



DIVERSITY OF ECOLOGICAL ECONOMICS AND DEGROWTH THEORY: FOCUSING ON THE RELATIONSHIP BETWEEN THERMODYNAMIC LAWS AND VISION

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ABSTRACT: The degrowth theories within ecological economics can be distinguished between two flows: Georgescu-Roegen, S. Latouche and K.E. Boulding, H.E. Daly, T. Jackson. In the former, degrowth leads to a complete rejection of any development or growth, culminating in negative growth, whereas, in the latter, degrowth does not necessarily end in a total rejection of all progression or growth. At first glance, these differences seem to stem from varying interpretations of thermodynamic laws, but underlying them are different analytical visions regarding environmental issues. The flow from Boulding to Daly to Jackson believes that the sustainability of human societies can be secured through balanced growth or steady-state economics, whereas Georgescu-Roegen and Latouche do not share this belief. This divergence in beliefs or visions has led to distinct degrowth theories. This paper will analyze this process while comparing the two degrowth theories.

KEYWORDS: Ecological economics, degrowth, vision, thermodynamic laws.

1 INTRODUCTION

Generally, environmental issues within economics are understood as a problem of inefficiency arising from the absence of property rights over the natural environment, leading to the improper application of market economic principles (externalities). Environmental economics offers solutions to this issue by proposing appropriate institutions or mechanisms to enable the application of market economic principles to the natural environment (internalizing externalities). This approach aims to extend market logic to the natural environment, with environmental economics believing that this can secure a balance or harmony between growth and the environment. The internalization of externalities is understood as an alternative for sustainable development. This discussion is rooted in mainstream economics, particularly neoclassical economics, and is often defined as neoclassical environmental economics.

However, discussions regarding environmental issues in contemporary economic spheres are not limited to environmental economics alone. Another discussion area exists, namely ecological economics. The latter starts from the judgment that mainstream economic theories or environmental economics based on these theories cannot present fundamental solutions to environmental issues. The most notable difference between mainstream economic theories or environmental economics and ecological economics arises in the interpretation of the conditions under which the natural environment can affect human economic activities (so-called environmental constraints). Mainstream economists or environmental economists believe that if natural resources (especially non-renewable natural resources) are depleted due to human economic activities, these can be substituted with artificial resources, i.e., capital. In contrast, ecological economists believe that while such substitutability may be partially possible, overall, it is not viable.

Ecological economics emerged when researchers inheriting the views of Georgescu-Roegen or Boulding formed the International Society for Ecological Economics in 1987, and in 1989, the journal Ecological Economics was launched.

Solow emphasized the seriousness of environmental problems and resource depletion, assuming that even when natural resources become scarce or are completely depleted, they can be entirely replaced by other artificial resources (capital) [1]. However, Georgescu-Roegen challenged the realism of this assumption based on thermodynamic laws [2]. In the journal *Ecological Economics*, a debate was held in 1997 between mainstream economists such as Solow and Stiglitz and ecological economists such as Daly, with the central issue being the substitutability of natural resources. Ecological economics, unlike mainstream economic theories or environmental economics, emphasizes the complementary relationship between natural resources and artificial resources rather than assuming the possibility of substitution or recognizing substitution relationships [3]. If substitutability between natural resources and artificial resources is not recognized, then the importance of environmental constraints must necessarily be understood differently from mainstream economic theories. In this context, ecological economists judge that mainstream theories are insufficient to resolve environmental issues and therefore attempt a new approach.

Although Georgescu-Roegen never explicitly referred to degrowth, the MAUSS group compiled his writings in 1979 in a book titled "Degrowth: Entropy, Ecology, Economy." There are also views suggesting that the issue of degrowth presented in "Limits to Growth" led to Daly's steady-state economics in the 1980s and 1990s. Advocates of this perspective claim that in the early 2000s, thanks to the efforts of the MAUSS group in France, discussions on degrowth spread further, becoming more widely known with the publication of Jackson's report for the UK Sustainable Development Commission [4].

Thus, discussions on degrowth within ecological economics can be roughly divided into flows leading from Georgescu-Roegen to Latouche and from Daly to Jackson. In the former, degrowth leads to a complete rejection of all development or growth [5] while the latter does not. In the former context, degrowth is seen as an alternative to surpass sustainable development, whereas in the latter, degrowth is regarded as a means to achieve sustainable development on a global level. This highlights the significant differences of opinion surrounding the concept of sustainable development within ecological economics.

