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Intertemporal Aspects of Keynes' Multiplier: On the Long-Term Benefits of Green Investments

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ABSTRACT: One of the hallmarks of macroeconomics is the Keynesian multiplier. John Maynard Keynes described the multiplying effect of new investments in the economy to have multifaceted influences on the overall wellbeing of nations. The notion that investments drive economic activity and growth is consolidated with many empirical findings in different domains. Interestingly, hardly any account exists on intertemporal aspects of Keynes' multiplier. The discounting and temporal elements of multiplying effects and the time-lag for investments to bloom in the economy are – to this day – not captured. Behavioral economics offers ample account on discounting. People are found to focus on the present rather than discounting for future instances properly. Integrating a temporal element into the Keynesian multiplier effect offers opportunities to understand the long-term benefits of green investments. Environmentally-conscientious finance has seen an advent in most recent decades. To this day, however, there is no clear account of the performance of green funds. Temporal aspects in Keynes' multiplier may help understand the difficulty in determining the long-term advantages of green investments. Adding information on the long-term benefits of green funds may also serve contemporary endeavors to capture wealth in nature. This article is organized as follows: First, an introduction describes Keynes' multiplier and temporal discounting. Then the need for integrating temporal aspects into Keynes' multiplier is outlined. The application of temporal Keynes' multiplier aspects in the green investment domain is provided. The discussion closes with a prospect for future research avenues.

KEYWORDS: behavioral economics, economics, finance, green funds, green investments, Keynes' multiplier, sustainability, temporal discounting

Introduction

John Maynard Keynes (1936) gave rise to the mathematical formalization of the influence of investments on the overall economy. Governmental spending was since then proven to have a positive multiplying effect within national economies. Empirical accounts consolidated that one point in governmental spending is, in general, associated with around 1.6 points rise in positive economic output. To this day, however, temporal aspects of the Keynesian multiplier are not well understood and under-researched.

Temporal discounting is a hallmark in behavioral sciences. Standard neoclassical economics assumptions of constant temporal choice were challenged by empirical evidence on temporal dimensions of discounting being non-linear. Choices over time were found to deviate from a constant choice pattern and an overall bias to be focused on the now became apparent in multiple economic studies (Kahneman, Slovic and Tversky 1982). Temporal choice and hyperbolic discounting have therefore become some of the most studied phenomena in the behavioral sciences (Puaschunder 2022). It is therefore surprising that hardly any account exists on the connection of temporal discounting and the Keynesian multiplier. This paper sets out to integrate temporal dimensions in the standard Keynesian multiplier applied in the domain of green investments. Outlining temporal aspects of green investments may help solve the ongoing discussion whether green investments in general tend to outperform or underperform conventional investments. The paper offers the following

structure: Theoretically, the Keynesian multiplier and temporal aspects in accounting for the multiplier are described in order to be applied to green finance. A discussion provides insights for future research on the multiplier function of green finance in the age of economically capturing wealth in nature and the environment.

Keynes' Multiplier

Economic multiplier effects of governmental investments were first described in John Maynard Keynes' *The General Theory of Employment, Interest and Money* (1936). During the Great Depression of the 1930s, Keynes (1936) found that large construction projects but also innovation in research and development are valuable macroeconomic accelerators (Puaschunder 2021). Since then the idea of investments for the good of the nation has been studied in many empirical investigations. Overall, multipliers were found to benefit society as a whole in the short and long term. The general positive multiplier effect is estimated to be around a 1.6 multiplier – meaning that 1 USD spent by the government leads to an overall increase of the economy by 1.6 USD (Puaschunder 2021). Multiplier effects of the money spent lead to consumption, which helps economic growth. The underlying assumption is that governmental spending in investment projects create economic growth and prosperity for all parts of society due to trickle down effects (Puaschunder 2021).

