Doughnut Economics: Exploring a New Alternative Sustainable Model

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Abstract

The orientation of the modern economy sustainability is imperative towards for shaping the economic systems of the future. This research paper presents a comprehensive analysis of the fundamental underpinnings and provides an eco-economic overview of the Doughnut model. The essence of this academic endeavor revolves around the model's analytical approach to pivotal economic indicators, including GDP, economic growth, and environmental factors. The model's central objective is to address income inequality, which remains despite GDP growth, with affluent segments benefiting more, as indicated by the Gini coefficient. A historical analysis from 1820 to 2020 shows fluctuations in this coefficient, peaking in 1910 and 2000 and decreasing to 0.67 by 2020. The Doughnut model's critique of GDP and economic growth, while facing opposition from traditional economic theory, requires a comprehensive economic evaluation through an examination of development experiences in selected countries to bridge the gap between theory and practice for potential adoption as an economic framework. This exploration of the innovative Doughnut economic model Received: 22.10.2023 Available online: 31.03.2025

significantly enriches the ongoing strategic discourse aimed at steering society towards a sustainable future.

Keywords: Doughnut economics, alternative economic model, green economics, innovation, sustainability.

JEL: A10, D60, O11, O44, Q50.

1. Introduction

conomic theories have played a pivotal role in shaping the trajectory of modern human evolution. Intellectual luminaries in the realm of economics have been instrumental in shaping the global landscape through their groundbreaking ideas. These shifts in economic thought have, in turn, catalyzed transformations. far-reaching social А consequential outcome of this intellectual interplay has been the meticulous examination of societal dynamics through the prism of political-economic theories. This analytical approach has spurred dedicated efforts to proffer remedies to prevailing challenges. One prominent figure in this lineage, John Maynard Keynes, notably recognized a trilateral challenge intrinsic to individuals as political actors. This challenge revolves around the intricate reconciliation of three fundamental tenets: economic efficiency, social justice, liberty (Keynes, and individual 1926).

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The intricate interplay of these tenets encapsulates a core predicament, representing the delicate equilibrium required to foster sustainable and harmonious societal advancement.

Spanning from classical theories to the present, the predominant domains of politicaleconomic scholarship have encompassed economic gain and individual autonomy. The discernible influence of theoretical underpinnings on practical markets has within manifested the global business Yet. landscape's continuous expansion. concurrent with this trajectory, a spectrum of socially significant issues has persisted, and as the 21st century unfolds, a heightened concern has emerged: the ecological and environmental repercussions stemmina largely from anthropogenic activities, resulting in contamination. Conventional trajectories of economic advancement, while persistently surging, have precipitated exacerbation in the planet's ecological integrity, provoking apprehensions. substantial Notably, the specter of global climate change has imperiled the very existence of humanity, while the excessive depletion of nature, the cornerstone resource of economies. has rallied international spheres to center their attention on this dilemma. Strategies spanning immediate and prolonged horizons have been formulated, foremost among which are blueprints aimed at achieving carbon emission reduction by 2050, as articulated in EU documents (European Commission, 2018).

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In the context of critiquing conventional inexorable economic theories. the development of novel models became an inevitable outcome. The ensuing confluence of economic and ecological challenges within the realm of academia has given rise to the discipline of sustainability science, amalgamating multidisciplinary investigations of contemporary times upon a unified framework. Emerging as a distinct academic discipline, sustainability science is now characterized by dedicated conferences. journals, and societies, recognized both as vital for advancing sustainability and bridging the gap between science and society, thus demanding substantial changes in scientific paradigms (Spangenberg, The 2011). necessity of transitioning from conventional economic theories to new sustainable models stems from the imperative to reconcile inherent shortcomings in prevailing paradigms, enabling the integration of ecological and social dimensions. This evolution is indispensable for aligning economic pursuits with imperatives of environmental health and equitable human advancement. Figure 1 visually represents the idea that traditional economic theories resemble running in place, whereas sustainable development models provide a forward-moving path toward progress.