METHODS

What accounts for these differences, and what implications do they hold for understanding the characteristics of degrowth theories within ecological economics? This paper starts from such questions. It will first examine the differences between the two degrowth theories and then confirm these differences through Schumpeter's concept of vision. Subsequently, it will explore how the theoretical and practical implications of the two degrowth theories can be understood in light of the history of economics or current environmental issues.

RESULTS

Sustainable development is defined as a means to secure the balance or harmony between growth and the environment. Although this concept was first introduced in the 1987 report "Our Common Future" by the World Commission on Environment and Development, the necessity for harmony or balance between growth and the environment was already presented in "Limits to Growth." The latter book emphasizes the harmony or balance between growth and the environment, proposing methods of restraining or adjusting economic growth rates in line with environmental constraints. This perspective inherits Malthus's views that stressed balancing population and food, emphasizing the need to restrain or control population growth according to food conditions [6], and thus the Club of Rome is often classified as neo-Malthusian.

Neo-Malthusians approach environmental issues by inheriting Malthus's views that emphasize the balance between population and food. They simply expand this balance perspective beyond the relationship between population and food to encompass the relationships between population, the natural environment (including food), and economic growth. For Malthus, infinite population growth is a disaster threatening human society; for neo-Malthusians, infinite population growth, as well as infinite economic growth, can constitute such a disaster. Thus, they seek solutions to environmental problems through balanced growth or zero growth. Both "Limits to Growth" and "Our Common Future" can be classified as neo-Malthusian due to this approach.

However, the history of economics shows that the argument for the necessity to restrain economic

needs in accordance with environmental constraints is not limited to Malthus. Unlike neoclassical economists, nearly all classical economists exhibit views similar to Malthus. Additionally, classical economists deny the possibility of infinite growth, meaning their efforts for economic growth ultimately conclude in a steady state [7]. A steady state indicates a situation where production, exchange, and consumption cycle at the same scale, resulting in no change in the overall output level of the economy. Consequently, for them, the outcome of growth leads to zero growth where further growth ceases. Schumpeter interprets their view of economic development as pessimistic for this reason.

Nonetheless, not all classical economists' perspectives on economic development can be depicted as pessimistic. Mill views that efforts for economic development must inevitably lead to a steady state [8], yet interprets this steady state optimistically. He distinguishes economic issues into production and distribution, where the former relates to economic growth or profit maximization, and the latter aims to mitigate inequalities in produced wealth or income. According to him, once the entire economy reaches a steady state, efforts to grow the economy or increase profits become ineffective. In this situation, efforts to resolve production issues become meaningless, while efforts to appropriately distribute already produced income or wealth, alongside progress in moral, cultural, or ethical aspects of humanity and society, may be deemed appropriate.

In classical economics, the steady state indicates not only the denial of infinite growth possibilities. Fundamentally, this concept arises from the finite nature of the natural environment, explained by the law of diminishing returns [9], emphasizing environmental constraints and thereby the necessity for harmony between growth and the environment. In the context of degrowth theory flowing from Daly to Jackson, this concept holds significant importance. Daly proposes the concept of the "steady-state economy" as an alternative for sustainable development. Here, the steady state refers to a condition that enables the balance or harmony between growth and the environment during the processes where resources are inputted into production and pollutants return to the environment [10]. In this sense, his steady-state concept bears similarities to the steady state concept of classical economics.

The terms steady state and equilibrium state are utilized by classical and neoclassical economists, respectively, but are evaluated as having considerable differences: "Classical economists saw that eventually growth would cease due to the constraints of natural resources, while... neoclassical economics anticipates that the growth rate will converge to the rate of technological development based on the law of diminishing returns. If steady state implies a state where growth can no longer occur due to "natural resource constraints," then the equilibrium state is understood as a state where further economic growth is viable depending on the degree of technological innovation. However, in his 1977 work, Daly initially quotes Mill's reference to the steady-state concept while subsequently adopting only the term equilibrium state without explicitly mentioning why [11]. Today, among ecological economists, very few distinguish between steady state and equilibrium state; most present the equilibrium state concept as an alternative for sustainable development, similar to Daly's view. In this regard, Daly revealed in a conversation with Peter Victor, who wrote his preface, that he switched to the equilibrium state concept because "steady state" sounded too static [12], later regretting not using the former concept, realizing that the latter denotes a state where capital and labor grow at the same rate in neoclassical economics.

