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Value Systems And Community Welfare: An ABM Based Exploration

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Abstract

This research paper investigates the impact of values ranging from absolute hedonism to absolute eudemonism on societal well-being, utilizing agent-based modeling (ABM) through NetLogo to create a simulated environment. The model features a population of "turtles" that embody diverse socio-economic characteristics, including materialism, altruism, and cooperation, which influence their individual well-being and energy levels. As these turtles navigate an ecosystem with both renewable and non-renewable resources, their interactions and consumption behaviors directly affect their personal well-being and the collective energy of the community. The simulation employs varying value indices, revealing a significant beta coefficient of 0.62, indicating a strong correlation between societal values and overall well-being. The findings underscore the importance of understanding how different value orientations influence not only individual behaviors but also community welfare and resource sustainability. This study has critical implications for policymakers and social planners, as it highlights the need to foster values that promote collective well-being and sustainable resource management. By elucidating the relationship between value systems and societal health, the research contributes to ongoing discussions about the ethical foundations of social structures and the role of individual choices in shaping communal outcomes.

Keywords *Agent-based Modeling, Asabiyyah, Wellbeing, Values, Upbringing, Responsible Consumption.*

Introduction:

The intricate relationship between individual values and societal well-being has garnered significant attention in recent scholarly discourse. As societies navigate the complexities of modern life, understanding how different value systems—particularly hedonism (the pursuit of pleasure) and eudemonism (the pursuit of a meaningful life)—impact community wellbeing is crucial. This research investigates the role of these value orientations in influencing collective well-being and resource sustainability, providing insights that are vital for policymakers and community planners.

In recent years, there has been a shift in focus towards the integration of subjective well-being measures into economic planning and development strategies (Sacks et al., 2010). Hedonism often emphasizes immediate satisfaction and material consumption, while eudemonism prioritizes long-term goals and meaningful engagement (Ryan & Deci, 2001). Understanding how these contrasting values affect not only individual behavior but also aggregate societal outcomes is essential for developing comprehensive social policies.

This study utilizes agent-based modeling (ABM) to simulate a community's behavioral dynamics under varying value orientations. Using NetLogo, a popular platform for agent-based simulations, we created a virtual environment populated by agents—referred to as "turtles"—that embody diverse socio-economic characteristics, including materialism, altruism, and cooperation. These traits influence the turtles' resource consumption patterns, impacting both individual well-being and the sustainability of shared resources.

Through the simulation, turtles interact with their environment, consuming renewable and non-renewable resources while seeking to optimize their well-being. We manipulated the value systems associated with these turtles to explore the full spectrum from hedonism to eudemonism. Our results indicate a strong correlation between societal values and overall community well-being, with a beta coefficient of 0.62. This suggests that communities that promote a balance between pleasure-seeking and purpose-driven values experience greater collective welfare and sustainable resource management.

The implications of these findings are profound. First, they underscore the necessity for policymakers to consider the prevailing value orientations within communities when designing interventions aimed at enhancing social well-being. For instance, communities dominated by hedonistic values may benefit from programs that integrate eudemonic principles, promoting not only individual gratification but also collective responsibility and sustainability (Kasser & Ryan, 1993). Furthermore, the research highlights the need for educational initiatives that foster values conducive to community health, emphasizing the benefits of altruism, cooperation, and a sense of purpose.

In conclusion, this study contributes to the growing body of literature examining the link between individual values and societal outcomes. By employing agent-based modeling, we have demonstrated how contrasting value systems can shape not just individual behaviors but also the overall well-being of a community. As societies continue to confront challenges related to resource management and social cohesion, this research provides a vital framework for understanding the ethical foundations of social structures and the role that values play in shaping communal outcomes. Future research should delve deeper into the mechanisms by which values translate into social behavior, paving the way for more effective policies that promote sustainable and inclusive societies.

Literature Review

Shifts in social behavior have always been a compelling focus of research. A notable change being explored by philosophers, historians, and social scientists is the transition from eudemonism to hedonism (Haybron, 2008). Hedonism, rooted in the thought of Epicurus, posits that the primary goal of human life is to maximize pleasure and minimize pain (Thompson & Marks, 2008). Hedonism leads to materialism, selfishness, greed and injustice in society (Kasser, 2003). This perspective emphasizes the pursuit of immediate gratification and sensory enjoyment as the ultimate life objectives. In contrast, eudemonism, championed by philosophers such as Aristotle, highlights the importance of living in accordance with virtue, personal growth, and the cultivation of meaningful relationships (R. M. Ryan et al., 2013). Eudemonistic values (altruism, compassion, equity, are deeply entwined with the notion of fulfilling one's true potential and achieving a sense of purpose in life (Martensen, 1891; Rizvi et al., 2021).

In recent years, societal values have witnessed a notable shift towards hedonism. This transition from eudemonism to hedonism has altered how individuals and societies conceptualize happiness and fulfillment (Haybron, 2008). The influence of consumer culture, driven by industrialization, globalization, and technological advancements, has prioritized instant gratification, material wealth, and individualistic aspirations over deeper, more meaningful sources of happiness (Laszlo, 1994). This growing emphasis on hedonistic pursuits has permeated various aspects of life, from social media to advertising, reinforcing the idea that happiness is primarily derived from pleasure-seeking behaviors (Rogers et al., 2012).

Despite the allure of hedonistic pursuits, research suggests that such an approach does not yield sustainable happiness or well-being for individuals or society. While short-term pleasures may provide immediate satisfaction, they often fail to contribute to long-term fulfillment and overall life satisfaction (Veenhoven, 2011). In fact, the incessant chase for fleeting pleasures can lead to a superficial existence, characterized by a lack of deeper emotional connections and meaningful life experiences (Austin, 2023). The societal implications of this trend are alarming, as evidence indicates that global levels of contentment and satisfaction have been declining, signaling a detrimental impact on overall quality of life (Handa et al., 2023).

