

Natural Resources and Economic Growth

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Abstract:

Renewable and non-renewable energy sources have become the central debate of economists, triggered by the concern over resource scarcity. These two types of resource are different with respect to the replenishment ability. Then, output growth based on either energy source is expected to show different paths along the optimal and balanced-growth path which the present paper attempts to investigate. The optimal control theory is applied to the theoretical model part, from which the results are subject to a simulation with MATLAB. The results support that along the optimal path, renewable energy-based output grows at a positive rate whereas that of non-renewable energy depends on whether saving is high enough to exceed the share of non-renewable energy. Along the balanced growth path, non-renewable energy-based per capita output growth would be negative if there is no technological progress. However, that of renewable energy-based per capita output would be positive if investment elasticity of energy production is high enough, even though there is no technological progress. The level of technological progress may not be an impeding factor to achieve a positive growth rate of per capita output based on renewable energy in the long-run since the investment-elasticity of energy can offset the effect of having zero technological progress on output growth. Further results will be discussed in the analysis.

Keywords: Energy, optimal control theory, balanced-growth path, simulation

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