IMPACT OF FINANCIAL DEVELOPMENT ON CARBON DIOXIDE EMISSIONS: EMPIRICAL EVIDENCE FROM AZERBAIJAN, RUSSIA, AND KAZAKHSTAN

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Overview

This paper empirically examines how financial sector development affects the carbon dioxide emissions in economically hydrocarbon dependent three post-Soviet economies - Azerbaijan, Russia, and Kazakhstan. To examine this relationship, we employed cointegration techniques to the data ranging from 1990 to 2019. We found that financial sector development has a positive and statistically significant impact on environmental pollution in all three countries. These empirical findings are in line with the theory. While the impact on carbon emissions was highest for Azerbaijan, it was the lowest for Russia. Considering the chosen countries have resource-dependent economies, as the more developed and liberalized the financial sector becomes, it intermediates investments more to oil-gas-related projects. Moreover, with the improving economic development in these countries under favorable oil prices, the living standards of people increases, and consumers are inclined to spend more on energy consumption intensive areas to enhance their living conditions, which engenders a rise in carbon dioxide emissions. Since information-intensive industries have not yet been established in the chosen countries, economic activities keep posing a negative impact on environmental pollution in the form of carbon dioxide emissions. The implications of the empirical results are discussed for energy and financial development policies.

Methods

Our empirical model is constructed as follows:

$$CO2PC=C(0)+C(1)FINDEV+C(2)GDPPC+C(3)OILPRC+C(4)AWA$$

Variable	Symbol	Description	Expected sign	Economic implication
Carbon emission	CO2PC	measured in metric tons per capita	-	-
Financial development	FINDEV	the index is based on (a) domestic credit provided the by financial sector (% of GDP), (b) foreign direct investment, net inflows (% of GDP), and (c) trade (sum of imports and export as a % of GDP)	+/-	If financial development impact is positive on carbon emissions, this means financing is directed to projects which contribute to environmental pollution. If this impact is negative, it means the financial sector helps companies to run financing more into green projects.
GDP per capita	GDPPC	GDP per capita in current USD	+	A higher level of GDP per capita increases carbon emissions. Considering the economic structure of the studied countries, we assume a positive linear impact of income on CO2 emissions.
Oil prices	OILPRC	Europe Brent Spot Price FOB (USD per Barrel)	+/-	When oil prices increase, oil-exporting countries are prone to either spending carelessly or investing in eco-friendly projects. Thus, the change in this variable may have both positive and negative impacts on carbon dioxide emissions.
Awareness of climate urgency	AWA	individuals using the internet as a percent of the population	+/-	If positive, though people are aware of climate change, they keep using fuel dominant means. If negative, it means, people are conscious of climate urgency and adopting environmentally friendly behavior.

All variables are used in a logarithmic form. We analyze the relationship between CO2 emission, financial development, oil price, awareness, and GDP per capita variables using the Dynamic Ordinary Least Squares (DOLS) technique (Stock & Watson, 1993). First, we checked the non-stationarity characteristics of selected variables. We used Augmented Dickey-Fuller (ADF, (Dickey & Fuller, 1981)) unit root test and Phillips–Perron test (PP, (Phillips & Perron, 1988)). Next, we can proceed to the cointegration test to analyze whether the variables move together in the long run. For this purpose, we used the Engle-Granger test (Engle & Granger, 1987) (cite it) for cointegration. After confirming the cointegration, we applied DOLS to investigate the long-run relationship among the variables.

Results

Results of empirical estimations show that financial development has a positive and statistically significant impact on carbon emissions for all three selected countries, which is in line with the findings of many papers (Sadorsky, 2010, 2011; Ali et al., 2018; Ma and Fu, 2020, among others). This finding allows us to conclude that, amid the development period of a country, where environmental quality is not a priority, betterment in the relatively easy access to finance "motivates" further consumption. The additional eco-unfriendly consumption results in environmental degradation.

We found that a 1% increase in financial development resulted in a 0.47%, 0.19%, and 0.30% rise in carbon dioxide emissions, respectively, in Azerbaijan, Russia, and Kazakhstan. Empirical results show that for Azerbaijan financial development and oil price, for Russia oil price and GDP per capita, and for Kazakhstan GDP per capita and financial development have the highest by the impact on carbon emissions. The impact of oil price was negative and statistically significant, GDP per capita was positive and statistically significant. While awareness of the population about climate urgency was negative and statistically significant for Azerbaijan and Kazakhstan, and it was positive and statistically significant for Russia. Overall, economic growth and financial sector liberalization raise carbon emissions, and oil prices and citizens' awareness about environmental degradation have a negative impact, as expected.

Conclusions

In this study, we investigated the impact of financial development on carbon dioxide emissions using DOLS for three post-Soviet countries – Azerbaijan, Russia, and Kazakhstan – with similar economic development and structure. The unit root exercises for variables of interest displayed their stationarity at first differenced form. Next, variables were tested for the long-run relationship by employing the Engle-Granger test for cointegration. The obtained results show the validity of cointegration among variables which implies the existence of a long-run relationship between financial development and carbon dioxide emissions in selected countries. The empirical results indicated that by employing the DOLS technique, financial development proxied by respective index built on credit to GDP, foreign direct investment, and trade balance could increase carbon dioxide emissions. Numerically, a 1% increase in financial development results in a 0.47%, 0.19%, and 0.30% rise in carbon dioxide emissions, respectively, for Azerbaijan, Russia, and Kazakhstan. Moreover, economic development also leads to an increase in environmental pollution. At the same time, oil prices and awareness of the population of climate urgency and changing their behavior have decreasing influence (except Russia) on carbon emission.

Based on the empirical results, we conclude the following policy implications. First, financial sector development is a lubrication channel for improving economic development; nevertheless, considering the calls for climate change, a "greener" investment approach should be adopted for alleviating carbon emissions and achieving sustainable and resilient economic growth. This is a crucial point for policymakers to consider when formulating energy and financial development policies. We performed a robustness check and verified the reliability of the results. As a part of the robustness exercise, we used several cointegration methods, but the results received by the DOLS technique outperformed results produced by other techniques. We also used other financial sector development proxies (domestic credit to private sector by banks (% of GDP) and foreign direct investment, net inflows (% of GDP)), and various control variables such as urban population growth (annual %), fossil fuel energy consumption (% of total). It would be interesting for future research to investigate similar relationships in the case of other oil-exporting countries.