



Causality between financial development and sectoral carbon emissions: evidence from GCC economies

Essahbi ESSAADI; Radouane HASNI; Wajih KHALLOULI

Outline

- 1. Motivations**
- 2. Research problem**
- 3. Objective**
- 4. Literature review**
- 5. Empirical Methodology**
- 6. Data**
- 7. Results**
- 8. Conclusions**

Motivations

- Sustained economic activity, fueled by high hydrocarbon revenues and abundant liquidity, has stimulated credit growth and bolstered banks' financial positions.
- The high level of financial development in the GCC is comparable to that of emerging markets.
- ✓ Environmental issues in the GCC countries are of great importance for a number of reasons:
 1. the most to global pollution per capita,
 2. the most vulnerable to the adverse effects of climate change

Research problem

Does financial development cause the quality of the environment?



If the relationship exist, which sector is most influenced by financial development?



How can policymakers reduce pollution through financial development policies?



Objective

We investigate the relationship between the Financial Development (FDI and its key dimensions) and the CO2 emissions per capita (CO2 and its principal sectors) for GCC countries.

Literature review

Authors	Country/Time	Variables of FD	Method	Findings
Bekhet et al (2017)	GCC countries for the period 1980-2011.	DCPS (%GDP)	VECM Granger causality	KSA : CO2→FD UAE : FD→CO2 Oman : FD→lnCO2 Kuwait :FD→CO2 Qatar : CO2→FD
Hasni et al (2023)	APEC 2000-2019	FDI (IMF)	Granger causality	Long run: FD ↔CO2 Short run : FD→CO2
Omri et al (2015)	12 MENA countries 1990-2011	DCPS (%GDP)	GMM and simultaneous-equation	Neutral
Bayar et la (2002)	11 post-transition European economies 1995-2017	FDI (IMF)	Dumitrescu-Hurlin	Neutrality hypothesis
Emenekwe et al (2022)	37 Sub-Saharan African countries 2000- 2016	FDI (IMF)	Dumitrescu-Hurlin	FD ↔CO2
Saud et al (2019)	59 Belt and Road Initiative countries 1980-2016.	DCPS (%GDP) FDB (% of GDP) FDFS (% of GDP)	Dumitrescu-Hurlin	FD ↔CO2
Kihombo et al. (2021)	WAME economies 1990–2017	Sum of FMI (IMF) and FII (IMF)	Dumitrescu-Hurlin	FD ↔CO2
Chen et al (2022)	31 provinces and municipalities in China 2000–2018.	the ratio of the loan balance to GDP	Toda-Yamamoto Fourier	FD ↔PM PM→FD FD→PM
Durusu-Ciftci et al (2020)	21 emerging markets 1971-2014	DCPS (%GDP)	Toda-Yamamoto Toda-Yamamoto Fourier Quantile panel Granger causality Kónya (2006)	South Korea and South Africa. CO2→FD Chile, India and Pakistan FD→CO2 Greece and Indonesia: FD ↔CO2 13 emerging markets: neutrality hypothesis
Faisal et al. (2023)	four emerging markets 1995-2018	Broad money	Kónya (2006)	Indonesia and Turkey: FD ↔EFP Malaysia and Nigeria: FD→EFP

Empirical Methodology

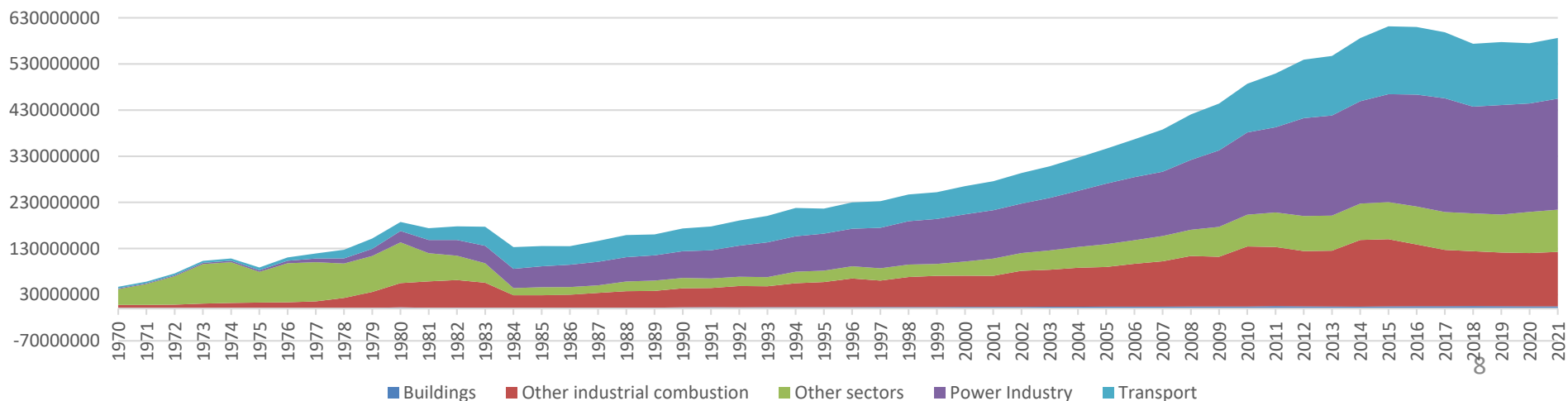
- Kónya (2006) outperform Granger causality testing approaches. Using a country-by-country analysis, between Y (FDI, and its key dimensions) and X (CO2 and its principal sectors) can be investigated using the following model:

