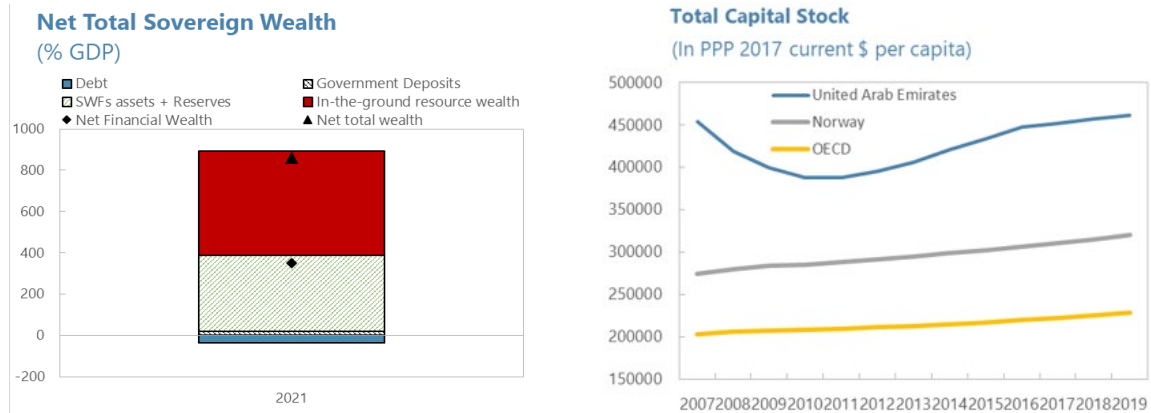
D. Fiscal Implications of Climate Policies in UAE

20. **The UAE pursued countercyclical fiscal policy after the GFC, helping to build large fiscal buffers to support ambitious reform agenda.** The UAE has amassed significant sovereign financial assets, estimated at around 350 percent of GDP in 2021 (comparable only to Norway), while also scaling-up investments in infrastructure (Figure 3). Fiscal and structural reforms have also improved fiscal and external breakeven oil prices and led to associated improvements in fiscal vulnerabilities to oil price volatility (Figure 1). Maintaining adequate financial (stabilization) buffers should help the UAE to withstand any large and persistent shocks, including related to global decarbonization efforts. These buffers also allow for a countercyclical fiscal policy and provide ample support to the government 2050 Strategy and UAE Green Agenda.

Actual Average Oil Prices and WEO Assumptions ($/bbl)

21. **Nevertheless, volatility and unpredictability of oil prices have increased in recent years**, while fiscal buffers were tapped to first respond to the COVID-19 crisis and then provide targeted support to the most vulnerable households to shield them from recent commodity prices shock.

Figure 3. Financial Wealth and Capital Stock

Net Total Sovereign Wealth
(% GDP)

Legend:
- Debt
- Government Deposits
- SWFs assets + Reserves
- In-the-ground resource wealth
- Net Financial Wealth
- Net total wealth

Total Capital Stock
(In PPP 2017 current $ per capita)

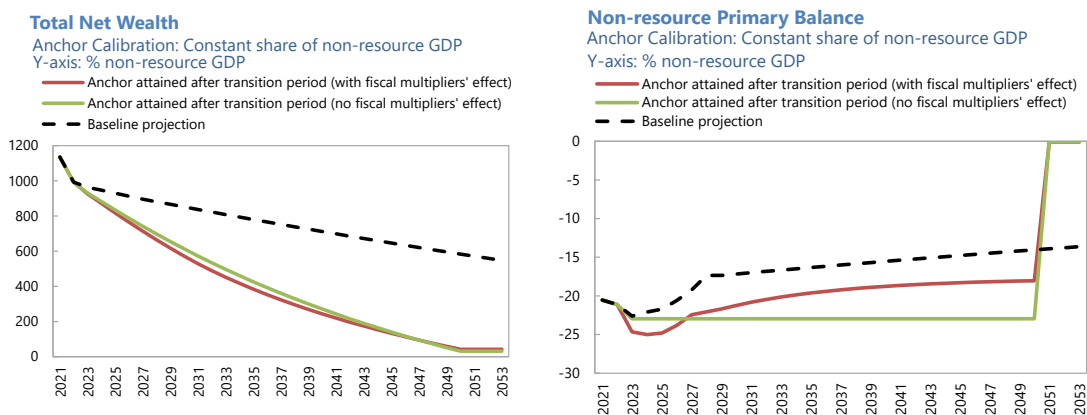Lines: United Arab Emirates, Norway, OECD

Sources: Bloomberg, Penn World Table 10.0, and IMF staff estimates.

