BOOK REVIEW

Unurjargal Nyambuu and Willi Semmler
Sustainable Macroeconomics, Climate Risks and Energy Transitions, Cham/Switzerland: Springer Nature, 2023, 195 pages, Softcover ISBN978-3-031-27984-3, eBook ISBN 978-3-031-27982-9, DOI https://doi.org/10.1007/978-3-031-27982-9.

It is great fortune for the readers when a textbook is both avant-garde and thoroughly contemporary. The textbook by the two professors Unurjargal Nyambuu and Willi Semmler, who have long been recognized as climate macroeconomists and teach in New York, has both: On the one hand, it is avant-garde because practical approaches and consolidated macroeconomic knowledge in the areas of sustainability, climate risks and ecological transformation are largely missing. On the other hand, it is absolutely timely because the global climate risks caused by human economic activity have started to endanger our livelihoods and are therefore among the most pressing challenges for national and international economic policy. It is precisely macroeconomics that is now called upon to do research on these urging matters and propose practical ways that are conducive to society and democracy by which climate risks can be contained on the one hand and managed on the other.

Just a few years ago, most macroeconomics professors would probably have refused to place categories such as sustainability, transformation and climate protection at the center of their macro teaching and research. Thankfully, this time of ignoring and suppressing the macroeconomic issues associated with maintaining a healthy climate and livelihoods is over. The effective combating of climate risks and the successful transformation to a social-ecological economy depends to a great extend on the knowledge and transformation skills of future generations of students in economics.

Driven by this mission Nyambuu and Semmler have broken down their research in the areas of sustainability, climate risks and ecological transformation into a textbook. In terms of goal setting, they call for a move away from both, models with extremely long time horizons but also short-termism. Instead, they advocate a medium-term perspective that guides macroeconomic policy aimed at achieving energy transformation, away from fossil energies and towards renewable ones. In addition to the orientation toward medium-term and adjustable goals, the authors propose using new key figures to measure the welfare of nations that go beyond the omnipresent but heavily critisized gross domestic product. Nyambuu and Semmler consider dynamic macroeconomics as the key tool for an analysis that fosters the necessary paradigm shift toward sustainable macroeconomics as this modelling tool is able to account for the interaction between the economy and the climate. Dynamic macroeconomics also allows medium-term climate policy measures to be included in the investigation. The book not only provides students and doctoral candidates but also teachers with useful tools for analyzing the macroeconomic dimensions of a sustainable economic policy. Such handy tools are essential for acquiring macroeconomic transformation skills and passing them on to others.

Framed by *Introduction and Overview* and *Concluding Remarks*, the textbook is divided into 10 analytical chapters. In the short chapter *Sustainable Growth, Welfare, and Short-Termism* Unurjargal Nyambuu and Willi Semmler lay the ground for the dynamic (intertemporal) modelling in the subsequent chapters, focusing on renewable and non-renewable natural ressources and their importance for sustainable growth and climate protection. They take stock of their own and others' research on the negative sides of economic growth since the take-off of industrialization. Based on

existing empirical studies the authors provide stylized facts about short-term thinking and its effects on resource extraction and climate change. In addition, they discuss welfare criteria and alternative approaches that allow them to study social, environmental and intergenerational equity challenges.

In the next chapter, *Non-sustainable Growth, Resource Extraction, and Boom-Bust Cycles,* Nyambuu and Semmler focus on commodity-exporting countries that became heavily indebted in foreign currencies and are, therefore, extremely vulnerable to external shocks. If resource prices fall sharply, many resource-rich developing countries are bound to go through a debt crisis and a rise in interest rates. This in turn can trigger internal real and financial crises. To study the effects of commodity boom-bust cycles, trade balances and foreign debt, the authors derive numerical solutions from a dynamic open economy regime-change macro model. They demonstrate that a low risk premia is associated with sustainable debt while high risk premia are linked to surging external debt and default probabilities.

The chapter, *Fossil Fuel Resources, Environment, and Climate Change*, brings the connection between CO2 emissions and the extraction and use of fossil fuels to the forefront. Nyambuu and Semmler discuss the resulting negative external effects. Historical trends in resource use and demand are covered, along with resource prices, particularly oil prices, and their impact on the economy.