Two dimensions of the multiplier appear unstudied to this day: For one the industry-dependent effect of the multiplier, for another the temporal dimensions and potential time-lags of multipliers. As for industry dependence of the multiplier, the spill-over effect of investments hinders a clear accounting of differences in multiplier functions over industries. But evidence from past large-scale investments' success indicate that long-term investments in infrastructure have better outcomes over time than short-term oriented spending patterns on durable goods. Research appears needed to better our understanding of the time impact of multipliers that are believed to unfold with a time-lag.

First accounts exist to empirically relate the multiplier to timings of demand shocks (Mittnik and Semmler 2011). The multiplier was found to be stronger in bad times (Mittnik & Semmler 2011). Time-dependent multiplier studies appear rather technical on how to integrate a time dimension into the multiplier concept and hardly any study is applied in the economics domain (e.g., Burke, Hsiang and Miguel 2015; Lee, Lim and Park 2018). Unraveling the time effect of multiplier functions, however, could offer invaluable insights for the study of the efficiency and widespread effect of green investments.

Discounting

While standard microeconomic theory captures linear temporal discounting to explain rational decision making; behavioral economics finds human time perception to be biased with a focus on the now in many laboratory and field settings (Kahneman, Slovic and Tversky, 1982). Temporal discounting therefore has become a hallmark in behavioral sciences and cognitive studies. The temporal dimensions of multiplying functions of investments in the economy and the time-lag associated with investment multiplications, however, is yet a field that has not been studied in economics. Capturing temporal dimensions of multiplying functions of investments offers multiple insights ranging from better calibrated estimations of economic output and growth, more time-sensitive applications of the multiplier given an overall economic climate of change as well as political implications on when to administer multiplying investments in the overall voting cycle scheme. This article, therefore, makes the case for research on temporal dimensions of the multiplier applied in the environmental green investment domain.

Green investments

Contemporary international finance politics has opened up to responsible investment trends around the world. In the last decades, green investments and sustainable finance concepts evolved. Sustainable finance integrates environmental, social and governance (ESG) aspects in finance and investment decisions. Green finance is a subset of sustainable finance with particular attention to environmental concerns. Ever since the advent of sustainable finance and green investments, the question was whether these market options outperform or underperform conventional funds. The relation of SRI and environmentally friendly funds with market performance is – to this day – inconclusive (Ito, Managi and Matsuda 2013 in Puaschunder 2023). Ito, Managi and Matsuda (2013) find SRI funds outperformed conventional finance in EU and US. Successful SRI funds include pension funds and community investment, in which financial institutions offer favorable (lower) rates on loans for urban development projects (Ito, Managi & Matsuda 2013 in Puaschunder 2023). Environmentally-friendly funds do not perform as well as SRI, but perform in manners equal or superior to conventional funds (Ito, Managi & Matsuda 2013 in Puaschunder 2023). Environmentally-friendly funds appear to hold value when they are highly innovative (Puaschunder 2010). Negatively-screened funds that rule out options for environmental reasons, however, tend to underperform conventional broad-based market options (Puaschunder 2010). Unraveling now the long-term impact of multipliers applied in the green finance domain holds multiple insights for the current endeavor to measure green wealth aspects.

The contemporary discourse on economics features the wish to account for natural resources in standard governmental budgeting and macroeconomic calculus. The Next Generation EU Sustainable Finance Taxonomy but also the U.S. White House endeavors to bring nature into economics target at assessing changes in environmental and ecosystem conditions in benefit-cost analyses (Reamer 2023; White House 2023). The current World Bank Changing Wealth of Nations report also starts integrating natural resources and greenhouse gas emissions into international accounting. The Columbia University-hosted Mapping Climate Justice project calculated the expected economic changes due to climate change (Puaschunder 2020). Integrating now time-sensitive aspects of macroeconomic multipliers offers a new perspective on how to integrate green assets into the overall economic calculus.

While there are many studies of discounting environmental conditions, including climate change focused investigations, no account exists to measure the multiplier effect of green investments (Kahn et al. 2019). Green investment multiplying effects are believed to be multifaceted: For one, financial performance of green funds is expected to rise in the future (Puaschunder 2023). For another, the environmental preservation and conservation of a favorable environment are likely to gain on importance with the multiple avenues capturing wealth of nature (Reamer 2023; White House 2023). Society also directly benefits from a favorable surrounding in better conditions for a healthy environment that preserves long-term health and thereby acts as an implicit preventive measure (Puaschunder 2021).