Note: Net financial wealth is estimated based on publicly available information for total assets of CBUAE, UAE SWFs and Developmental Funds, such as Abu Dhabi Investment Authority, Investment Corporation of Dubai, Mubadala Investment Company, Abu Dhabi Developmental Holding Company, Emirates Investment Authority, Sharjah Asset Management, and Fujairah Holding.

22. **Accelerating energy transition reforms would put additional pressures on public finances.** Frontloading investments in adaptation and mitigation would mean higher non-oil primary deficits during the transition period, resulting in lower net public financial wealth (Figure 4). Alternative financing strategies (including relying more on green and sustainable private finance) would help to preserve net public financial wealth (2022 UAE AIV, Annex III). Mainstreaming private sector green finance and alternative and supporting fiscal policy options for meeting emissions goals, as well as appropriate design of these policies, could mitigate impacts on public finances.

Figure 4. Public Finance and Energy Transition

Total Net Wealth
Anchor Calibration: Constant share of non-resource GDP
Y-axis: % non-resource GDP
- Anchor attained after transition period (with fiscal multipliers' effect)
- Anchor attained after transition period (no fiscal multipliers' effect)
- Baseline projection

Non-resource Primary Balance
Anchor Calibration: Constant share of non-resource GDP
Y-axis: % non-resource GDP
- Anchor attained after transition period (with fiscal multipliers' effect)
- Anchor attained after transition period (no fiscal multipliers' effect)
- Baseline projection

Sources: Country authorities and IMF staff estimates.

Note: Constant share of non-resource GDP estimates nonhydrocarbon primary balance NHPB target consistent with consumption of a constant share of non-resource GDP overtime. The frontloading scenario shown on the charts assumes additional AED 600 bn investments in renewables by 2050 that are financed by exhausting existing public financial wealth, while the NHPB adjustment is postponed to 2050. No growth benefits beyond the fiscal multiplier effects are assumed.

