COULD INVESTMENT IN INFRASTRUCTURE SOFTEN THE POLLUTION HAVEN HYPOTHESIS IN DEVELOPING COUNTRIES?

Rafaela Vital Caetano, NECE-UBI, University of Beira Interior, rafaela.caetano@ubi.pt
António Cardoso Marques, NECE-UBI, University of Beira Interior, amarques@ubi.pt
Tiago Lopes Afonso, NECE-UBI, University of Beira Interior, tiago.afonso@ubi.pt
Isabel Vieira, CEGACE-UÉ, University of Évora, impvv@uevora.pt

Overview

The urgency of fighting climate change has led economists to scrutinise the relationship between Foreign Direct Investment (FDI) and the environment. Such analyses may assess the consequences of FDI in the host countries from two main perspectives: the Pollution Haven Hypothesis (PHH) and the Pollution Halo Hypothesis (PHlH). The first holds that countries with stricter environmental regulations may relocate their polluting industries to countries with more relaxed environmental constraints (e.g. Xu et al., 2021). Briefly, relaxed environmental regulations can translate into lower environmental compliance costs, thus reducing production costs. Developing countries may thus hold a comparative advantage. The PHlH is based on the positive spillover effect of FDI; the host country might benefit from greener and more efficient technologies that consume less energy (e.g. Balsalobre-Lorente et al., 2019).
The comparative advantage of some developing countries over polluting goods might be the most relevant factor for attracting polluting FDI. Therefore, strengthening their environmental restrictions to softening this comparative advantage might reduce the harmful effect of FDI. However, developing countries are evolving a dependency on foreign investment to promote their economic growth (e.g. Qureshi et al., 2020). Therefore, softening this comparative advantage might have a negative impact on economic growth, and can then be a potential barrier to changes in environmental behaviour in developing countries, compromising global sustainability.
Some studies support the transfer of polluting industries solely based on the polluting effect of FDI. However, the PHlH suggests that there is a relationship between FDI, energy, and its sources. As FDI might reduce pollution by reducing energy consumption, could FDI increase pollution by raising energy consumption from non-renewable sources? The lack of renewable energy infrastructure can be a challenge for developing countries but can be an indispensable driver for their economic growth (Khanna and Sharma, 2021). Corruption may be a concern when investing in developing countries, but its control can thus increase investment levels and boost economic growth (Aparicio et al., 2016).
This study considers the energy structure of the host countries before supporting the transfer of polluting industries. Therefore, this study analyses the effects of FDI and the Private Participation in Energy Infrastructures (PPEI) on Gross Domestic Product (GDP), Carbon Dioxide (CO_2) emissions, and Clean Energy Transition (CET) and assesses the impact of FDI and PPEI on energy transition, contributing to ascertaining the impact on both renewable and fossil fuel energy supply. The results indicate that investment in renewable energy infrastructure and energy transition are quite relevant and urgent to change the energy paradigm and thus reducing the polluting impact of FDI in developing countries.

Methods

This study analyses 17 developing countries from 2000 to 2018. The countries are selected according to the data availability on the World Bank's Private Participation in Infrastructure. The analysis is divided into two stages. In the first stage, a non-parametric analysis using Data Envelopment Analysis (DEA) is carried out to evaluate the efficiency of the countries to attract both FDI and PPEI. The inputs are chosen following the literature on the determinants of FDI and PPEI; trade openness, regulatory trade barriers, labour force, energy consumption, and political stability. The output variables are Inward FDI stock (for FDI efficiency), and Private Participation in Energy Infrastructure Investments (for PPEI efficiency). Then, FDI and PPEI efficiency are used in the second stage of the analysis where a Seemingly Unrelated Regression (SUR) is carried out. This model has diverse advantages: (i) it allows an analysis of the three dependent variables simultaneously with their error terms but with a contemporaneous correlation between them (Nasri and Zhang, 2019); (ii) it preserves degrees of freedom; (iii) it handles heteroskedasticity and contemporaneous correlation; and (iv) it is robust to small sample sizes.

Results

FDI increases economic growth, pollution and reduces energy transition. PPEI appears to reduce economic growth, which merits debate. The economic growth of many developing countries is based on comparative advantages such as natural resources (mainly hydrocarbons). The main concern is the lack of efficient use of these resources which leads to countries suffering from environmental degradation and economic recession (Cheng et al., 2021). The effect of the PPEI increasing energy transition might reveal an increase in overall energy consumption (both renewable and non-renewable). However, there is potential to reduce pollution.

Controlling corruption has the same effect as FDI: it increases economic growth, pollution, and reduces energy transition. These effects suggest that controlling corruption might boost investment that increases non-renewable energy use. This might be evidence of the lack of renewable energy infrastructure to generate the renewable energy required to meet demand.