The 21st century is marked by a multitude of well-documented environmental challenges. These environmental issues, due to their severity, have led to significant economic difficulties. Presently, nations worldwide, in



Figure 1. The new movement trajectory of Homo Economicus.

collaboration with international organizations, are actively pursuing a variety of solutions to address these pressing problems. A prominent example of such a monumental effort is the Sustainable Development Goals 2030. However, it is crucial to understand that these challenges are far from being fully resolved. Prominent think tanks and international organizations are dedicated to the development of an optimal model in this direction.

Successive economic models build upon and succeed their predecessors, forming the foundation of the prevailing economic order. Throughout history, economic models have evolved in response to the needs of their respective times, shaped by various global processes occurring in the world.

It is evident that the 21st century presents humanity with global challenges of unprecedented magnitude. From this perspective, transitioning to a new economic model becomes imperative. Many scholars argue that traditional models have lost their relevance. In the modern world, where sustainability has taken center stage across all domains, it can be asserted that the principles of sustainability, which underpinned earlier models, are notably absent (Turner & Wills, 2022).

In response to the pressing significance of the scientific challenge presented by sustainability, there has been a compelling need to formulate fresh and comprehensive theoretical constructs within the realms of social, political, and economic deliberations. A prominent exemplar of this endeavor is the Doughnut economic model, which has arisen as a distinct conceptual framework aiming to address multifaceted sustainability concerns by reconciling environmental boundaries and social aspirations. Doughnut economics introduces a visual framework resembling a doughnut or lifebelt, merging the notions of planetary and social boundaries to promote sustainable development (Raworth, 2012). Economist Kate Raworth's Doughnut Model presents an innovative viewpoint that strives to reconcile the necessity for prosperity and economic advancement with the pressing requirements of environmental sustainability and equitable social well-being. Articulated within her pioneering book, Kate Raworth introduces a visionary model that intricately endeavors to harmonize the prudent utilization of natural resources with the imperative of addressing the issue of excessive human consumption (Raworth, 2017a, pp. 49-50). Doughnut economics is labeled as such due to its visual depiction resembling a doughnut shape, symbolizing the ecological ceiling and social foundation that define sustainable and equitable human prosperity. The internal demarcation, designated as the social foundation, articulates the fundamental criteria necessary to guarantee the state of well-being for individuals.

Figure 2 depicts the "Doughnut" model, a sustainable development framework designed to ensure human needs are met within a safe and just space for humanity, represented by the green area between the social foundation and the ecological ceiling, while preventing both the overshoot of planetary boundaries and the shortfall in addressing human needs.

The Doughnut model, heralding a transformative ecological-economic paradigm, assumes paramount importance due to its visionary outlook. This economic construct, subject to thorough analysis by a select cohort of global scholars, stands as a pivotal strategy for advancing sustainable development in the contemporary 21st-century landscape.

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Figure 2. The Doughnut of social and planetary boundaries. Source link: www.kateraworth.com

There is no denying the existence of several critical environmental issues today, ranging from climate change and ocean acidification to chemical pollution, loss of biodiversity, and air pollution.

The inner circle of the doughnut model represents the social foundation, emphasizing reduced inequality among people. This entails providing essential services like quality education, access to healthcare, a fair minimum wage, and decent employment opportunities. When we consider this, we can draw parallels between the Human Development Index (HDI) and the Doughnut model, both focusing on human well-being and social equity.

While developed nations are actively discussing the implementation of the Doughnut model, it is arguably more essential to apply this framework in countries facing profound economic and social challenges. Therefore, it is advisable for developing countries to establish and regularly convene multilateral discussion platforms. These platforms can facilitate collaboration and knowledge-sharing to address their unique difficulties within the context of the doughnut model's principles. Such an approach can serve as a catalyst for meaningful progress and sustainable development in regions grappling with significant hardships (Raworth, 2017b, pp. 216-222).