According to Georgescu-Roegen, thermodynamic laws are crucial elements in understanding human economic activities or the relationship between humans and nature. These laws consist of the law of energy conservation (first law) and the law of entropy (second law), with the latter being particularly important to him. Here, human economic processes are understood as the process of converting materials or energy extracted from the natural environment into goods desired by humans. In this process, available materials or energy (low entropy state) are continuously transformed into unavailable materials or energy (high entropy state), and this transformation is irreversible [13].

Latouche's degrowth theory begins from Georgescu-Roegen's ecological economics. Thus, in his discussions, degrowth implies (-) growth rather than emphasizing balanced growth or sustainable development that highlights the harmony or balance between growth and the environment. In contrast, Jackson's degrowth theory originates from Daly's steady-state economics. In Daly's discussions, the steady state is derived from the classical economists' concept of steady state, which means his steady-state economics bears similar characteristics to Malthusian balanced growth theory. This suggests that the

discussions on degrowth within ecological economics can be divided into two positions, illustrating significant differences in understanding the relationship between sustainable development and degrowth. When understanding the degrowth concept in the context of the flow from Georgescu-Roegen to Latouche, this concept is viewed as an alternative that transcends the limits of sustainable development. Conversely, understanding it in the context of the flow from Daly to Jackson presents it as a means to effectively implement sustainable development.

DISCUSSION

The degrowth theory flowing from Georgescu-Roegen to Latouche advocates for the abandonment of the goal of infinite growth. In Latouche's view, the pursuit of infinite growth not only destroys the natural environment but also captures humanity in the logic of growth and money, ultimately destroying humanity itself. Therefore, this goal of infinite growth needs to be relinquished for the sake of humanity [14]. He attributes this goal to growthmania, which governs modern civilization and thus modern society. He argues that there needs to be a departure from this value system for the sake of humanity, indicating a critique of modern society and modern civilization from an ethical perspective while seeking alternatives. Therefore, his degrowth theory not only addresses the physical limits of growth but also summarizes the cultural and social limitations of growth, including a critique of the value systems that dominate modern society.

Accordingly, two flows of degrowth theories can often be distinguished: one emphasizing the physical limits of growth and another also stressing the cultural and social limits of growth [15]. In this regard, the former proposes degrowth as a means to secure zero growth and sustainable development [16], while the latter advocates degrowth to reject the value systems dominating modern society. If the degrowth theory flowing from Daly to Jackson represents the former, then the flow from Georgescu-Roegen to Latouche represents the latter.

Thus, the difference between the two degrowth theories may be understood as arising not so much between the physical limits and social limits of growth but rather in how each discusses and understands these two limits differently. What are the reasons for differences in the discussions surrounding the physical and social limits of growth? Firstly, the connection made between degrowth and socialism may be a consideration related to the social limits of growth. According to Latouche, degrowth represents a critique of the value system dominating capitalist society and a critique of capitalism itself. Therefore, he defines degrowth as a political project that can renew the left, based on fundamental critiques of the ecological limits or social contradictions of capitalist society.

According to Jackson, regardless of its specific appearance, a new alternative economy should ensure jobs that contribute to human flourishing and be based on ecologically friendly economic activities. In this alternative economy, productive activities must meet three operating principles: actively contributing to self-fulfillment, providing decent livelihoods, and possessing low material and energy throughput. He believes that the seeds of such an economy already exist in socially responsible enterprises based on local communities. He defines such enterprises as a "Cinderella economy," which is often treated with disregard.

According to Arendt, human activities can be broadly categorized into labor, work, and action. Labor conforms to the conditions of life as an activity to maintain human life, while work provides a relatively permanent artificial world and fits the conditions for worldliness. Action signifies human participation in communities, i.e., political activity, aligning with the conditions for plurality [17]. Here, while labor serves as the condition for human survival, work is an activity through which humans seek to validate their permanence by leaving something meaningful in the world. Jackson seeks to improve self-fulfillment by transitioning human activities from labor-focused ones towards work-focused activities to evade the growth-centric society.

The differences between Jackson and Daly are not entirely absent. Daly presents the potential for reinterpreting economic processes through the introduction of the entropy law, which he views as necessary in his governance approach. Both are influenced by Schumpeter's differentiation between qualitative change accompanied by innovation and mere quantitative increase, as both seem to adopt this distinction in their theories. Thus, Daly's equilibrium economics and Jackson's "prosperity without growth" correspond to concepts of economic development as described by Schumpeter.