Asabiyah, a concept that refers to social cohesion and collective well-being, reflects the interconnectedness and mutual support within a community (Delle Fave et al., 2011). This total well-being is profoundly affected by the prevailing values of society. Eudemonism enhances Asabiyah by promoting virtues such as empathy, cooperation, and communal growth, thus fostering strong, supportive relationships among individuals. In contrast, hedonism undermines Asabiyah as it encourages self-centered pursuits that prioritize individual pleasure over collective welfare. Such a focus can erode social bonds, reduce cooperation, and ultimately lead to a fragmented society (B. Cook, 2013). Understanding this dynamic highlight the necessity of revisiting and realigning societal values towards eudemonism to cultivate a more cohesive and thriving community (Van Den Born et al., 2018).

Hedonism, the philosophy that prioritizes pleasure and individual satisfaction, has been linked to various negative societal outcomes, including materialism, selfishness, greed, and injustice (Carruthers, 2024). Understanding the complex interactions and cascading effects of hedonistic values on society is crucial (Lelkes, 2021). One effective methodological approach for such investigations is Agent-Based Modeling (ABM) (Koponen, 2022). ABM allows researchers to create models that simulate the interactions of autonomous agents in a system, providing valuable insights into the emergent behaviors driven by individual-level motivations and societal norms (An et al., 2021).

Agent-Based Modeling (ABM) is a computational approach that simulates the actions and interactions of individual agents within a defined environment. Each agent operates based on a set of predefined rules and behaviors, which can consider various characteristics such as preferences, beliefs, and social connections (Angoa-Pérez et al., 2020). ABM enables researchers to observe how these individual behaviors lead to aggregate phenomena, making it an excellent tool for studying complex systems characterized by interdependent relationships and dynamic change (North & Macal, 2007).

In ABM, agents can represent various entities, such as individuals, groups, or organizations, and may operate independently or interact with one another based on specific rules (Bonabeau, 2002). This flexibility allows researchers to model diverse scenarios, exploring how changes at the micro-level can influence macro-level outcomes (Bianchi & Squazzoni, 2015). The resulting simulations generate insights that often reveal unexpected patterns and dynamics not easily captured through traditional research methodologies such as surveys or aggregate statistical analyses.

Society comprises multifaceted interactions influenced by hedonistic values (Okumuş, 2020). ABM is particularly adept at capturing these dynamics as it allows for the modeling of individual choices, social influence, and feedback loops (An et al., 2021). For instance, the decision of one individual to prioritize material wealth can affect those around them, leading to a ripple effect that reinforces consumerist behaviors. Researchers can observe how varying levels of hedonism among agents produce different societal effects, thus shedding light on the relationship between individual actions and collective trends.

One of the primary strengths of ABM lies in its ability to demonstrate how local interactions can lead to large-scale phenomena (Bonabeau, 2002). For example, when individuals are driven by hedonistic values, they might engage in competitive consumption, leading to increased socio-economic stratification and injustices. ABM simulations can help visualize how these emergent properties arise from individual behaviors and choices, providing a clearer understanding of the potentially harmful societal consequences of unchecked hedonism.

ABM allows researchers to test various theoretical frameworks regarding societal behavior and outcomes (Nugroho & Uehara, 2023). For instance, by simulating environments with varying levels of emphasis on hedonism versus eudemonism, researchers can analyze how these different societal values impact overall well-being and social equity. This testing can identify the conditions under which hedonism contributes to negative outcomes, thereby informing policy and intervention strategies aimed at fostering values that enhance social cohesion (Lloyd & Hannikainen, 2022).

Agent-Based Modeling emerges as a superior methodology for studying the societal impacts of hedonism. Its ability to simulate individual behaviors and their interactions offers valuable insights into the complex dynamics of social systems. The emergent patterns produced through ABM can reveal critical information about how hedonistic values contribute to materialism, selfishness, greed, and injustice, ultimately guiding efforts toward fostering more cohesive and equitable societies (Perelló-Moragues, 2020). By leveraging the strengths of ABM, researchers can pave the way for a deeper understanding of the interplay between individual choices and societal outcomes, thus informing strategies aimed at mitigating the detrimental effects of hedonism.

Theoretical Lens

Utilizing Ibn Haldun's cyclical theory of history as a theoretical lens for this research provides a robust framework for understanding the dynamics of societal well-being through the lens of Asabiya, or social solidarity. Haldun's theory posits that civilizations undergo cyclical phases of growth and decline, heavily influenced by the strength of social bonds and collective values such as cooperation, equity, and humanity (Shareef, 2018). By examining how these values foster Asabiya, this research can elucidate the mechanisms through which societal values impact individual and communal well-being, ultimately offering insights into sustainable resource management and community resilience in contemporary contexts (Salahuddin, Taseer and Vergil, 2024).

Methodology and Model Explanation

The presented agent-based model simulates the interactions and behaviors of a population of turtles within a defined environment characterized by patches that harbor various types of resources. The primary objective of the model is to investigate the dynamics of well-being and energy consumption as influenced by individual characteristics such as materialism, altruism, and collective interactions. This research contributes to the understanding of socio-economic behaviors in contexts where resource depletion and regeneration occur, providing insights into potential pathways for enhancing societal well-being.

Agent-Based Model (ABM)

The following notation describes the key components and processes of the agent-based model (ABM) described in the provided code. We will break down the individual components, interactions, and updates using mathematical notation.

Global Variables

The model employs global variables total-wellbeing and total-energy. The total-wellbeing variable serves as a composite measure of the overall well-being of the turtle population, while total-energy tracks the accumulated energy resources of all turtles, allowing for analysis of how energy consumption affects collective well-being.