E.   Developing and Facilitating Green and Sustainable Finance in UAE to Support Energy Transition

23.   The UAE has the most advanced sustainable finance framework in MENA. The UAE Sustainable Finance Framework (SFF) 2021-2030 envisages enhancing both supply and demand of sustainable finance and strengthening the enabling environment for diversified and innovative sustainable finance products. The UAE Sustainable Finance Working Group (SFWG)[13] identified three actions to support the development of the nation-wide SFF: (i) strengthening consistent sustainability disclosures across UAE, (ii) fostering sustainability focused corporate governance, and (iii) developing UAE taxonomy of sustainable activities. To operationalize the SFF, the UAE Ministry of Climate Change and Environment (MoCCAE) is working on defining a common green taxonomy at the sectoral level, identifying eligible green projects, and matching them with the least-cost financing instruments. Additionally, the authorities are assessing the need for targeted incentives and enhancing federal and local regulations to facilitate public-private collaboration (including PPP laws) for green projects. The UAE is also developing green finance capacity building programs to facilitate green projects implementation and setting a mechanism to monitor the initiatives, including in the financial sector.
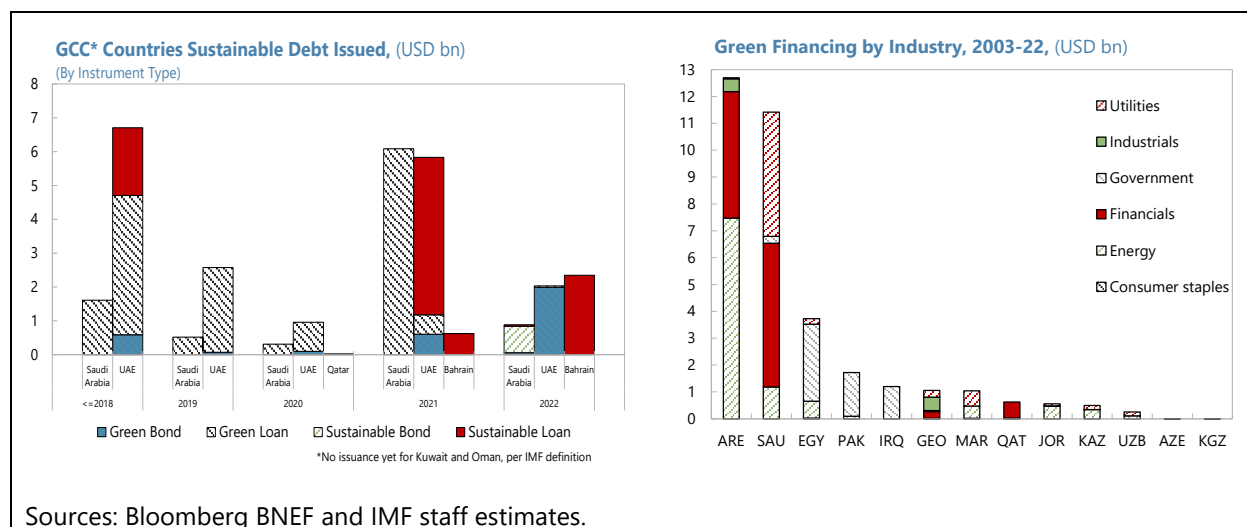
24.   Efforts are being undertaken to green the financial system. The CBUAE has added climate change to the list of its strategic priorities and is promoting standards in line with international best practices, focusing on risk management, stress testing, and data collection, as well as on deliverables related to the UAE taxonomy of sustainable activities. The CBUAE also supports the inter-agency work on the comprehensive response of the insurance industry to climate-related risks and opportunities. Abu Dhabi Global Market (ADGM) and DFS participate in the Network for Greening the Financial System (NGFS).[14]

25.   Despite the authorities' actions, sustainability considerations have only been partially mainstreamed into key businesses activities and the level of green finance remains low. Although issuances of green and green-linked bonds and loans in the UAE have increased, volumes remain quite low relative to estimated USD 163 billion financing need. Moreover, issuances have been mostly undertaken by the energy and financial sectors, and most of the pioneering green projects in the UAE are government funded or led, with limited private-sector participation.

---

[13] The Group includes the Ministry of Finance, the Ministry of Economy, the CBUAE, the MoCCAE, the Securities and Commodities Authority, the DFS Authority and the ADGM amongst others.

[14] The NGFS is a group of central banks and supervisors that share best practices and contribute to developing environment and climate risk tools. The ADGM Financial Services Regulatory Authority and the DFS Authority both joined NGFS in 2019. The NGFS group has 95 members with 16 observers.

GCC* Countries Sustainable Debt Issued, (USD bn)
(By Instrument Type)

Green Financing by Industry, 2003-22, (USD bn)

*No issuance yet for Kuwait and Oman, per IMF definition

Sources: Bloomberg BNEF and IMF staff estimates.

26.   The UAE could strengthen private green and sustainable finance through a number of avenues.

- *The UAE has diverse green finance products and services, with the total amount of green investments amounting to 6.8 percent of GDP (AED 80 billion15).* The 2016 State of Green Finance Report identified 16 types of products and services, ranging from green transition and project financing to green auto loans, sukuks, and credit lines, among others. The UAE was the first Gulf country to issue bank and company green sukuk. In 2017, First Abu Dhabi Bank issued a green bond valued at USD 587 million; in 2019, Majid Al Futtaim, a Dubai real estate company, issued successive USD 600 million green sukuk. Since 2003, the UAE has attracted USD 13 billion in green bonds and loans.