Sustainable development was not the only issue of the day. In the middle of the last century, during the US presidential elections, candidate John F. Kennedy promised 5% economic growth if elected. Shortly after being elected president in 1960, he proposed the idea of creating the OECD (Organisation for Economic Co-operation and Development). The industrialized countries of the time came together to form this organization to support the idea of sustainable economic growth. Maintaining the ecological balance was one of the main factors in achieving this goal. These examples show that the Doughnut model is not really new. It is a logical continuation of the process that began in the 1960s (Raworth, 2017c, pp. 32-33).

Planetary boundaries provide а conceptual structure to outline limitations on the repercussions of human actions on the Earth system. According to Rockström and colleagues (2009), three boundaries had been surpassed (biodiversity loss, climate change, and nitrogen cycle), while others were on the verge of being exceeded. The following paper highlighted the interplays among the nine boundaries and designated climate change and the erosion of biodiversity integrity as 'core boundaries' essential to the framework, as these interactions between the climate and biosphere scientifically delineate Earth system conditions (Frank & Rakhyun, 2020). David Attenborough, the esteemed British biologist, has again urgently alerted to the critical issue of global climate change, stressing the necessity of prompt action to prevent reaching a point of irreversible consequences (BBC, 2021). The United Nations, dedicated to resolving human issues, has acknowledged these cautions for an extended duration and has undertaken concrete efforts accordingly. The Race To Zero campaign serves as a global initiative with the primary objective of rallying leadership and garnering support from enterprises, urban hubs, regional sectors, and investors. This collective effort aims to cultivate a resilient, carbon-neutral recovery that safeguards against future threats, fosters job creation, inclusive and and unlocks sustainable economic expansion and this mobilization entails the collaboration of prominent netzero initiatives, uniting a comprehensive total of 11,309 non-State actors, including 8,307 corporations, 595 financial institutions, 1,136 municipalities, 52 states and regions, 1,125 educational institutions, and 65 healthcare organizations (United Nations, 2022). The project's overarching objective is to pave the way for a novel economic paradigm by prioritizing the substantial reduction of carbon emissions by the year 2050. However, guaranteeing the stability of such a longterm system necessitates the development of theoretical models, a profound comprehension of the philosophical essence of the process, and a thorough mastery of the psychology underpinning eco-economic behavior. The principal objective of the Doughnut model in the realm of science is to bridge this gap.

2. Literature Review

The Doughnut economics model is a relatively new subject in academic literature. Its primary theoretical foundation can be traced foundational back to Kate Raworth's book (2017). Additionally, Kate Raworth maintains an official website (Raworth, 2013) dedicated to providing extensive theoretical information about the Doughnut economics model. Moreover, various media platforms, such as DEAL (2015), offer comprehensive theoretical resources related to the model. Notably, Kate Raworth's presentations on

YouTube (TEDx Talks, 2015) further contribute to the understanding of the Doughnut economics model. These diverse sources collectively enhance the accessibility and dissemination of knowledge concerning the Doughnut economics model within both academic and wider intellectual circles.

Another extensive literature source on the Doughnut economics model is Hayward Susan's book (2021), where the author delves into a wide range of planetary themes, encompassing energy, waste management, agroecology, and the comprehensive valuation of ecosystems. Schokkaert (2019) provided a review analysis of the Doughnut economics from an economic-philosophical model perspective. An overview of the model was conducted by Ross (2019), and seven vectors were succinctly classified. In addition, the Doughnut economics model has garnered significant interest for its application in the business sector concerning environmental assessments. Sahan et al. (2022) conducted a thorough analysis from the perspective of business enterprises, presenting valuable insights into the model's relevance within the corporate sector. Another researcher, Acosta (2022), undertook a region-specific evaluation with a particular focus on Nevada, thereby providing a localized perspective on the model's applicability within a specific geographic context.