W=total-wellbeing,

E=total-energy

Turtle Attributes

Each turtle in the model is equipped with individual characteristics encapsulated within the turtles-own variables. These characteristics represent various social and moral dimensions, including:

- M = Materialism
- S = Selfishness
- G = Greediness
- I = Injustice
- A = Altruism
- SD = Solidarity
- E = Equity
- H = Humanity
- Mo = Morality
- C = Cooperation

The vector of characteristics can be defined as:

C i = [Mi, Si, Gi, Ji, Ai, SDi, Ei, Hi, Moi, Ci]

First four dimensions are the ones extracted from content analysis done for the studies on Ibn Haldun's Asabiyah. These were the most repeated prominent factors negatively impacting Asabiyah or social solidarity which in turn was negatively impacting wellbeing and last six are the positive determinants of wellbeing (Salahuddin, Taseer and Vergil, 2024). Additionally, each turtle possesses a wellbeing attribute, which reflects its subjective welfare, and an energy attribute that tracks its energy reserves.

For each turtle i:

Wi=random (0,50),

Ei=0

The characteristics are initialized randomly:

C_i= random-float ∀ c ∈ **C**i

Patch Attributes

The environment is divided into patches characterized by two main properties: resource-type and resource-units. The resource-type can either be "renewable" or "non-renewable," influencing how resource consumption affects the patches and the turtles interacting with them. resource-units indicates the quantity of resources available in a patch, while regeneration-timer controls the rate of resource recovery for renewable patches.

Each patch Pj (where j indexes the patches) has the following variables:

- RTj: Resource type (renewable or non-renewable)
- RUj: Resource units available
- Rtj: Regeneration time

For each patch j:

RTj = {"renewable"with probability 0.4"non-renewable"with probability 0.6

RUj = {6 if RTj ="renewable" 20 if RTj="non-renewable"

Resources Regeneration

For renewable resources in patch j:

If pcolorj= brown: {Rtj←Rtj+1If Rtj≥10: RUj←6pcolorj←greenRtj←0

When turtle Ti moves and interacts with its environment:

Movement:

θi∼Uniform (0,360)(random direction)

Ti=Ti+(1⋅cos(θi),1⋅sin(θi)) (moving forward)

Consuming resources:

If RUj>0:{Ei=Ei+4if RTj="renewable"Ei=Ei+10if RTj="non-renewable"

RUj=RUj−1

Interaction with Other Turtles

When turtle Ti interacts with another turtle Tk:

Iik=(Ai+SDi+Ci)−(Mi+Si+Gi)

Update well-being:

Wi←Wi+0.1*Iik

Individual Well-Being Update

The individual well-being update for turtle Ti is given by:

Wi←Wi+10*((Ai+SDi+Ei+Hi+Moi+Ci)−(Mi+Si+Gi+Ji))

Total Well-Being Update

To compute total well-being and energy:

$W = i = \sum_{N}^{1} Wi,\ E = \sum_{N}^{1} Ei$

Total Well-being
(T)=W+E

Model Dynamics
The simulation begins with the setup procedure, which initializes the environment and the turtle population. Patches are randomly assigned renewable or non-renewable resources, while turtles are distributed randomly across the habitat, each initialized with predefined characteristics affecting their interactions.

During each simulation tick, turtles engage in several key processes: moving, interacting, consuming resources, updating their individual well-being, and updating global well-being. Turtles can move in a random direction, consuming resources from the patches they occupy. The consumption of resources is differentiated based on the resource type, with renewable resources providing less energy per unit compared to non-renewable resources.

Interactions among turtles are modeled within a specified radius, allowing turtles to influence each other's well-being based on their characteristics. The interaction logic employs a calculated influence-factor that determines the net impact of altruistic and selfish traits on well-being.

The model also incorporates a resource regeneration mechanism for renewable resources, which cycles through a state of depletion and recovery, reflecting ecological principles. Over the course of the simulation, total well-being is monitored, capturing the interplay between individual behaviors and resource availability.

Value Index Construction
In this research, we developed a comprehensive Value Index (V.I.) that quantifies the socio-economic characteristics of individuals by assigning weights to both negative and positive attributes. The intention behind the construction of this index is to create an evaluative tool that provides an equitable representation of both detrimental and beneficial traits on an individual's overall well-being.

The formula for the Value Index is expressed as follows:

V.I = [(Materialism + Selfishness + Greed + Injustice) /4 * (−0.5)] + [(Altruism + Cooperation + Solidarity + Equity + Morality + Humanity) /6 * (0.5)]

In this formulation, the four negative traits—Materialism, Selfishness, Greed, and Injustice—are averaged and multiplied by a weight of -0.5 to reflect their detrimental impact on the overall well-being of individuals. Conversely, the six positive traits—Altruism, Cooperation, Solidarity, Equity, Morality, and Humanity—are averaged and multiplied by a weight of 0.5 to capture their beneficial contribution to well-being.

This balanced weighting scheme ensures that both sets of values exert equal influence on the resulting Value Index. Negative and positive traits are considered symmetrically, thereby allowing the V.I. to provide a nuanced perspective on individual characteristics. By doing so, we aim to address the complexity of human behavior and its implications for societal dynamics in relation to well-being.

Experimental Setup
To generate the necessary data for evaluating the influence of the Value Index on overall well-being, we executed a series of simulations in which each socio-economic characteristic was

assigned a continuous value ranging from 0 (indicating absence) to 1 (indicating full presence). This spectrum of values allowed us to comprehensively capture a wide range of individual attributes within our simulated population.