Future research endeavors

Responsible finance is an *en vogue* topic of our times. The 2008 World Financial Recession but also the COVID-19 pandemic economic fallout have driven a call for responsible finance. Climate change has exacerbated the wish to stabilize the environment and heightened the call for a rapid financialization of climate change mitigation and adaptation efforts around the world. This paper addressed the most recent trends to bring nature into national accounting and to measure nation's wealth in terms of stable environmental conditions. In the quantification of the benefits of green investments, a temporal aspect of the multiplying function of green funds is missing. Opening up the measurement of the success of green finance for temporal aspects offers to better tact sustainable investments given concurrent

business cycle dynamics. Applying temporal discounting insights from behavioral finance onto the standard Keynes' multiplier advances economic theory and empirics.

Future research could open the Keynesian multiplier theory and empirical validation for temporal aspects and outline the unfolding of multiplying investment benefits over time. Keynesian multiplier aspects should also start to systemically test different domains and offer comparative insights into what aspects of the multiplier are better equipped to create long-term and lasting value.

Environmental studies that focus on the financialization as well as green finance investment practices could become elucidated with empirical validations of the efficiency and long-term impact of green finance. The time-flow of green investments could be tacted in line with general economic cycles. Improvements in the domain of green finance could also happen if certain aspects of green finance – e.g., entrepreneurial or long-term value generating – are found to be particularly successful. The concept of the overall multiplier could be opened up for a multi-faceted investigation of the many explicit but also implicit benefits of a stable environment and favorable conditions. For instance, not only health and productivity benefits are attributed to a good environmental setting, but also time perception advantages were found in studies being associated with environmental prospects (Puaschunder 2020).

The concrete research endeavors could feature qualitative and quantitative investigations. Qualitative research could address the multiple experiences with green finance and sustainable investment from an exploratory perspective. Literature reviews, expert interviews but also qualitative narrative accounts of people who invested in green funds could serve as an exploratory basis to address the multiple dimensions of the Keynesian multiplier. Qualitative research is hardly the basis for studies in macroeconomics and could therefore offer invaluable first insights into the quality and nature of green investment multipliers. Qualitative investigations could also serve to validate first ideas about the positive implications of green investment funds that are of more subjective and psychological nature. The socio-psychological motives of responsible finance have been investigated for financial decision makers theoretically, which warrants for a deeper analysis of the motives' interrelation and finding out actual decision drivers (Puaschunder 2017). Qualitatively, the long-term impact of multipliers could also integrate psychological effects of knowing about previous investment aid. Socio-psychological studies have already found that resilience is dependent on previous experiences that aid was given. Future qualitative multiplier investigation could now delve deeper into the socio-psychological components of governmental aid and the notion of being protected by the state. Quantitative research is the state-of-the-art in macroeconomic studies and the primary source of information about the Keynesian multiplier. Macroeconomic research of the future could unravel the different facets of multipliers and the general role of multipliers over time. The long-term impact of multipliers applied in the environmental domain should be expanded onto a concrete quantification of benefits that are derived from environmentally-sound investments.

Overall, the post-2008 World Financial Recession, as well as the post-COVID-19 economic shock, have prospered green finance. Climate change has exacerbated attention to the need for a stable environment that thrives human. Green finance has become a viable market tool that is supported by governments all over the world. It is yet surprising that hardly any information exists on the multiplying functions of green investments that trickle down in the overall health and well-being of nations aside from clear financial benefits. This paper served as a first attempt to advocate for studying the Keynesian multiplier effect in the environmental domain for green investments and sustainable finance. Future research avenues featuring qualitative and quantitative innovations for green finance were provided in the hope to ignite the scientific advancement of green wealth of nations for this generation and the following.

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