3. Methodology

In this research, the Gini index was employed as a methodological tool to empirically measure income or wealth distribution within a specified population. The experiment yielded results that were subsequently analyzed to underscore the social criterion's importance within the framework of the Doughnut model. The

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Gini index, an empirical statistical indicator, quantifies income or wealth inequality within a population. It ranges from 0 (perfect equality) to 1 (perfect inequality) and plays a significant role in evaluating societal disparities, particularly within the context of the Doughnut model.

The incipient nature of Doughnut Economics as a scholarly discourse is reflected in the dearth of specific econometric models. As such, there exists a pronounced imperative to outline preliminary model trajectories in a simplified fashion within this strategic purview. To facilitate methodological scrutiny and the development of pertinent econometric frameworks for Doughnut Economics, a prerequisite involves the initial assessment of prevailing environmental quandaries alongside individual-oriented social indices. A technique and a suitable econometric structure that comprehensively represent the favorable impacts of human well-being markers on climate change, while situated within the framework of Doughnut Economics. Key individual social indicators encompass health, education, and financial income, while greenhouse gas emissions stand as the primary driver of global climate change. This data perspective, sourced from global or local contexts, can serve as the basis for constructing a multifaceted multiple linear regression model, affording an avenue to scrutinize the intricate influence of human well-being indicators on the dynamics of greenhouse gas emissions.

GHG = $\beta 0 + \beta 1 * HI + \beta 2 * EI + \beta 3 * II + \epsilon (1)$ Where:

 GHG (Greenhouse Gas) is Climate Change Indicator which represents the level of greenhouse gas emissions. HI (Health

Index), EI (Education Index) , and II (Income Index) are the Human Well-being Indicators.

- β0, β1, β2, β3 are the coefficients to be estimated.
- ε represents the error term.

In the context of Doughnut Economics, the envisaged impacts are anticipated to be positive; however, these effects are likely to be tempered by the incorporation of sustainable practices and the adherence to ecological limitations. The intricate nature of realworld data and nuanced relationships may extend beyond the scope of this simplified model. Nevertheless, this model assumes a foundational role, serving as an initial platform for comprehending the prospective positive implications of human well-being concerning climate change within the encompassing framework of Doughnut Economics. There is a necessity to enhance this methodology, upon which an environmental assessment of the Doughnut economic model can be conducted.

In the course of the research, counterthesis indicators to the Doughnut economic model were also presented during the discussion panel. This model, which centers around critical principles related to GDP growth, is exemplified within the context of traditional economic theory. The research included formulas illustrating the positive impacts of real GDP on real incomes, along with empirical statistical findings. In the equation:

 $ln(real_min_wages_it) = \beta + \beta 1 *$ ln(realGDP_it) + a_i + µ_it (2)

The variables are defined as follows:

 In(real_min_wages_it): This represents the natural logarithm of real minimum wages for country i in year t.

- In(realGDP_it): This represents the natural logarithm of real GDP for country i in year t.
- a_i: This symbolizes the country-specific fixed effect, typically represented by dummy variables unique to each country.
- µ_it: This term denotes the error component in the model.

The fixed effects, or country-specific intercepts (a_i), are employed to account for persistent, unchanging disparities between countries that could potentially impact the dependent variable. These fixed effects play a critical role in addressing unobserved heterogeneity. enabling researchers to control for and analyze how these constant factors influence the dependent variable across various countries and over time. Prior to drawing conclusions from your analysis, it is vital to conduct a rigorous assessment of several key assumptions. These include the assumptions verifying of linearity, homoscedasticity (equal variance of errors), and the absence of multicollinearity among independent variables. It is prudent to address potential issues such as endogeneity, omitted variables, and serial correlation, as these can have significant implications for the reliability of your results. It's important to remember that the model presented here is a basic one, and its appropriateness may vary depending on the specific characteristics of your dataset and the precise research question you aim to answer. Furthermore, it is essential to acknowledge that this model assumes a linear relationship between the variables, which may not always hold in real-world data. Consequently, thorough validation of your model and results using suitable techniques and statistical tests is paramount to ensure the robustness and credibility of your findings.