The experimental settings were designed with specific scenarios that examined the extremes of socio-economic behavior. One scenario represented a state of absolute hedonism, wherein all negative traits were assigned a value of 1 (indicating their maximization), and all positive traits were assigned a value of 0 (indicating their absence). Conversely, the opposing setting represented an idealistic construct where all positive traits received a value of 1 and all negative traits were set to 0.

The mathematical representation succinctly encapsulates the experimental framework of the simulations, capturing the spectrum of socio-economic characteristics, the formulation of the Value Index, and the structured approach towards generating a diverse dataset through defined scenarios.

Socio-economic Characteristics
Let C={C1,C2,…,Cn} be the set of socio-economic characteristics, where each characteristic CiCi can take values in the continuous interval:

$Ci \in [0,1]$for i=1,2,…,n

Assuming we have p positive traits and q negative traits among these characteristics, we can denote:

- Positive traits: P= {P1, P2,…,Pp}
- Negative traits: N= {N1, N2,…,Nq}

Value Index
The Value Index VI can be defined as a function of the socio-economic characteristics:

VI=f(C1,C2,…,Cn)

Expressed in terms of positive and negative traits:

$VI=\sum_{p}^{i=1} Pi \ -\sum_{q}^{j=1} Nj$

Simulation Scenarios
The two extreme scenarios defined included:

Scenario 1: Absolute Hedonism
In this scenario, all negative traits are maximized, and all positive traits are absent:

$Pi=0 \forall i \in P and Nj=1 \forall j \in N$

Thus, the Value Index in this scenario can be computed as:

$VIhedonism=0-\sum_{q}^{j=1} \ 1=-q$

Scenario 2: Absolute Eudemonism
In this scenario, all positive traits are maximized, and all negative traits are absent.

$Pi=1 \forall i \in P and Nj=0 \forall j \in N$

In this case, the Value Index can be calculated as:

$VIeudemonism=\sum_{p}^{i=1} 1-0=p$

Dataset Generation
The simulations generate a dataset D consisting of m individual simulations (in this case, m=80,810), each representing a unique combination of socio-economic characteristics:

$$(D = \{(C1(k), C2(k), \ldots, Cn(k), VI(k)) \mid k = 1,2, \ldots ,80810\})$$

Where:

Ci(k) is the value of characteristic Ci in the k-th simulation.

VI(k)=f(C1(k),C2(k),…,Cn(k)) represents the computed Value Index for the k-th simulation.

Through this structured experimentation, we generated a substantial dataset comprising a total of 80,810 simulated values for the Value Index, derived from varying combinations of individual characteristics across the defined spectrum.

Regression Analysis
To assess the relationship between the Value Index (V.I.) and overall well-being, we performed a regression analysis where the total-wellbeing scores served as the dependent variable and the Value Index acted as the independent variable.

Results and Discussion

ABM Model Results
The interface of ABM depicts the model environment. In this environment black person shape represents people, green and yellow patches represent renewable and non-renewable resources respectively (Figure 1).

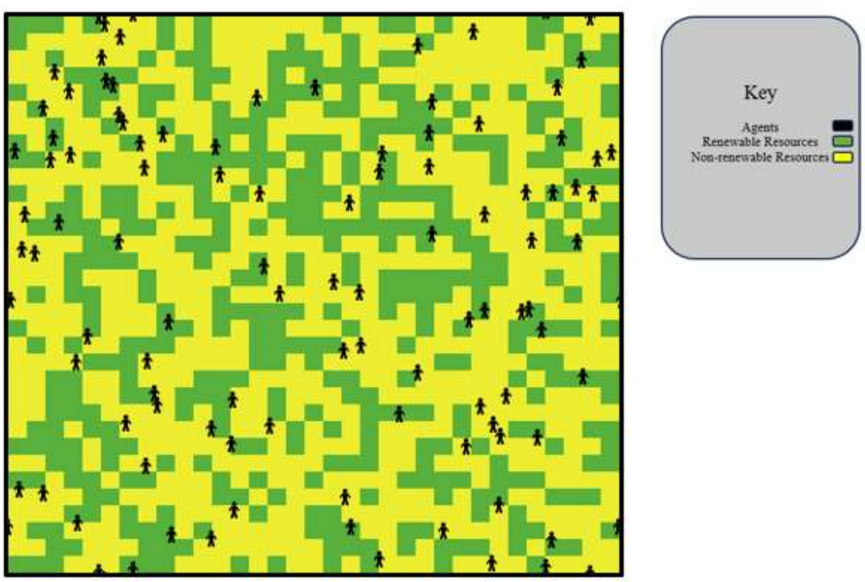

Figure 1: ABM Interface Model Environment

Following screenshots depict three distinct scenarios of value spectrum and impact of change in values on total wellbeing of the society.