$$y_{i,t} = \alpha_{1,t} + \sum_{l=1}^{mlyi} \beta_{1,i,l} y_{i,t-l} + \sum_{l=1}^{mlxi} \gamma_{1,i,l} x_{i,t-l} + \varepsilon_{1,i,t}$$
$$x_{i,t} = \alpha_{2,t} + \sum_{l=1}^{mlyi} \beta_{2,i,l} y_{i,t-l} + \sum_{l=1}^{mlxi} \gamma_{2,i,l} x_{i,t-l} + \varepsilon_{2,i,t},$$

Data

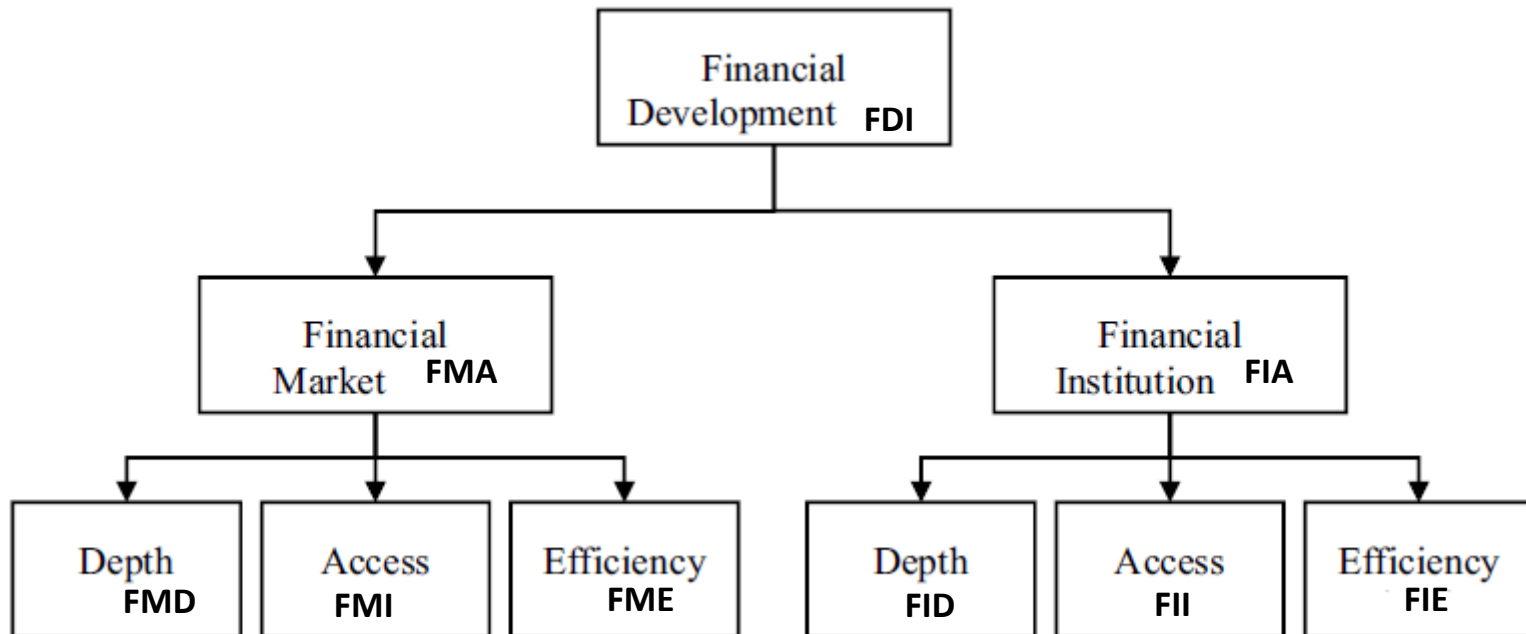
- the GCC: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates
- Total and sectoral CO2 per capita data are collected from the EDGAR (Emissions Database for Global Atmospheric Research) database from 1980 to 2021.

Saudi Arabia CO2 emissions by sector



Data

Data was collected from IFS web site. We use nine different financial index proposed by IMF. the Financial sector development index (FDI) and its sub-index were secured from the International Monetary Fund (IMF).



Results (1/3)

- None of the financial development indicators are significantly caused by CO2 emissions.

In the GCC region, 21 of the 51 relationships for which there is a causal effect from financial development indicators to CO2 :

-For Oman, the causality from financial development indicators (FDI, FII, FIA and the FMI) to CO2 .