Sectoral diversification, measured through the Hannah-Kay (HK) index using the sectoral share of value-added (OECD 2013), reduces economic growth. Sectoral diversification could suggest an increase in high technological sectors. These sectors commonly require specialised knowledge which, on its turn, demands higher spending on education. As these countries have lower wealth, any additional spending may impact economic growth, at least in the short run. However, this diversification appears to reduce CO_2 emissions by increasing the renewable energy supply. Energy imports appear to be a barrier to energy transition, as by importing energy at competitive prices, investment in renewables might be delayed (Afonso et al., 2021), however, it could benefit countries when the imported energy is from renewable sources.

Conclusions

The pollutant effect of FDI supports the PHH, thus confirming the transfer of polluting industries. However, FDI boosts energy demand and, to meet that demand, the available energy is used, which in developing countries is mostly from fossil fuels. Increased control of corruption has the same environmental impact as increased FDI: an expansion of non-renewable energy supply leading to more pollution. This might occur due to increased levels of investment and production in developing countries. Therefore, the impact of FDI and control of corruption might highlight a lack of renewable energy infrastructure in developing countries and not necessarily a transfer of polluting industries. Investment in energy infrastructure should reduce pollution. Therefore, developing countries' governments should attract private investment (both domestically and abroad) in energy infrastructure through the implementation of good governance. However, this investment must be directed towards renewable energy infrastructure, to avoid resource-exhausted exploitation.

The analysis of the environmental impacts of FDI must be accompanied by a detailed assessment of the effects of energy consumption (and its sources). PPEI seems to be able to soften the polluting effect of FDI. Strategies to attract FDI must be accompanied by policies to encourage the use of renewable energy. Developing countries should change their comparative advantages into more environmentally friendly ones and turn their energy structure into a renewable one (through PPEI), thus reducing the pollutant effect of investments (mainly FDI).

References

Afonso, T. L., Marques, A. C., & Fuinhas, J. A. (2021). Does energy efficiency and trade openness matter for energy transition? Empirical evidence for countries in the Organization for Economic Co-operation and Development. *Environment, Development and Sustainability*, *0123456789*. https://doi.org/10.1007/s10668-021-01228-z

Aparicio, S., Urbano, D., & Audretsch, D. (2016). Institutional factors, opportunity entrepreneurship and economic growth: Panel data evidence. *Technological Forecasting and Social Change*, *102*, 45–61. https://doi.org/10.1016/J.TECHFORE.2015.04.006

Balsalobre-Lorente, D., Gokmenoglu, K. K., Taspinar, N., & Cantos-Cantos, J. M. (2019). An approach to the pollution haven and pollution halo hypotheses in MINT countries. *Environmental Science and Pollution Research*, *26*(22), 23010–23026. https://doi.org/10.1007/s11356-019-05446-x

Cheng, Z., Li, X., & Wang, M. (2021). Resource curse and green economic growth. *Resources Policy*, *74*(September), 102325. https://doi.org/10.1016/j.resourpol.2021.102325

Dong, Y., Shao, S., & Zhang, Y. (2019). Does FDI have energy-saving spillover effect in China? A perspective of energy-biased technical change. *Journal of Cleaner Production*, *234*, 436–450. https://doi.org/10.1016/j.jclepro.2019.06.133

Khanna, R., & Sharma, C. (2021). Does infrastructure stimulate total factor productivity? A dynamic heterogeneous panel analysis for Indian manufacturing industries. *Quarterly Review of Economics and Finance*, *79*, 59–73. https://doi.org/10.1016/j.qref.2020.08.003

Mufutau Opeyemi, B. (2021). Path to sustainable energy consumption: The possibility of substituting renewable energy for non-renewable energy. *Energy*, *228*, 120519. https://doi.org/10.1016/j.energy.2021.120519

Nasri, A., & Zhang, L. (2019). Multi-level urban form and commuting mode share in rail station areas across the United States; a seemingly unrelated regression approach. *Transport Policy*, *81*(May 2018), 311–319. https://doi.org/10.1016/j.tranpol.2018.05.011

OECD. (2013). *OECD Science, Technology and Industry Scoreboard*. https://doi.org/10.1787/sti_scoreboard-2013-sum-sl

Qureshi, F., Qureshi, S., Vinh Vo, X., & Junejo, I. (2020). Revisiting the nexus among foreign direct investment, corruption and growth in developing and developed markets. *Borsa Istanbul Review*. https://doi.org/10.1016/j.bir.2020.08.001

Xu, C., Zhao, W., Zhang, M., & Cheng, B. (2021). Pollution haven or halo? The role of the energy transition in the impact of FDI on SO2 emissions. *Science of the Total Environment*, *763*, 143002. https://doi.org/10.1016/j.scitotenv.2020.143002