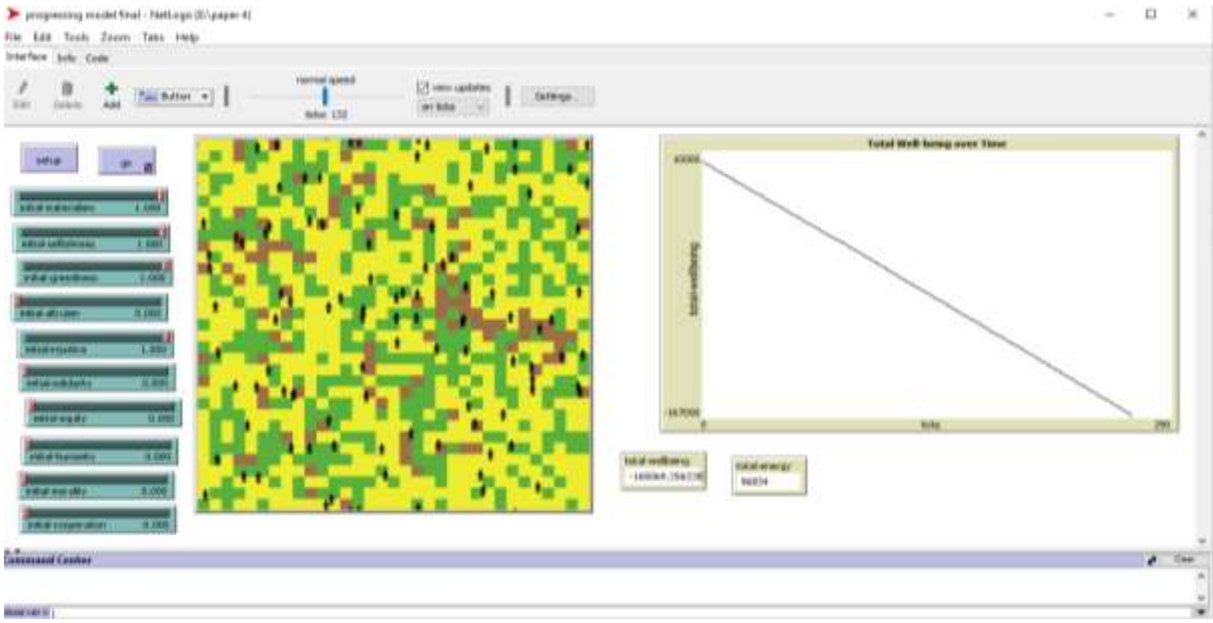

Figure 2: Scenerio 1 (Absolute Hedonism)

First is Absolute hedonism where the society has maximum Materialism, Selfishness, Greed, and Injustice (value = 1 for each) but Altruism, Cooperation, Solidarity, Equity, Morality, and Humanity are none-existent (Figure 2). Total Wellbeing plot shows a negative slope showing that hedonism negatively impacts wellbeing of the society.

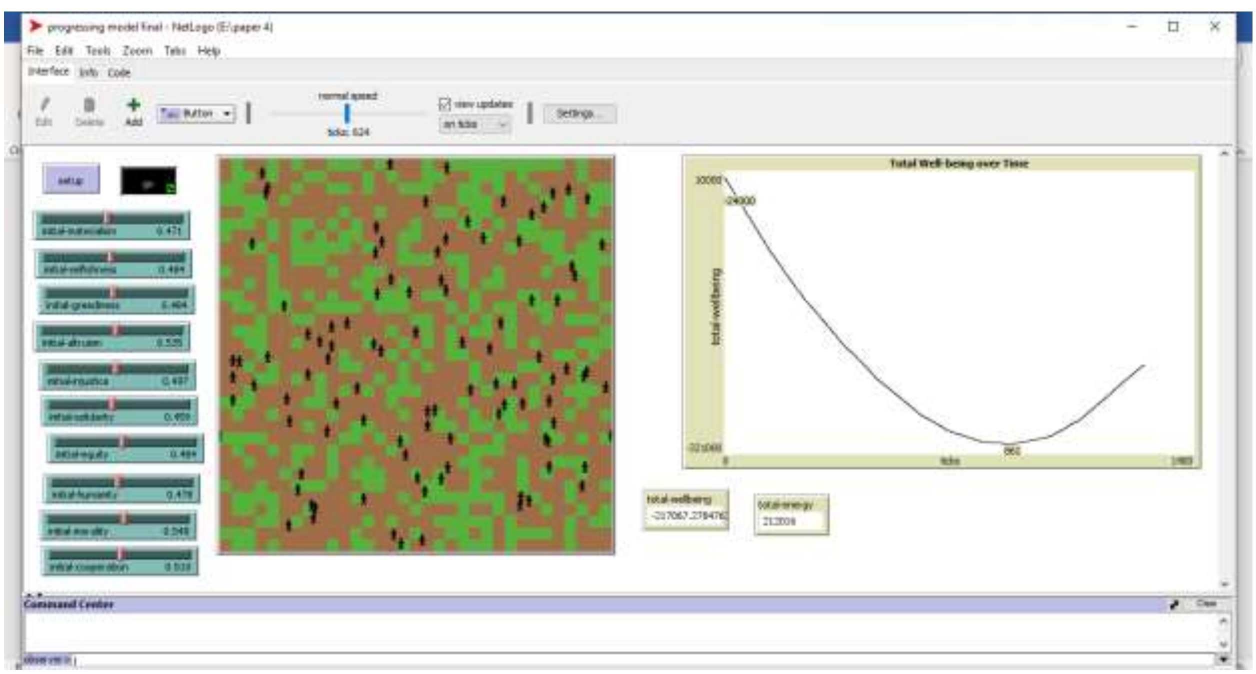

Figure 3: Scenerio 2 (Mixed Values)

In the second scenario it is seen that as soon as the value scales are moved to almost center and Materialism, Selfishness, Greed, and Injustice (hedonic values) along with Altruism, Cooperation, Solidarity, Equity, Morality, and Humanity (eudemonic values) are in the middle, having values around 0.5, i.e. when in the society hedonism starts decreasing and eudemonism starts to increase, total wellbeing curve becomes horizontal and then starts to shift towards positive slope. This means that society's total wellbeing starts to increase slowly (Figure 3).

Last scenario depicts absolute eudemonism where Materialism, Selfishness, Greed, and Injustice are none-existent and Altruism, Cooperation, Solidarity, Equity, Morality, and Humanity are maximum (Values = 1 for each) (Figure 4). Total wellbeing shows a sharp positive slope which reflects a steep increase in total wellbeing as soon as the people in the society turn eudemonic. This depicts that shift in the value system from hedonic to eudemonic will positively impact society's overall wellbeing. Although in real life scenarios 1 and 3 do not exist nevertheless this analysis gives a very important lesson. As per Ibn Haldun's cyclical theory a civilization which has more Asabiyah and social cohesion with values like equity, solidarity, cooperation, humanity, and morality flourishes under a strong leadership. However, as this society gets more materialistic comforts and become sedentary, they become lazy lose these eudemonic values and shift towards hedonism developing greed, selfishness, and injustice, that civilization is doomed. He predicted that this cycle continues in the life time of every civilization (Shareef, 2018). Results of the study validate these observations by this prominent Muslim scholar.