4. Results and Discussion

The underpinning of the Doughnut Model is established on the framework of the "Seven Ways to Think Like a Twenty-First-Century Economist" approach (Raworth, 2017d, pp. 34-37):

- Change the goal Decades of GDP fixation in economics justified inequality and environmental harm, but the 21st century demands meeting human rights within planetary boundaries, symbolized by the Doughnut concept, urging a transition to balanced and inclusive economies.
- See the big picture The Circular Flow diagram of mainstream economics limits perspectives and reinforces narrow narratives, while a new depiction of the economy integrated with society, nature, and solar power offers a more comprehensive framework.
- Nurture human nature Twentieth-century economics portrayed us as self-interested and dominant, yet a richer self-portrait reveals our social interdependence and potential alignment with the Doughnut Model.
- Get savvy with systems The conventional supply and demand framework, originating from outdated metaphors, is surpassed by systems thinking, exposing insights into economic dynamics, inequality, and climate change, underlining the requirement to oversee the economy as an intricate, progressing system.
- Design to distribute In the 20th century, the Kuznets Curve implied that inequality would worsen before improving, but in the 21st century, economists acknowledge inequality as a design flaw and explore ways to establish fairer economies by

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redistributing wealth and reconfiguring value flows.

- Create to regenerate In the past, economics viewed a clean environment as a luxury for the wealthy, backed by the Environmental Kuznets Curve; however, 21st-century economics advocates regenerative design, a circular economy, and reconnection with Earth's cycles.
- Be agnostic about growth The rarely depicted diagram of long-term GDP growth in economic theory signifies the mainstream's push for constant expansion; yet, the imperative to prioritize economies nurturing well-being, regardless of growth, confronts our deep-seated attachment to growth addiction.

Figure 3 visually represents the "Doughnut" model, a sustainable development framework that strives to meet human needs within planetary boundaries through strategies such as systems thinking, equity redesign, and systemic change.

The fundamental vectors of Doughnut economics encompass the amalgamation of social and environmental factors, with the objective of reconciling human well-being within the ecological constraints of the planet. This paradigm entails a departure from GDPcentric growth towards holistic sustainability, accentuating just resource allocation and regenerative methodologies as guiding principles for economic decision-making.

Drawing inspiration from cities like Amsterdam, Copenhagen, and London, ongoing studies are exploring the adoption of a doughnut economy framework, which sets boundaries on economic growth while prioritizing environmental sustainability, social justice, and the well-being of current and future generations (AB, 2021). The Amsterdam City Doughnut operationalizes the global



Figure 3. The seven main vectors of Doughnut Economics. Source: Author's finding.

Doughnut concept, originally formulated by Kate Raworth, and transforms it into an actionable tool for driving transformative change within the city of Amsterdam (Circle Economy, 2020).

The Doughnut model has the potential to mitigate the gender imbalance prevalent in today's economic sphere (Capmourteres et al., 2019). It is well-documented that men have greater access to opportunities in the workplace compared to women, with these disparities being more pronounced in developing countries. In many instances, engaged in women are predominantly domestic work and are excluded from various job opportunities, resulting in unjust circumstances. The opportunities presented by the Doughnut model have the capacity to rectify these injustices and recognize the value of women's domestic labor.

For nearly a century, GDP has served as the primary indicator of countries' income, inadvertently contributing to the perpetuation of global inequalities. A transformative Doughnut economic model rooted in sustainability principles, has emerged as a promising solution to address these disparities. The philosophy underpinning this model, advocated by Kate Raworth, seeks to alleviate global economic challenges, rectify unequal distributions, and shift away from the widespread reliance on GDP as the primary indicator adopted by all nations.