- *There is significant potential for the UAE SWFs to catalyze green investments.* SWFs are well-suited to support green investments given their substantial assets and inter-generational focus. UAE SWFs are investing in green infrastructure assets directly or via commitments on green infrastructure funds. In 2015, the Dubai Green Fund was established to support the implementation of viable green economy projects and programs, deploying about USD 27 billion. The fund serves as seed capital to encourage private finance to climate and green energy related activities, including energy efficiency and green energy power generation. Among other examples, Abu Dhabi's Mubadala and its subsidiaries support many wind and solar projects, including in developing countries, while Mubadala's Masdar is developing the first sustainable real estate investment trust in the UAE, with the Masdar Green REIT established at ADGM. SWFs could be further used to catalyze green investments by integrating national climate strategies into their long-term investment strategies. SWFs, PPPs, and joint investments in climate-friendly projects with institutional investors and multilateral development banks could further expand financing options.

---

[15] As identified by the 2016 State of Green Finance Report.

- *GREs, including ADNOC, could also play a key role in driving sustainable finance.* Given the prominent role of UAE GREs in the 2050 Strategies, they could offer opportunities to advance green transition.[16] For example, ADNOC is committed to supporting the national drive to achieve Net Zero emissions by 2050. To further reduce the intensity of its GHG emissions by 25 percent by 2030, ADNOC is investing to diversify outside its core business in new energy solutions and low carbon technologies and establishing partnerships to support the global energy transition. For example, Mubadala, ADNOC, and ADQ, established the Abu Dhabi Hydrogen Alliance to develop low-carbon green and blue hydrogen markets. ADNOC is also investing in CO2 utilization capabilities and providing solutions with a broader impact by strengthening Carbon Capture Utilization and Storage (CCUS) infrastructure in the UAE.

- *Supportive climate policies, including carbon pricing, could further enhance green finance options.* A carbon trading platform is being explored by the Dubai Carbon Centre of Excellence, while ADGM is working on carbon credit markets. Market mechanisms like cap-and-trade systems and voluntary carbon markets have been shown to reduce the overall cost of emission reductions and help develop private finance. There is also an opportunity for developing a regional carbon market, potentially building on the methodologies and framework of Qatar's Global Carbon Council or the proposed Riyadh Voluntary Exchange Platform initiative.

- *Other tools, like government guarantees and risk insurance, as well as investment mechanisms could also play a role but should remain targeted.* Guarantees could support private sector investments, while risk insurance would ensure risk sharing mechanism in case of project failure.

27.   The UAE's participation in internationally coordinated platforms could further promote and scale-up green finance internationally. For example, IRENA and the UAE announced the Energy Transition Accelerator Financing (ETAF) Platform, a new global climate finance facility to accelerate the transition to renewable energy in developing countries. To grow green finance portfolio in the context of international cooperation, the UAE might also consider enhanced participation in Debt-for-Nature and Debt-for-Climate Swaps.

F. Conclusions and Other Policy Considerations

28.   Managing climate change challenges and energy transition policies will be key to ensuring sustainable long-term growth. The UAE is committed to climate adaptation and mitigation policies that would ensure necessary transition of its economy away from fossil fuels. Our analysis shows that scaling up investments in clean energy and renewables while continuing to invest in the development of diversified and greener traditional energy products and markets under the UAE 2050 Energy Strategy would increase potential non-oil GDP in the medium- to long-term to 6 percent. The growth benefits could increase to about 8 percent in the medium- to long-term with

---

[16] The 30 UAE companies are committed to stepping up their efforts to combat climate change by measuring their carbon footprint and taking concrete steps to reduce it, and by integrating sustainability principles across their operations.

full and successful implementation of the UAE ambitious reform agenda as discussed also in Chapters 1 and 2. Nevertheless, the global decarbonization could happen faster and might require additional substantial financing.

29.   Accelerating energy transition reforms could put pressure on public finances. Frontloading investments in adaptation and mitigation would require alternative financing strategies, including relying more on green and sustainable private finance to help preserve net public financial wealth. Mainstreaming private sector green finance, energy transition enabling environment, and alternative and supporting fiscal policy options for meeting emissions goals, as well as appropriate design of these policies, could mitigate impacts on public finances.