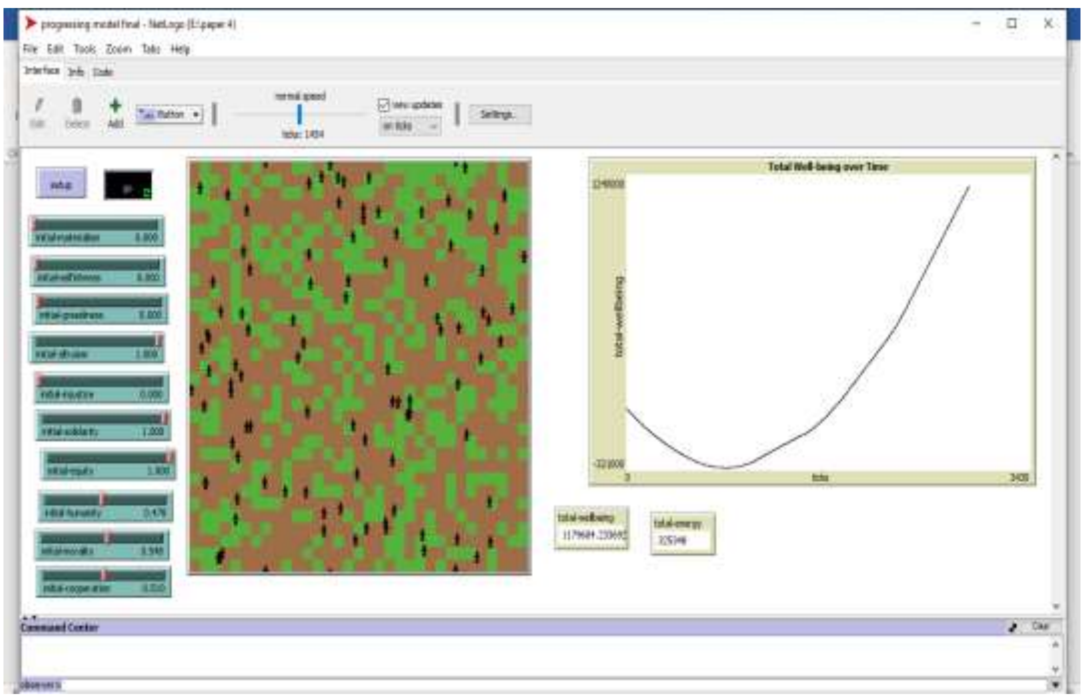

Figure 4: Scenerio 3 (Absolute Eudemonism)

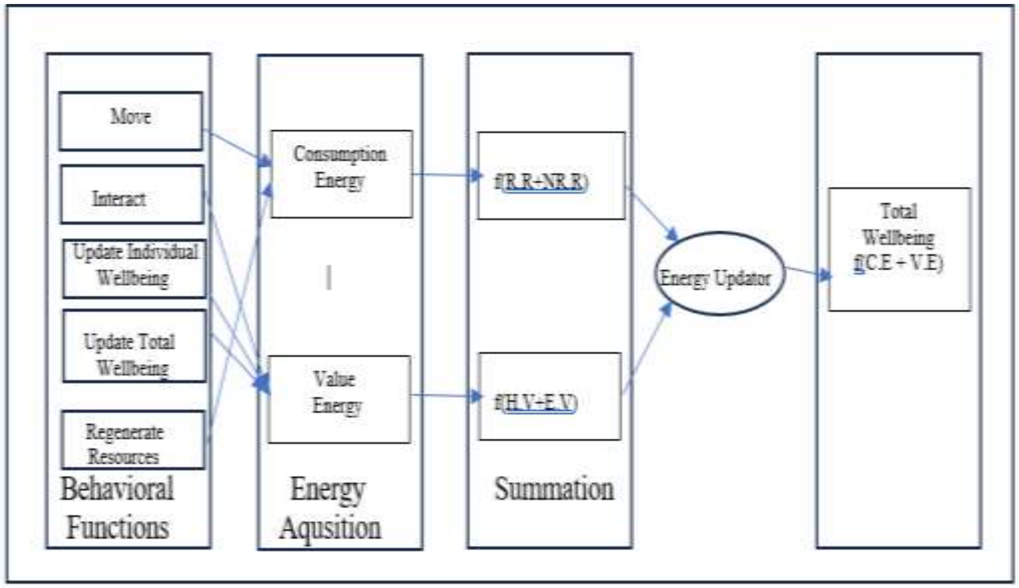

Figure 5: The Model Flowchart for Value Based Wellbing ABM

Figure 5 illustrates the framework of the NetLogo model designed to simulate the interactions between behavioral functions, energy acquisition, and overall wellbeing. The "Behavioral Functions" block encompasses actions of agents in the model including moving, interacting, and updating individual and total wellbeing. Energy acquisition is represented in the central block, where "Consumption Energy" is evaluated against "Value Energy." This process determines the energy available for the system. The "Summation" block integrates the results from energy acquisition, calculating total wellbeing through the functions f(R=NR·R) and f(H.V=E·V). Consumption energy is gained by the agents via consumption of both renewable and non-renewable resources. This energy helps the agents move and is related to regeneration of resources. Value energy on the other hand is the energy agents experience due to the value system they have it is the summation of both hedonic and eudemonic value systems. The "Energy Updater" connects these components, ensuring that the total wellbeing is dynamically adjusted based on summation of consumption energy and value energy. This model provides insights into how energy dynamics influence individual and collective wellbeing within the simulated environment.