In contrast to traditional economics textbooks that predominantly explore efficient resource utilization as a means to achieve economic development, Kate Raworth adopts a holistic perspective. It places significant emphasis on the broader context while meticulously considering crucial details. The book articulates the Doughnut economic model's vision, striving to identify an optimal and sustainable pathway towards achieving economic goals and targets.

Inadequate indicators like GDP have resulted in the categorization of countries into two groups: developed and developing nations. Economist Amartya Sen argues that the primary objective should not be centered on indicators such as GDP but, rather, should revolve around the expansion of people's opportunities (Anand & Ravallion, 1993). This perspective highlights the importance of considering a more comprehensive set of factors and capabilities, beyond mere

economic measurements, when evaluating the well-being and progress of societies.

One of the central objectives of this model is to address the issue of income inequality. Practical observations have demonstrated that despite increased GDP production in numerous countries, there has been a notable acceleration in social stratification, GDP growth has disproportionately benefited the economically affluent segments of society, often at a greater rate than the middle and lower income classes. The Gini index stands as a key representation of the disparities in resource distribution. Developed by the Italian statistician Corrado Gini, this coefficient is widely utilized today to gauge income distribution within countries worldwide. Examining the historical dynamics of income distribution from 1820 to 2020 reveals notable patterns. The Gini coefficient increased from 0.60 in 1820 to 0.72 in 1910, experienced a similar peak at 0.72 in 2000, and then

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decreased to 0.67 by 2020. Remarkably, global inequality exhibited two significant peaks in its historical trajectory: first, around 1910, and subsequently during the period between 1980 and 2000. It is noteworthy that a substantial portion of the reduction in global inequality occurred in the aftermath of the 2008 financial crisis. These fluctuations underscore the complex nature of income distribution and its global evolution over time.

The graph presented in Figure 4 illustrates the trend of the Gini index for global income inequality between 1820 and 2020. It reveals an upward trajectory from a value of 0.60 in 1820, reaching a peak of 0.72 in both 1910 and 2000, before experiencing a modest decline to 0.67 in 2020.

In general, income inequality within a population is often an indicator of underlying social problems. It's important to note that the Gini coefficient, which measures this inequality, can never reach the extremes





of 0 or 1, as it reflects a scale of income alarming distribution. Nevertheless, the trend of increasing inequality in recent years, with the Gini coefficient nearing 80-90 percent in some cases, calls for urgent attention. The primary objective should be to maintain this ratio at an acceptable level, potentially requiring a reevaluation of the social dimensions within the Doughnut model. Now, turning to the paradoxical situation concerning technological development, the rapid dissemination of Industry 4.0 like Artificial Intelligence, technologies Blockchain, and Machine Learning holds significant promise for economic progress. However, it also brings with it potential negative consequences. The emergence of terms such as "disruptive technologies" and "disruptive business models" underscores the transformative nature of these advancements. Disruptive technologies have the potential to displace jobs and disrupt traditional market competition. Consequently, the central focus of the Doughnut model places considerable importance on creating an environment where technological progress occurs safely, minimizing its potentially destructive effects, and fostering responsible development.

In various research endeavors, scholars dialogues Doughnut engage in with Economics, either endorsing its principles with novel perspectives or providina constructive criticism to complement its framework, showcasing the ongoing evolution of economic discourse towards sustainability and social justice (Ribiero & Rodrigues, 2023). The Doughnut model represents an intriguing and forward-thinking approach to economic and environmental sustainability. However, it's important to acknowledge that it is still in its early stages of development and can be considered more as a pilot project interplay between GDP growth and various

or hypothesis rather than a fully established economic framework. While its theoretical foundations, particularly concerning sustainability, offer an attractive and futuristic vision, there are substantial gaps when it comes to practical implementation. One of the primary challenges facing the Doughnut model is the availability of mathematical tools with concrete proof to support its realworld application. Developing such tools and providing robust empirical evidence is a crucial step in demonstrating the model's feasibility and effectiveness.

