The Effect of Financial Development on the Decoupling of Energy Consumption and Economic Growth[1]

Saeed Rasekhi[2], Sara Ghanbartabar[3]

INTRODUCTION

Although the financial economics literature provides significant evidence of the positive effects of financial development on macroeconomic indicators and economic growth (Cooray, 2010; Guru & Yadav, 2019), as well as its negative impact on energy consumption (Chiu & Lee, 2020; Adom et al., 2020), the question remains unanswered: can financial development improve the decoupling of energy consumption from economic growth? Answering this question requires examining the status of the decoupling period and assessing the impact of financial development on this period. Given the empirical gap regarding the influence of financial development on the decoupling of energy consumption and economic growth, this study aims to test the hypothesis that financial development can enhance the decoupling of economic growth from energy consumption. The research unfolds in two stages: first, using the Tapio approach, decoupling intervals are plotted for 64 selected countries during the period

2002-2021. Second, the study investigates and tests the effect of financial development on decoupling using the Generalized Method of Moments (GMM).

MATERIALS AND METHODS

According to Tapio, the decoupling coefficient ($e(E)$) is calculated according to equation (1).

(1)
$$e(E) = \frac{(\Delta E_t / E_{t-1})}{(\Delta G_t / G_{t-1})}$$

where, ΔE_t indicates changes in energy consumption during the period, E_{t-1} indicates energy consumption in the base year, ΔG_t changes in GDP per capita during the studied period, and G_{t-1} is GDP per capita in the base year.

This research econometric model is based on equation (2) with the logarithm of energy consumption ($\log E_{it}$), economic growth ($\log Y_{it}$), and also the interaction of the logarithm of economic growth with the logarithm of independent variables including financial development ($logFD_{it}$), economic freedom ($logFHI_{it}$), human development ($log\ HDI_{it}$), economic structure ($log\ IND_{it}$), energy price ($log\ PE_{it}$), technology ($logTEC_{it}$) and urbanization ($logURB_{it}$) all in the year t for the country i.

$$\log E_{it} = \alpha_0 logE_{it-1} + \alpha_1 \log Y_{it} + \alpha_2 \log Y_{it}.logFD_{it} + \alpha_3 \log Y_{it}.log\ HDI_{it} +$$
$$\alpha_4 \log Y_{it}.logFHI_{it} + \alpha_5 \log Y_{it}.logTEC_{it} + \alpha_6 \log Y_{it}.log\ IND_{it} +$$
(2)
$$\alpha_7 \log Y_{it}.logURB_{it} + \alpha_8 \log Y_{it}.log\ PE_{it} + \varepsilon_{it}$$

Equation (2) is estimated using the Generalized Method of Moments (GMM).

RESULTS AND DISCUSSION

Figure (1) illustrates the decoupling intervals estimated in the present research for selected countries during the years 2002-2021. According to this figure, the state of decoupling of energy consumption from economic growth in the studied countries falls within the first region of Tapio coordinates, indicating weak decoupling. Furthermore, based on the estimation results of this research model, financial development enhances decoupling within the first region of Tapio coordinates, thereby confirming the research hypothesis. Although the variables influencing energy consumption (including financial development, economic freedom, and human development) have contributed to decoupling, their overall effect has not fundamentally altered the decoupling period.
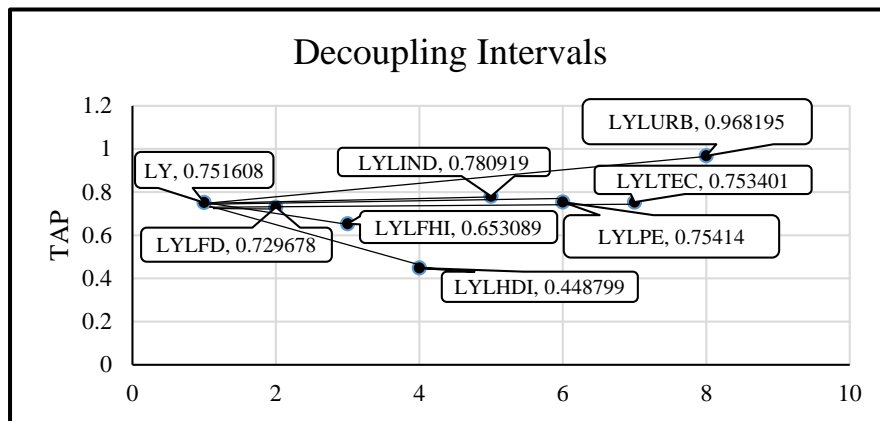
Figure 1. Decoupling intervals for selected countries during the years
2002-2021
Reference: Present Research

CONCLUSION

The main purpose of this research is to address the recent question and test the hypothesis that financial development can improve the decoupling of energy consumption from economic growth. For this purpose, the method of Generalized Method of Moments was employed for 64 selected countries based on the maximum available data during the period of 2002-2021.

The results obtained in this research confirm the hypothesis that financial development improves the decoupling of energy consumption from economic growth. However, according to the results, although the variables affecting energy consumption have played a role in decoupling, the overall effect of these variables has not been able to create a fundamental change in the decoupling interval. Furthermore, it seems that decoupling in the selected countries needs to be shifted to the fourth region of Tapio coordinates, where energy consumption decreases and economic growth increases. Achieving this requires the application of soft policies, particularly targeted at financial development, energy-oriented efficiency, and upgrading energy hardware and technology through financial means to reduce energy intensity.

Overall, based on the results of this research, although financial development has improved decoupling, a sustainable development approach is necessary for achieving strong decoupling.

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