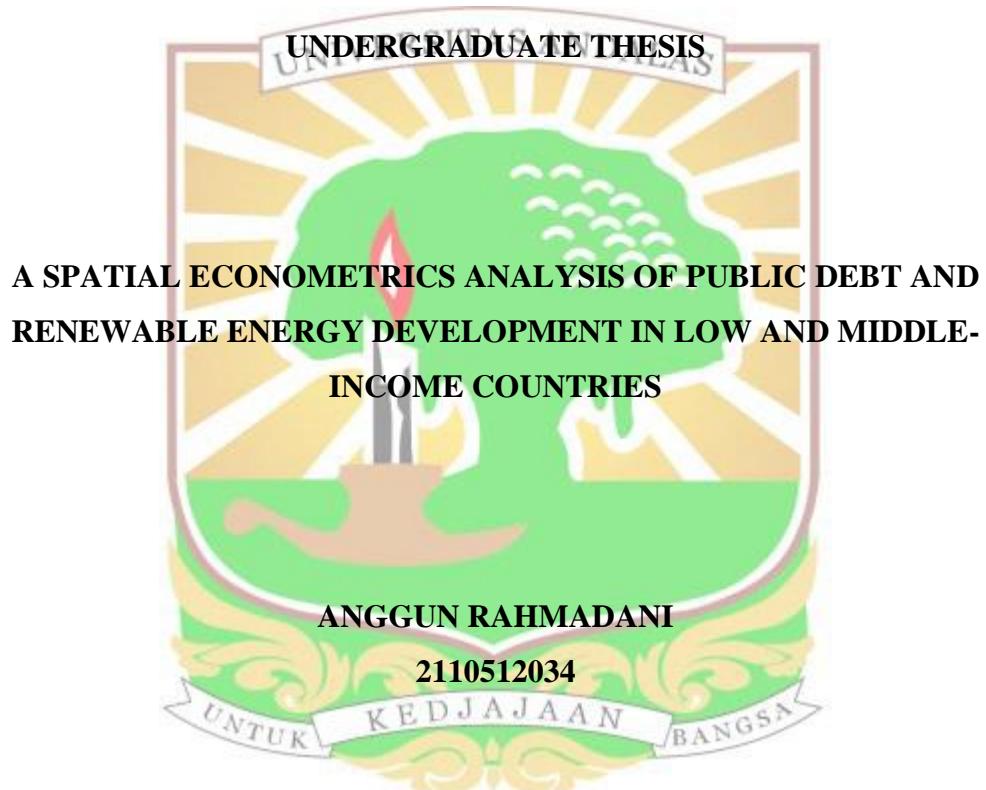




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A SPATIAL ECONOMETRICS ANALYSIS OF PUBLIC DEBT AND RENEWABLE ENERGY DEVELOPMENT IN LOW AND MIDDLE-INCOME COUNTRIES

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ABSTRACT

This study aims to analyze the relationship between public debt and renewable energy development across different stages, namely renewable energy investment (REI) and renewable energy generation (REG). It also investigates the moderating roles of financial institutions (FI) and financial markets (FM) in shaping the relationship between public debt and renewable energy development. Using panel data for 69 low- and middle-income countries over the period 2000–2020, this study employs the Spatial Durbin Model (SDM) to capture the direct nonlinear and spatial spillover effects of public debt while accounting for cross-country interdependence. The results reveal that public debt exhibits a nonlinear relationship with renewable energy development, characterized by an inverted U-shaped effect on renewable energy investment and a U-shaped effect on renewable energy generation, reflecting differences in adjustment speed and project maturity. Moreover, public debt generates negative spillover effects on renewable energy generation. The moderating analysis shows that financial institutions mainly act as domestic stabilizers by strengthening the nonlinear impact of public debt within countries, whereas financial markets amplify both domestic and regional effects, particularly for renewable energy generation through financial integration and positive spillovers. Overall, these findings highlight the importance of effective debt management and financial sector development in maximizing the role of public debt in supporting renewable energy transitions in low- and middle-income countries, while emphasizing the relevance of spatial dynamics in clean energy policymaking.

Keywords: Public Debt; Renewable Energy Investment; Renewable Energy Generation; Spatial Durbin Model

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