The Doughnut model faces significant opposition and counterarguments from traditional economic theory and established practical indicators. It critiques the reliance on GDP and economic growth, which are fundamental pillars of classical economic theories. However, when we examine the trajectory of human civilization, it becomes apparent that traditional economic models have played a pivotal role in increasing economic prosperity in numerous instances. GDP growth, for example, has often led substantial improvements in to public welfare, particularly in terms of real income. The increase in real income serves as a cornerstone for both material well-being, which encompasses access to goods and services, and moral well-being, which denotes improved living standards and enhanced quality of life. To gain a comprehensive understanding of the relationship between GDP growth and public welfare, it becomes valuable to undertake an extensive economic evaluation. This analysis might encompass the examination of experiences from four specifically selected countries renowned for their dynamic development. Such an inquiry would empower us to assess the intricate

facets of public welfare, shedding light on the multifaceted nature of economic progress and its repercussions for societies. Ultimately, addressing these issues and reconciling the theoretical vision of the Doughnut model with practical realities constitute pivotal steps in its evolution and its potential adoption as a comprehensive economic framework.

Table 1 presents the regression analysis outcomes, indicating a significant positive relationship between the independent variable (LNREAL_GDP_ $M_$) and the dependent variable, as evidenced by the positive coefficient (0.0576) and the high statistical significance of the model (F-statistic p-value = 0.000003).

Figure 5 depicts the longitudinal trends and interconnections between real GDP and real minimum wages over a 20-year period in four prominent economies (Japan, South Korea, USA, and Israel), emphasizing the disparities in economic growth trajectories and income evolution.

Simultaneously, empirical evidence has demonstrated that the augmentation of real individual incomes yields substantial influence on various critical social indicators. Furthermore, the integration of green economic principles and the promotion of Doughnut Economics: Exploring a New Alternative Sustainable Model

sustainable behavior can be facilitated through technological advancements and educational initiatives. This multifaceted approach underscores the interconnectedness of economic growth, sustainability, and societal progress.

A significant shortcoming of the Doughnut model is its critique of GDP and economic growth without providing a well-defined systematic methodology to counter these challenges. To facilitate the model's further evolution and validate some of its hypotheses, there is a pressing need for comprehensive, systematic research. Such research is essential to transform these hypotheses into empirically supported facts, offering a practical roadmap for addressing the model's concerns. This systematic inquiry is critical for bridging the gap between theoretical concepts and realworld implementation, ultimately enhancing the model's effectiveness as a framework for sustainable economic development. Economist Branko Milanovic has argued that the Doughnut economic model fails to consider the vital necessity of achieving higher GDP growth to effectively combat global poverty, highlighting the complex task of reconciling economic expansion with social equity (Burbano, 2022). This critique underscores

Variable	Coefficient	Std. Error	t-Statistic	Prob.
С	8.789592	0.169330	51.90799	0.0000
LNREAL_GDP_\$M_	0.057609	0.011437	5.037215	0.0000

Table 1. Relationship Between Real GDP and Real Incomes Using Panel Least Squares Method

Statistic	Value
R-squared	0.227824
Adjusted R-squared	0.218845
F-statistic	25.37353
Prob(F-statistic)	0.000003
Durbin-Watson stat	0.060963







the intricate balance required in policymaking to simultaneously address poverty eradication and environmental sustainability.

When examining the Doughnut model, it becomes intriguing to delve into the interplay between GDP and the release of greenhouse gases, which are the primary culprits behind global climate change. In essence, there have been noteworthy paradoxes emerging in recent analyses of the connection between CO_2 emissions and GDP. One of the central arguments posited by critics of GDP, as outlined in the Doughnut theory, is that as GDP grows, there is a corresponding increase in carbon emissions. This correlation has persisted since the dawn of the Industrial Revolution, with an escalating intensity that reached its zenith in the early 21st century.