Figure 6 titled "Wellbeing and Energy over Time" presents a longitudinal analysis of the relationship between total wellbeing (represented by the red curve) and total energy (depicted by the blue curve) across three distinct stages: Hedonism, Mixed Value, and Eudemonism. In Stage 1, characterized by hedonistic pursuits, total wellbeing initially rises sharply as energy levels increase, reflecting a focus on immediate gratification. Transitioning into Stage 2, the Mixed Value phase, the growth in wellbeing begins to plateau, indicating a shift towards a more balanced approach that incorporates both pleasure and meaningful engagement. Finally, in Stage 3, Eudemonism, total wellbeing experiences a significant upward trajectory, suggesting that sustained energy investment in purposeful activities leads to enhanced overall wellbeing. This model underscores the dynamic interplay between energy consumption and wellbeing, highlighting the importance of evolving values in fostering long-term satisfaction.

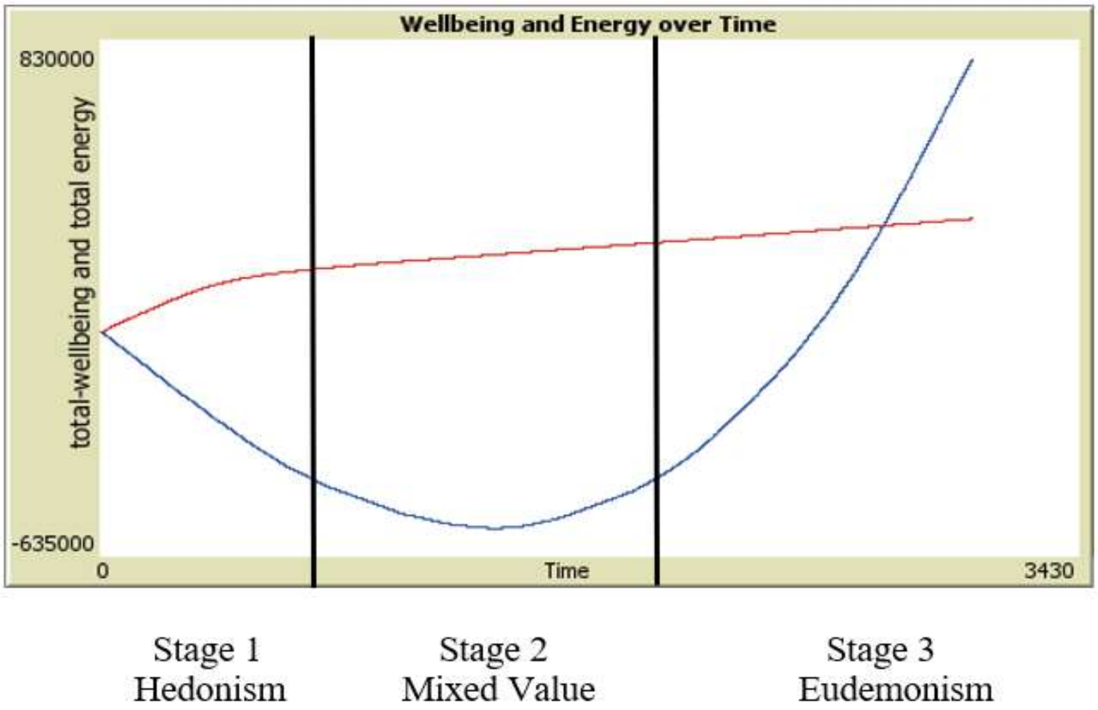

Figure 6: Total Wellbeing and Total Energy over Time

Regression Results

We define the following variables for the purpose of analysis:

Value Index (V.I.): A composite score that balances detrimental traits against beneficial traits, calculated using the equation:

V.I.=[(M+S+G+J)/4 × (−0.5)] + [(A+C+SD+E+Mo+H)/6 × (0.5)]

Where:

M = Materialism
S = Selfishness
G = Greed
J = Injustice
A = Altruism
C = Cooperation
SD = Solidarity
E = Equity
M = Morality
H = Humanity

A dataset comprising individual character traits was simulated, resulting in a total of n=80,810 observations of Value Index values derived from varying combinations of socio-economic characteristics, where each trait was measured on a continuous scale from 0 to 1.

To explore the relationship between the Value Index (V.I.) and the overall well-being of individuals, we constructed a simple linear regression model defined as:

TWS =β0+β1·V.I.+ϵ

Where:

TWS = Total Well-Being Score (in Millions) (dependent variable)
β0 = Intercept of the regression equation
β1 = Coefficient representing the sensitivity of Total Well-Being Scores to changes in the Value Index
ϵ = Error term, encapsulating the variability in Total Well-Being Scores not accounted for by the Value Index

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.620[a]	.385	.385	2.58471	1.871

a. Predictors: (Constant), valuescore

b. Dependent Variable: totalwellbeingmil

Table 1: Model Summary

The Model presented in Table 1 offers valuable insights into the relationship between the predictors and the dependent variable, total wellbeing. The correlation coefficient R=0.620 reflects a moderate positive correlation, indicating that as the predictors increase, there is a tendency for the total wellbeing to also increase. This suggests that the variables included in the model have a meaningful link to overall wellbeing.