-For KSA, the significant positive causality from financial development to CO2 is confirmed for FDI, FIA, FID, FII, FMD, FME and FMI.

-For Qatar, the results support a positive causal relationship between financial development and CO2 for the indicators FDI, FME and FMI, and a negative causal relationship for the indicator FIE.

➔ Financial development in these economies significantly boosts economic activity, which has a negative impact on environmental quality.

-In the case of the UAE, there is a causality from financial development to CO2 using four indicators (FDI, FMI, FMA and FMD), with a negative sign.

➔ Financial development in the UAE stimulates economic activity, but based on high technology, which allows a greater improvement in environmental quality .

Results (2/3)

Sectoral results: Which sectors are most sensitive to financial development?

-For all countries and all sectors, there is no causality effect from CO2 emissions to financial development, **except in UAE and Kuwait with the energy industry and other sectors.**

→The high level of carbon emissions in both (power industry and other sectors) has prompted UAE and Kuwait to develop their financial sector in order to improve the technologies used in industrial sectors to counter environmental degradation.

- Causality from FDI to CO2 emissions by sector: 12 / 36.

- For Bahrain, there is no causality from FDI to CO2 emissions, regardless of the sector.

- For Kuwait, FDI has a positive impact on CO2 emissions in Industrial Combustion, Power Industry, and other sectors.

- For Oman, Qatar, KSA, FDI positively causes CO2 emissions in Building, Combustion, Power Industry, and other sectors.

- For the UAE, financial development improves environmental quality only by reducing CO2 emissions in the Building and Power Industry sectors.

Results (3/3)

- Policymakers in each country should implement targeted policies that address their specific challenges:
- In Bahrain and Kuwait, the focus should be on promoting sustainable practices.
 - In Oman, Qatar and KSA, they should direct their financial sectors to promote green investments and technologies.
 - To reduce CO2 emissions, Saudi Arabia can develop the efficiency of its financial institutions.
 - The development of the financial sector in Saudi Arabia has had a positive impact on the reduction of CO2 emissions from the country's main source, the power industry.

Table 5: Bootstrap Granger causality from FDI to CO₂/cap

Countries	Sum of Coefficients (Sign of Causality)	Wald Statistic	Critical Value		
			10%	5%	1%
Bahrein	-0.0435	1.9899	2.8972	4.1689	7.7081
Kuwait	0.0686	0.9094	2.9523	4.1133	6.8621
Oman	0.2194	5.9705	3.8233	5.2406	8.8075
Qatar	0.1779	5.7064	2.9017	4.1613	7.5965
Saudi Arabia	0.1185	10.9267	3.2336	4.6597	8.2040
UAE	-0.1712	10.1115	3.6254	5.3328	9.7031

Table 17: Bootstrap Granger causality from FDI to Power Industry

Countries	Sum of Coefficients (Sign of Causality)	Wald Statistic	Critical Value		
			10%	5%	1%
Bahrein	0.1493	1.3200	2.9496	4.2880	7.6958
Kuwait	0.3383	3.4110	2.8687	4.3459	7.4281
Oman	0.1292	1.4844	2.8507	4.2096	7.4571
Qatar	0.0139	0.0309	2.8814	4.0988	7.3703
Saudi Arabia	-0.0546	2.3230	2.8422	4.0375	6.9937
UAE	-0.1820	4.2336	2.9467	4.1736	7.2365

Table 7: Bootstrap Granger causality from FIE to CO₂/cap

Countries	Sum of Coefficients (Sign of Causality)	Wald Statistic	Critical Value		
			10%	5%	1%
Bahrein	0.0333	0.1498	2.9380	4.2686	7.5008
Kuwait	0.3042	0.6957	2.8792	4.3858	9.1451
Oman	0.3697	2.4027	3.0836	4.6992	8.8165
Qatar	-0.3680	4.8955	2.8261	4.0653	7.2058
Saudi Arabia	-0.0832	1.7568	2.8744	4.0187	6.4214
UAE	0.0685	0.8783	2.8933	4.1978	7.2085

Conclusion

- GCC countries must consider the heterogeneous impact of financial development on CO2 emissions across various sectors.
- Policymakers in each country should implement targeted measures addressing their specific challenges.
 - Bahrain and Kuwait, where CO2 emissions show less sensitivity to financial development, the focus should be on fostering sustainable practices.
 - In contrast, Oman, Qatar, and KSA should orient their finance sector toward promoting green investments and technologies while establishing incentive mechanisms for adopting energy-efficient technologies, which can reduce emissions.

Conclusion

The novelty of this study is two-fold:

1. To our knowledge, we are the pioneers in studying the relationship between CO₂ emission and the Financial Development index for the GCC region by using the **bootstrap panel Granger causality procedure**.
2. Our study extends the related literature due to **sectoral CO₂ emission and Financial Development relationship**. This last finding helps policymakers to identify the causal links between vital financial indicators to achieve environmental objectives at a low cost.

Thank you for your attention