Nevertheless, there has been a discernible positive trend in more recent years. In 2022, global energy-related carbon dioxide emissions experienced a minimal uptick of less than 1%. This increase was less severe than originally feared. The growth of solar and wind power, the widespread adoption of electric vehicles (EVs), heat pumps, and advancements in energy efficiency all contributed significantly to curbing the negative effects of escalated coal and oil utilization during the global energy crisis (IEA, 2023). The trend observed in the statistics of the past three decades within the United States, a country known for its status as the world's leading producer of GDP, is particularly remarkable.

Figure 6 illustrates the divergent trends between GDP growth, measured in billion current U.S. dollars, which exhibits a consistent Doughnut Economics: Exploring a New Alternative Sustainable Model

upward trajectory from 1990 to 2022, and carbon dioxide emissions, measured in million tons, which display fluctuations but indicate an overall declining pattern in recent years.

Doughnut The model encompasses diverse avenues for building a sustainable world. emphasizing significant factors population dynamics, such as income distribution, technological advancements, and governance. Notably, the model diverges from the conventional view of continuous population growth. According to this model, a sustainable world requires stable population growth rather than an unchecked increase in the number of people. This perspective underscores the importance of achieving a balanced and sustainable equilibrium in demographic trends to align with the overall objectives of the Doughnut model (Wahlund



Figure 6. Annual GDP and CO₂ production in the US (1990-2022).

Source: Author's finding. Data collected from EIA via Statista (Statista Research Department, 2023; Tiseo, 2023).

& Hansen, 2022). Undoubtedly, the pursuit of stable population growth, as advocated by the Doughnut model, can give rise to a range of concerns and potential issues. For instance, it may lead to an aging workforce and possible job displacement, posing significant challenges for workforce planning and economic vitality. Moreover, the ongoing trend of accelerated urbanization, which is projected to further intensify by 2050 according to research, introduces its own complex set of problems. One of the foremost challenges lies in the growing urban-rural population imbalance. This imbalance can trigger socio-ecological problems, such as the erosion of traditional rural economies and other undesirable consequences linked to heightened population density in urban areas. Striking a harmonious balance between urban and rural development becomes imperative to effectively address these issues and foster sustainable socio-economic progress.

The rings of the Doughnut model present an opportunity to formulate novel indicators that extend beyond traditional economic measures. Examples include the National Stability Index and the National Happiness Index. Introducing these indicators may necessitate a gradual transition since their adoption cannot occur abruptly. Nonetheless, as a pilot initiative, governments have the option to implement these innovative metrics in specific cities or regions as they enter a new phase of development. This approach enables the practical testing of these indicators, assessing their viability and effectiveness in real-world contexts. Over time, such pilot projects may pave the way for broader adoption of these indices at the national level, offering a more holistic means of evaluating well-being and sustainability.

5. Conclusion

The research conducted a comprehensive analysis of Doughnut economics, examining it through the lens of its foundational theoretical principles. The model's appeal is rooted in its capacity to elucidate the intricate interplay between ecological threats and social disparities. Within this framework, the article elucidated the adverse consequences of economic growth, as discerned through Gini analysis. Furthermore, the statistical analysis of graphs served to underscore the profound impact of GDP on individual income levels, emphasizing its pivotal role in overall well-being. The examination of the relationship between GDP and CO, emissions offers a contemporary lens through which to view sustainability principles. Nevertheless, this analysis also brought to light a notable limitation in the practical applicability of the Doughnut model.

While the Doughnut model proffers an enticing hypothesis for fostering sustainability, this research accentuates critical deficiencies in its real-world implementation. It is imperative that these limitations not be disregarded as society navigates its trajectory towards a sustainable future. This scientific exploration of the Doughnut economic model serves as an invaluable compass on this arduous journey. As society grapples with the pressing challenges of our era, an astute comprehension of the model's strengths and weaknesses assumes paramount importance in the formulation of efficacious strategies and policies conducive to a more equitable and sustainable future.

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