From rents to renewables: The financial tipping point in OPEC's energy divide

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Overview

This paper develops a dynamic optimization model to analyze the allocation of oil rents between renewable (RE) and non-renewable energy (NRE) sectors in OPEC economies, considering the systemic effects of financial development and lobbying pressure. The model demonstrates that financial development enhances RE investments once it exceeds a threshold, accelerating capital accumulation in the sector. However, lobbying pressure diverts resources to the NRE sector, potentially reversing RE growth. The steady-state analysis reveals the equilibrium allocation of oil rents is shaped by the balance between financial development and lobbying, with dynamics sensitive to initial conditions. Empirical validation through threshold regression analysis of OPEC countries (1988–2019) confirms that strong financial systems foster RE investments, while lobbying reduces their effectiveness. These findings underscore the need for structural policies promoting financial development and curbing lobbying influences to support a sustainable energy transition in resource-dependent economies.

Methods

The study employs an intertemporal optimization framework where a representative agent allocates oil rents between the RE and NRE sectors. In this theoretical model, capital accumulation dynamics in each sector are driven by investment decisions influenced by financial development and lobbying. The renewable energy sector's investment efficiency improves with financial development, particularly once the critical threshold is reached. Conversely, lobbying activities create friction, diverting resources to the non-renewable energy sector and impeding renewable energy growth. The model incorporates steady-state analysis to identify equilibrium allocations and assess the sensitivity of convergence dynamics to initial conditions. After establishing the theoretical foundations, the empirical section of the paper employs a panel threshold regression model to assess the validity of the theoretical findings. To address potential endogeneity of oil rents, the analysis integrates a recent control function approach developed by Zhang et al. (2024), which tackles effectively endogeneity issues at the threshold variable. Specifically, this methodology accounts for the exogenous variation in oil rents, ensuring robust estimation of their impact on renewable energy investments (REN) at varying levels of financial development. Overall, the dual approach adopted in this study allows for a comprehensive understanding of the systemic dynamics of renewable energy investments in OPEC economies from both a theoretical and empirical standpoint.

Results

The model reveals that financial development accelerates capital accumulation in the RE sector once it surpasses a critical threshold. Lobbying pressure reduces the allocation of oil rents to renewable energy, counteracting the positive effects of financial development. High financial development combined with low lobbying pressure leads to greater shares of oil rents being directed toward RE investments, enhancing steady-state capital in the sector. In contrast, excessive lobbying diverts resources to NRE, resulting in reduced RE growth or even decline under extreme conditions. The dynamics of convergence show that low lobbying pressure and robust financial development accelerate the system's stabilization, while high lobbying slows or destabilizes convergence to the steady state. Empirical results validate these theoretical insights, demonstrating the significant role of financial systems and lobbying in shaping energy transition trajectories in OPEC economies.

Conclusions

This analysis bears important policy insights for OPEC economies seeking a sustainable energy transition. Enhancing financial development is shown to be a key factor in accelerating renewable energy investments and capital accumulation, particularly when financial systems are robust and effective. However, the detrimental impact of lobbying pressure on the allocation of oil rents highlights the need for measures to counteract such influences. In this regard, efforts to promote transparent and equitable decision-making processes can reduce the distortionary effects of lobbying, enabling a more balanced allocation of resources. Furthermore, policies that strengthen financial institutions and improve access to funding for renewable energy projects can create an environment conducive to growth in the renewable sector. The dual approach of promoting financial development while addressing lobbying pressures can ultimately serve as an effective policy strategy to improve the the efficiency and equity of resource allocation, supporting long-term environmental and economic sustainability in OPEC economies.

References

Zhang, J., Chen, C., Sun, Y., & Stengos, T. (2024). Endogenous kink threshold regression. *Journal of Business & Economic Statistics*, 1-12.