

**INSIGHTS AND PERSPECTIVES ON THE INTEGRATION OF PHYSICAL AND MONETARY  
PRINCIPLES IN THE “HARMONEY” ECONOMIC GROWTH MODEL**

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**ABSTRACT**

A recent publication of my Human and Resources with MONEY (HARMONEY) model shows that it can simultaneously mimic several important long-term dynamic trends of the United States (U.S.) and global economies [1]. These trends include resource intensity, debt levels, wage levels (or wages as a share of gross domestic product), and the distribution of monetary transactions within the economy (i.e., within input-output tables). The model, for example, can help explain wage stagnation in OECD countries, most expressed in the U.S., as a policy response to maintain profits in the face of the energy constraints of the 1970s oil crises. This is despite the fact that the model is, to date, a relatively simple toy model (i.e., not calibrated to the U.S. or global economies). I will explain how I attribute this capability to the coherent integration of conservation of stocks and flows of both money and physical variables (e.g., resources, capital goods) and the incorporation of basic thermodynamic principles, such as machines require fuel to operate, into the conservation of flow (conceptually as matter and energy).

I will conclude with thoughts on the benefits and challenges of this modeling framework in the context of how we might improve the practice of more accurate economic growth modeling to inform economic policy including, for example, a low-carbon energy transition. While HARMONEY is, like all models, a simplification of reality, it is more complex than the neoclassical growth model and post-Keynesian frameworks (upon which it is based), thus bringing into question how complex an economic growth model can become in order to be widely adopted.

References:

[1] King, Carey W. (2022) Interdependence of Growth, Structure, Size and Resource Consumption During an Economic Growth Cycle, *Biophysical Economics and Sustainability*, volume 7, Article number: 1.

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