30.   The UAE authorities are working on addressing the identified financing challenges to mainstreaming green finance in UAE. This includes resolving bottlenecks such as: (i) no universal definition of ESG finance; (ii) absence of nation-wide taxonomy; (iii) the lack of adequate enforcement of policies and regulations; (iv) scarce ESG financial disclosures at the company level[17]; (v) high risk of green sectors; (vi) long payback period and lack of long-term finance; and (vii) lack of profitability and clarity in benefits. Lack of data and standard methodology for measurement, reporting and verification (MRV) were also considered as barriers, since it affects decision-making such as due diligence and risk assessment. Developing and disseminating consistent climate related dashboards and unified databases will promote growth of green private finance, while education and training programs will enable finance providers to better identify, assess, price, and mitigate ESG risks. A sufficient base of well-qualified lawyers and accountants would further support the growing sustainable finance sector.

31.   The UAE should continue strengthening its governance, legislative and regulatory frameworks and their enforcement to create an enabling environment for private green finance markets. The focus should remain on setting a coherent UAE wide set of standards for ESG products to guide investors and avoid "greenwashing." The UAE's nation-wide taxonomy for ESG finance, along with pipeline of well-defined green projects, will help inform investors and set a path for economic transition. The UAE's regulators could help reinforce this initiative by enhancing legislations, removing financial and non-financial barriers, enforcing green finance rules and guidelines, boosting the capacity of the financial sector, and considering offering incentives such as preferential rates and credit allocation policies. Additionally, the nation-wide company level ESG disclosure standards should be followed, while ESG scoring methodology to assess ESG performance, industry practices, and corporate performance developed to support the industry.

---

[17] Only few organizations headquartered in the UAE currently support Taskforce for Climate-related Financial Disclosures (TCFD).

References

ADNOC. Overview - Abu Dhabi National Oil Company (adnoc.ae).

UAE Ministry of Climate Change and Environment. (2021). UAE Sustainable Finance Framework. https://www.moccae.gov.ae/assets/download/24b84d14/UAE_Sustainable_framework_21.pdf.aspx?view=true

Aligishiev, Melina and Zanna. 2021. DIGNAR-19 Toolkit Manual, No 2021/007, IMF Technical Notes and Manuals, International Monetary Fund.

Batini, Nicoletta and di Serio, Mario and Fragetta, Matteo and Melina, Giovanni and Waldron, Anthony, Building Back Better: How Big are Green Spending Multipliers? (March 1, 2021). IMF Working Paper No. 2021/087.

Berg, A., Portillo, R., Yang, S., and L.-F. Zanna. 2013. Public Investment in Resource Abundant Developing Countries. IMF Economic Review. Vol. 61, No. 1, pp. 92-129.

Bergek, A., Mignon, I. and Sundberg, G., 2013. Who invests in renewable electricity production? Empirical evidence and suggestions for further research. Energy Policy, 56, pp.568-581.

Buffie, E.F., A. Berg, C. Pattillo, R. Portillo, and L. F. Zanna. 2012. Public investment, growth, and debt sustainability: putting together the pieces. IMF Working Paper 12/144. IMF, Washington, D.C.

Dincer, I., 2000. Renewable energy and sustainable development: a crucial review. Renewable and sustainable energy reviews, 4(2), pp.157-175.

Dincer, I. and Rosen, M.A., 1998. A worldwide perspective on energy, environment and sustainable development. International journal of energy research, 22(15), pp.1305-1321.

Eyraud, L., Clements, B. and Wane, A., 2013. Green investment: Trends and determinants. Energy Policy, 60, pp.852-865.

Garrett-Peltier, H., 2017. Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model. Economic Modelling, 61, pp.439-447.

Gurara, Daniel and Melina, Giovanni and Zanna, Luis-Felipe, Some Policy Lessons from Country Applications of the Dig and DIGNAR Models (March 2019). IMF Working Paper No. 19/62.