However, the influence of Schumpeter within degrowth theory is not simplistic. Georgescu-Roegen

also significantly draws inspiration from Schumpeter, albeit for slightly different reasons. He invokes the entropy law to explain evolutionary principles in economic processes. For him, evolution does not represent quantitative change but qualitative change that is irreversible over time. In this way, he connects the entropy law as an evolution principle of economic processes. Herein lies a recognition of Schumpeter's views focused on qualitative change and evolution, especially maintaining the distinction between growth and development, although he understands this differently in terms of the entropy law rather than applying it to the growth-development distinction.

In light of the above discussions, distinctions concerning social limits of growth do not clearly showcase internal differences within degrowth theory. Would these gaps become more pronounced in discussions related to physical growth limits? Daly views economic processes as a unidirectional flow from resources to waste. He describes this flow as "entropic flow" and defines it as the amount processed. In contrast, Jackson only mentions Georgescu-Roegen as the supervisor of Daly's doctoral thesis and fails to acknowledge Georgescu-Roegen's contributions to ecological economics. He even emphasizes the importance of thermodynamic laws but overlooks Georgescu-Roegen's initial integration of this law into.

Daly suggests that the core task of environmentally friendly macroeconomics is to limit the flow of economic inputs—extracted raw materials converted into goods and finally into waste—within the ecosystem's capacity for regeneration and absorption. Jackson also notes that Daly defined the process by which the economy generates useful materials and energy from the natural environment while simultaneously depositing pollutants and waste as the handling quantity concept.

While Daly's handling quantity concept can be viewed as an influence of Georgescu-Roegen in light of its summary as a physical flow of entropy, it essentially borrows from Boulding. Likewise, Daly's concept of equilibrium economics carries the impact of Boulding's spaceman economy [18]. Thus, the equilibrium economy concept, proposed by Daly as an alternative for sustainable development, arises from both Mill's concept of stability and the legacies of Boulding's spaceman economy and handling quantity notions. Can the differences in perspectives among Boulding, Daly, Jackson, and Georgescu-Roegen's approaches be explained through their views on the laws of thermodynamics?

Boulding argues that in a closed system like Earth, the entropy law operates solely in terms of energy. He contends that in terms of material, dispersed substances in the atmosphere can be recollected and recycled, thus rendering the entropy law non-inevitable. Daly and Jackson's equilibrium economies or sustainable development concepts imply controlling material flows within ecological limitations through recycling concepts, suggesting a continuity of Boulding's views. Since the 1970s, many economists (J. Young, S. M. Miller, R. U. Ayres, etc.) have grown optimistic about recycling raw materials, believing that while the entropy law may be inevitable concerning energy, it does not apply the same way to materials, leading to criticisms of Georgescu-Roegen's approach, which relies heavily on thermodynamic laws. In response, Georgescu-Roegen stated that if sufficient energy is available, complete recycling of materials is possible, describing this as the energetic dogma under Boulding's influence. He argues that, in a closed system, it is impossible to recycle materials fully, asserting that 'the entropy of matter inevitably moves towards a maximum value' as his new law (the fourth law of thermodynamics).

As a disciple of Georgescu-Roegen, Daly accepts a significant portion of Georgescu-Roegen's interpretations of the laws of thermodynamics. Engaging in public debates with mainstream economists like Solow and Stiglitz in the "Ecological Economics Journal" in 1997, he criticized them primarily based on Georgescu-Roegen's viewpoints. He does not fully agree with his mentor's fourth law of thermodynamics, yet he acknowledges that his equilibrium economy concept may not suffice as an alternative to address environmental issues, indicating he cannot completely disregard his mentor's counterarguments.

When Zhang critiques Boulding or Daly's views on alternatives to environmental problems while also indicating agreement with "Georgescu-Roegen's arguments," suggesting alternative paths, it hints at issues of belief or judgment that are challenging to explain solely through scientific logic or economic analysis. Bonaiuti's interpretation of the differences in degrowth discussions among various ecological economists reflects this distinction within the context of Schumpeter's vision.

In contemporary discourse regarding the concept of decoupling, or the historical debates between ecological economists and mainstream economists over the substitutability of production factors, the issue of vision probably remains prevalent. Decoupling implies there are no links between human economic

activity and environmental degradation.

