



*University of Utah*

UNDERGRADUATE RESEARCH JOURNAL

## **Energy Consumption & Limits of Global Economic Growth**

**Joshua E. Swan (Dr. Stephen C. Bannister)**

**Department of Economics**

In this project I had the honor to work with Professor Stephen Bannister from the College of Social & Behavioral Sciences in the department of Economics. This project taught me a great deal of the mathematical nature of economics research. It is interesting to learn how science and policy intersect in regard to multifaceted issues globally.

My research is at the intersection of economic forecasting and the issues of renewable energy for a 21st century economy. Current economic modeling of the ramifications of climate change are very two-dimensional, only forecasting minor alterations to the global economy with the issues of global temperatures rising in the next 3-5 decades.

The work that I co-research with my Professor Dr. Stephen Bannister takes conventional economic modeling and applies a more system-dynamical approach that makes forecasting the effects of climate change on the global economy more accessible and easier to predict. We found a very high correlation between energy inputs and economic outputs across time and space.

The majority of growth models use a micro foundation to help explain macro problems, this mindset dispels emergent system properties that come from a macro-scale. Our models rely on system macro assumptions and a very large dataset of actual data, and models from there, improving on empirical validity and realism of economic predictions.

The Minsky model allows for more space to build out various scenarios. Instead of thinking of common linear economic modeling, system dynamics shows the dynamical, non-linear nature of economic behavior.

My research was presented at Harvard University, Brigham Young University and The Utah State Legislator in early 2021. I intend to earn a PhD in either Applied Mathematics or Finance in the future.