Chapter 5, *Limits on the Extraction of Fossil Fuels,* presents a model of non-renewable resources and their optimal extraction as proposed by Hotelling (1931), along with predictions of their price movements over time. Nyambuu and Semmler compare Hotelling's price forecasts with actual price movements, assuming a monopolistic market structure instead of competitive markets. By using a numerical simulation of resource extraction paths, price movements and their effects on the environment and sustainable growth, empirical facts can be reproduced. U-shaped patterns and monotonically increasing trends in resource prices which emerge in later periods, seem to be in contrast to what Hotelling had claimed.

The chapter, *Fossil Fuel Resource Depletion, Backstop Technology, and Renewable Energy,* summarizes how economic analysts became aware of the increasing externalities of using fossil fuels and the resulting potential for disasters. To account for sustainability the authors extend the basic closed economy growth model with backstop technology and apply three different types of extraction costs. The numerical solutions suggests that fossil resources need not be extracted to exhaustion any longer because of the possibility to switch to a renewable energy technology (backstop technology) which has been available for a long time and is available in unlimited quantities.

The subsequent chapter, *Transition to a Low-Carbon Energy System*, presents historical trends related to carbon dioxide (CO2) and greenhouse gas (GHG) emissions that impact the carbon budget. Based on a production function that depends on both fossil fuel and renewables, Nyambuu and Semmler show various ways to decarbonize the economies of industrialized and developing countries. Their numerical analysis indicates that a large fraction of coal reserves should remain untouched and renewables should be phased in faster in order to meet the requirements of the Paris 2015 agreement.

The private sector has a different role to play in de-carbonising the economy than the public sector. Nyambuu and Semmler account for those separate roles in the two chapters, *The Private Sector – Energy Transitions and Financial Market* and *The Public Sector – Energy Transition and Fiscal and*

Monetary Policies. The private real sector and the financial markets can be either an obstacle or a bridge to a low-carbon economy. If renewable energy is key to a low-carbon economy and essential to meeting the Paris Agreement, renewable energy supplies must be significantly expanded. Primarily, the private sector needs to produce the required huge additional supply. The authors emphasize the pivotal role of capital costs and entry barriers for increasing renewable energy production. To achieve the shift and to counteract the large (incumbent) companies in the field of fossil fuels, low entry barriers for new (small) companies in the field of renewable energy production are of paramount importance. The authors also show that negative externalities created by the incumbents may lead to a decline of asset prices. If confidence in fossil-fuel companies suddenly drops or they either lose huge amounts of public subsidies or face newly imposed carbon-related taxes, those companies' assets may become "stranded". In the complementary chapter dealing with the public sector role, Nyambuu and Semmler take up and further develop a series of works written for the IMF, the World Bank and the ILO. They focus on dynamic macromodels to guide climate policies that can support mitigation and adaptation efforts to address climate change, as well as the role of broader public policies that promote and incentivize the energy transition. Specifically, they are investigating how fiscal and monetary policy can be used to combat climate change.

The chapter, *Delaying Forces and Climate Negotiation – Games, Lock-ins, Leakages, and Tipping Points,* examines the delayed impacts and obstacles to scaling up effective climate strategies. Specifically, they present three model-based illustrations showing the slow pace of negotiations and policy creation in favor of a true switch to a renewable energy-based economy. Nyambuu and Semmler identify three issues that render progress in environmental and climate policy so slow. Over time, entry barriers into the energy market for newcomers in renewable energy production become higher, thus, limiting the needed resources for the transition. Second, fiscal space shrinks and monetary policy loses focus or becomes more concerned with other issues such as inflation. Third, international negotiations develop into non-cooperative games. To overcome those obstacles the authors call urgently for extensive research and more practical policies in the fields of energy and finance.

Accordingly, the chapter *Climate Risks, Sustainable Finance, and Climate Policy* focuses explicitly on a variety of sectoral, financial and macroeconomic measures that can support the transition to a fossil-free economy. Innovation and industrial policy are taken into account, as are fiscal, monetary and financial policy. Possible restrictions regarding raw materials necessary for the transformation are also discussed.

Overall, the book of Unurjargal Nyambuu and Willi Semmler fills a huge gap in contemporary macroeconomics. The authors discuss comprehensively the current state of research in the different areas and use solid dynamic macro theory to analyse sustainability issues, climate risks and the ecological transformation to a fossil-free economy. In this way, a kind of paradigm shift is taking place, away from traditional macro modeling, which tends to ignore sustainability issues, towards progressive macroeconomics which focusses on the transition paths toward a fossil-free economy. Nyambuu and Semmler not only offer students and teachers a book with provides added value, but also researchers and economic policy decision-makers.

Dorothea Schäfer

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