Hepburn, C., O'Callaghan, B., Stern, N., Stiglitz, J. and Zenghelis, D., 2020. Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? Oxford Review of Economic Policy, 36(Supplement_1), pp.S359-S381.

IMF 2018. Public Investment Management Assessment— Review and Update: https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/05/10/pp042518public-investment-management-assessment-review-and-update

IMF GFSR, October 2022, Chapter 2, "Scaling up private climate finance in EMDEs: Challenges and opportunities".

IMF WEO, April 2022, Chapter 3, "A Greener Labor Market: Employment, Policies, and Economic Transformation".

Melina, G., S. C. S.Yang, and L. F. Zanna. 2016. "Debt Sustainability, Public Investment and Natural Resources in Developing Countries: The DIGNAR Model." Economic Modelling, Vol 52 (Part B), pp. 630–49.

Moriarty, P. and Honnery, D., 2016. Can renewable energy power the future? Energy policy, 93, pp.3-7.

Polzin, F., Migendt, M., Täube, F.A. and von Flotow, P., 2015. Public policy influence on renewable energy investments—A panel data study across OECD countries. Energy policy, 80, pp.98-111.

Sadeghi, A (2018) "How Public Investment Could Help Strengthen Iran's Growth Potential: Issues and Options. IMF Working Paper No. 18/129.

Sakai, A., Fu, C., Roch, F. and Wiriadinata, U. 2022. "Sovereign Climate Debt Instruments: An Overview of the Green and Catastrophe Bond Markets." IMF Staff Climate Note 2022/004, International Monetary Fund, Washington, DC.

Moreau, F and Aligishiev, (2022): Assessing the National Investment Strategy Using the DIGNAR-19 model : Saudi Arabia Selected Issues Paper IMF Country Report No. 22/275

Semieniuk, G. and Mazzucato, M., 2019. Financing green growth. Handbook on green growth, edited by Roger Fouquet, Edward Elgar Publishing (2019), pp. 240-259: Retrieved from

https://www.peri.umass.edu/economists/gregor123/item/1211-financing-green-growth

Simon Black, Victor Mylonas, Ian Parry, Nate Vernon, and Karlygash Zhunussova, 2022, "Climate Policy Assessment Tool (CPAT): A Tool To Help Countries Mitigate Climate Change", IMF forthcoming.

UAE Securities and Commodities Authority's Master Plan for Sustainable Capital Markets (2019).

Annex I. The DIGNAR-19 Model

1.   The Debt Investment Growth Natural Resources and COVID-19 (DIGNAR-19) model is an extension of the DIGNAR model by Melina, Yang and Zanna (2014, 2016) that accommodates the effects of the COVID-19 pandemic. The model has helped inform policy analysis, based on qualitative and quantitative scenario analysis, on issues such as public investment surges, fiscal consolidations, PFM reforms and the collapse of commodity prices, among others. The model has features of the debt model of Buffie et al. (2012) and the natural resource model of Berg et al. (2013). It includes a resource fund and a range of fiscal tools, such as consumption tax, income tax, and government spending, which is further divided into consumption, investment, and transfers. The model also contains resource-abundant developing economy features, such as absorptive capacity constraint and public investment inefficiency, which makes the model suitable for analysis in resource rich countries such as the UAE (see Gurara, Melina and Zanna ,2019 for an overview of the model application).

2.   The model consists of two types of households and three production sectors. The intertemporal optimizing households who have access to capital and financial markets and are able make future savings and the "hand to mouth" households who are poor, financially constrained and consume all their earnings. The production sectors include a nontraded good sector, a (non-resource) traded good sector, and a natural resource sector. The model further assumes that the natural resource sector is exogenous with all production in the sector assumed to be exported.

3.   The government uses revenue from taxes, resource revenues; bond sales, and the principal and interest earnings from the resource fund to finance public consumption, public investment, transfers to households, debt service payments, and savings in the resource fund.