In this regard, the approaches of Boulding, Daly, Jackson, and Georgescu-Roegen to tackle environmental problems stem from their differing visions based on their interpretations of the laws of thermodynamics. Each has developed distinctive degrowth theories informed by their conception of the thermodynamic law. Herein, the equilibrium growth or sustainable development proposed by Boulding, Daly, or Jackson potentially aligns with long-standing beliefs or frameworks in the economics discipline since classical economics, contrasting with Georgescu-Roegen or Latouche's perspectives, which seem insufficient as alternatives for resolving pressing environmental issues. The latter appear to adopt a significantly more pessimistic outlook towards environmental challenges, leading them to seek fundamentally different alternatives in critique of both capitalist society and the historical geographies of economics.

CONCLUSION

The discussions on degrowth within the economic sphere chiefly arise within the realm of ecological economics, where there exist two principal divergent streams. From Georgescu-Roegen through Latouche, one stream connects with perceptions leaning towards equilibrium or sustainable forms of growth, whereas the latter, involving Boulding and extending through Daly to Jackson, perceives degrowth as embodying negative growth. The disparities between these locations revolve around whether concepts of stagnant or equilibrium economies can sufficiently secure the sustainability of human society, juxtaposed against the severity of contemporary environmental dilemmas.

REFERENCES:

1. Solow, R. M., "The Economics of Resources or the Resources of Economics," *American Economic Review*, Vol. 64, No. 2, 1974, pp.1-14.
2. Georgescu-Roegen, N., *Analytical Economics*, Cambridge: Harvard Univ., 1966, pp. 92-93.
3. Cleveland, C. J., and M. Ruth, "When, Where, and by how much do Biophysical Limits Constrain the Economic Process? A Survey of Nicholas Georgescu-Roegen's Contribution to Ecological Economics," *Ecological Economics*, Vol. 22, 1997, pp.205-207.
4. Jackson, T., *Prosperity without Growth: The Transition to a Sustainable Economy*,
5. Ellwood, W., *The No-Nonsense Guide to Degrowth and Sustainability*, New Internationalist, 2014; Demaria, F., F. Schneider, F. Sekulova, and J. Martinez-Alier, "What is degrowth?: From an Activist Slogan to a Social Movement," *Environmental Values*, Vol. 22, 2013, pp.191-215.
6. Malthus, T. R., *An Essay on Population*, 7th ed., J. M. DENT & SONS LTD, 1872, pp. 153-157.
7. Schumpeter, J. A., "Science and Ideology," 1949 ; in D. M. Hausman(ed.), *The Philosophy of Economics - An Anthology*, Cambridge Univ., 1984, p.562
8. Mill, J. S., *Principle of Political Economy*, 5th ed., D.Appleton and Company, 1864, p.334.
9. Meier, G. M., "The 'Progressive State' in Classical Economics," in Gerald M.Meier(ed.), *From Classical Economics to Development Economics*, St. Martin's Press, 1994, p. 13.
10. Constanza, R., J. Cumberland, H. E. Daly, R. Goodland, and R. Norgaard, *An Introduction to Ecological Economics*, St. Lucie Press, 1997, pp.32-33
11. Daly, H. E., *Steady-State Economics*, 2nd ed.. Island Press. 1977a, pp.14-49.
12. Victor, P., *Herman Daly's Economics for a Full World : His Life and Ideas*, Routledge, 2022, p. 176.
13. Georgescu-Roegen, N., *Analytical Economics*, Cambridge: Harvard Univ., 1966, p. 66-67.
14. Mesner, S., and J. M. Gowdy, "Georgescu-Roegen's Evolutionary Economics," in K.Mayumi & J. M. Gowdy(eds.), *Bioeconomics and Sustainability: Essays in Honor of Nicholas Georgescu-Roegen*, Edward Elgar, 1999, pp.62-65.
15. Latouche, S., *Farewell to Growth*, Polity Press, 2009, pp.7-9
16. Bonaiuti, M., "Introduction: Georgescu-Roegen, the Man and Scientist," in M.Bonaiuti(ed.), *From Bionomics to Degrowth: Georgescu-Roegen's "New Economics" in eight essays*, Routledge, 2011, pp. 45-48.
17. Arendt, H., *The Human Condition*, 1958, pp. 34-41.
18. Boulding, K. E., "The Economics of the Coming Spaceship Earth," In K. E. Boulding & H. Jarrett(ed.), *Environmental Quality in a Growing Economy*, Johns Hopkins Univ., 1966, pp. 5-