4.   The model also includes a resource fund that serves as a fiscal buffer which is drawn down to cover a revenue shortfall or accumulates savings from excessive revenues. The resource fund can also be used in combination with other available fiscal tools in the model such as changing the rate of consumption or income tax, cutting, or expanding public consumption, and reducing or expanding transfers to households to cover the required public expenditure needs including public investments in line with fiscal rules there in, that allow to control the speed of fiscal adjustments needed to close the fiscal gap.

5.   The model further incorporates three main economic mechanisms for the analysis of public investment scale-up: (i) a growth-investment nexus, (ii) a fiscal response required to maintain debt sustainability, (iii) the potential for both crowding-in and crowding-out of private investment (iv) and the potential to increase labor supply. Higher public capital is assumed to raise productivity of private factors and increases real output as specified in the equation below[1]:

---

[1] See IMF (2022) for Saudi Arabia and Melina, Yang and Zanna, (2016) for details.

$$y_t = A_t (K^G_{t-1})^{\alpha_g} (L_t)^{\alpha_N} (K_{t-1})^{1-\alpha_N}$$

where y_t is the real output of the economy; A_t is the total factor productivity; L_t is labor; K_t and K^G_t are private and public capital stock respectively. $\alpha_g \epsilon$ (0,1) and $\alpha_N \epsilon$ (0,1) are elasticities with respect to public capital and the labor share in production, respectively. The level of public capital at any given year is a sum of the stock of capital in the previous year, net of depreciation, and the new effective public investment expenditure:

$$\underbrace{K^G_t}_{New\ public\ capital\ stock} = \underbrace{(1-\delta)K^G_{t-1}}_{Old\ capital\ after\ depreciation} + \underbrace{\in I^G_t}_{New\ investment\ after\ waste}$$

where I^G_t is the total public investment expenditure; $\delta \in$ (0,1) is the depreciation rate; and $\epsilon \in$ (0,1] governs the efficiency of public investment. Higher investment expenditure translates into higher capital stock, which in turn increases the marginal product of private capital. Higher marginal product of capital incentivizes the private sector to match higher public expenditure with more private investments. The strength of this crowding in effect depends on the size of the private investment adjustment costs:

$$\underbrace{K^G_t}_{New\ public\ capital\ stock} = \underbrace{(1-\delta)K^G_{t-1}}_{Old\ capital\ after\ depreciation} + \underbrace{I_t}_{New\ investment\ after\ waste} + \underbrace{\frac{k}{2}\left(\frac{I_t}{I_{t-1}}-1\right)^2 I_t}_{Adjustment\ cost}$$

where I_t is private investment expenditure and $\kappa \in$ [0,1) governs the size of the adjustment cost. Higher values of α_g and ϵ increase the size of the investment multiplier, while higher values of κ decrease it.

6.   Calibrating DIGNAR-19 for UAE. The DIGNAR-19 model is calibrated at an annual frequency using recent data capturing salient features of the UAE's economy. The key parameter values necessary to pin down the initial steady state are presented in Annex 1. Table 1. In some cases, parameters are calibrated in line with data provided by the IMF country team. The initial efficiency of public investment is set at 50 percent in line with the IMF's average score for the Middle East and Central Asis countries in 2017. Additional parameters are as in Aligishiev, Melina and Zanna (2021).

Table 1. United Arab Emirates: Calibrated Parameters and Initial Values for the Steady State
(In percent)

Potential real non-oil GDP growth rate	4.0
Exports to GDP ratio	71.9
Imports to GDP ratio	68.7
Private investment to GDP ratio	10.5
Public investment to GDP ratio	10.5
Public consumption to GDP	11.4
Total public revenues to GDP ratio	31.0
Share of government natural resource revenues in total government revenues	55.0
Public debt to GDP ratio	29.2
Private foreign debt to GDP ratio	76.9
Share of the natural resource sector to GDP	30.0
Implied interest rate on domestic debt	5.0
Public investment efficiency	50.0/70.0
Depreciation rate of public capital	7.0
Inverse of the Frisch elasticity of labor supply (skilled)	0.5
Inverse of the Frisch elasticity of labor supply (low skilled)	0.5

Source: IMF staff calculations.