The coefficient of determination, R2=0.385, indicates that approximately 38.5% of the variance in total wellbeing can be accounted for by the predictors in this model. This implies that while the model captures a significant portion of the variability associated with wellbeing, there remains a considerable amount (61.5%) of unexplained variance. Total energy being provided by consumption of resources in ABM could be the unexplained predictor. This unexplained variance could be attributed to other factors not included in the model, highlighting the complexity of wellbeing as a construct that may involve additional variables such as socio-economic factors, psychological well-being, and social relationships.

The adjusted R2 value, which remains at 0.385, reinforces the model's robustness given the number of predictors. This indicates that the model is adequately specified, providing a reliable estimation without overfitting.

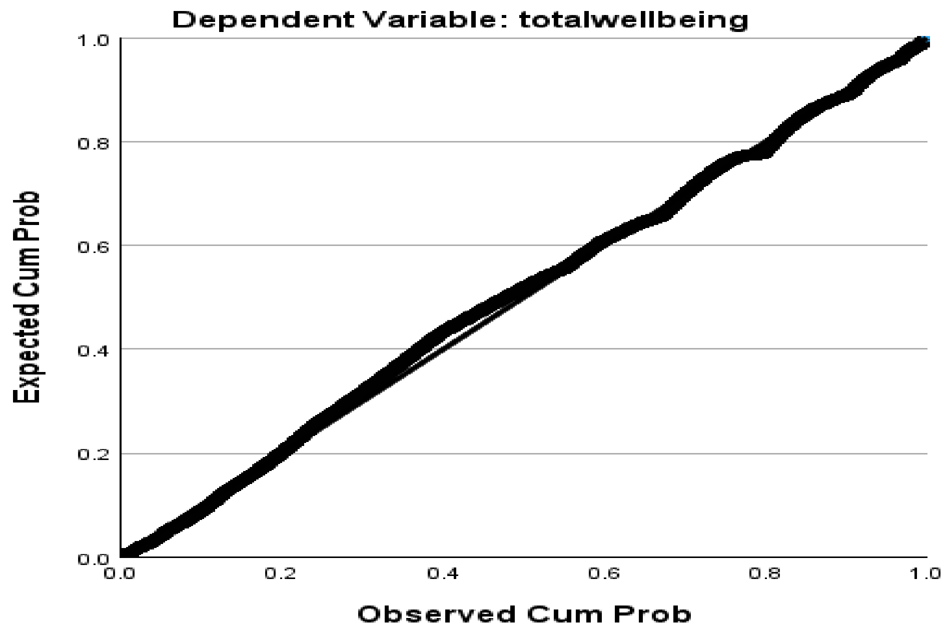

Figure 1: Normal P-P plot of Regression Standardized Residual Dependent Variable

The Normal P-P plot (Figure 1) of the regression standardized residuals further supports the model's validity, as the residuals closely follow the diagonal line, indicating that they are approximately normally distributed. This adherence to normality is crucial for the reliability of statistical inferences drawn from the model, suggesting that the findings regarding total wellbeing are robust and warrant further exploration of additional predictors to enhance understanding of this complex construct.

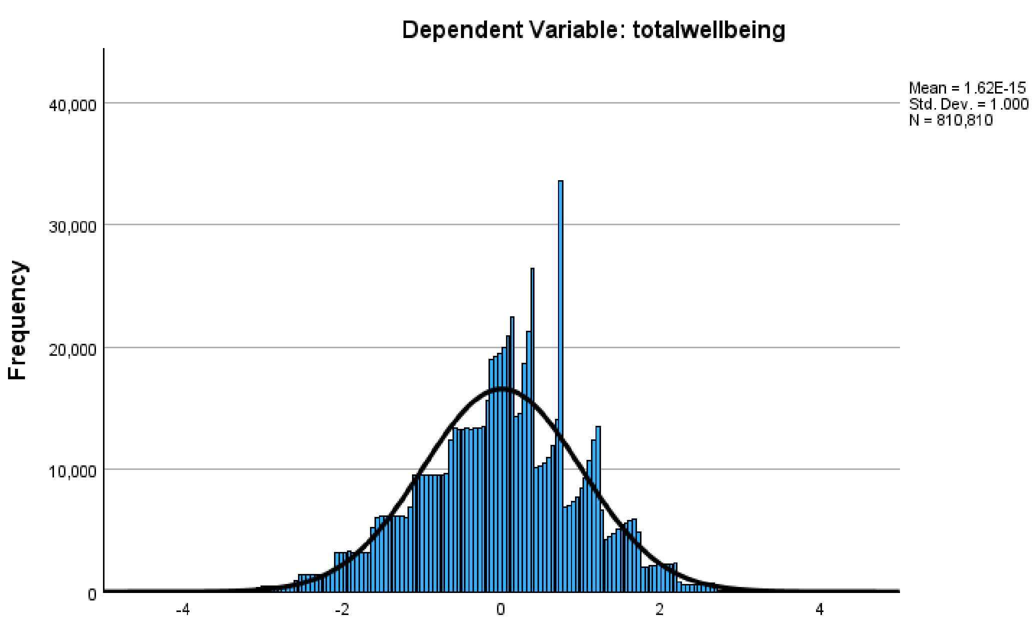

Figure 2: Regression Standardized Residual

The histogram of the regression standardized residuals (Figure 2) for the dependent variable, total wellbeing, provides a visual assessment of the distribution of residuals, which is crucial for evaluating the assumptions of the regression model. The distribution appears to be approximately normal, with a central peak and a symmetrical spread around the mean, although some deviations are evident, particularly in the tails, where there are noticeable spikes indicating potential outliers or non-normality.

The parameters of the model (β0 and β1) were estimated using ordinary least squares (OLS) regression techniques. The estimated coefficient for the Value Index (β1) was found to be:

β1 ≈ 0.62

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.821	.008		239.820	<.001
	valuescore	20.036	.028	.620	712.396	<.001

a. Dependent Variable: totalwellbeingmil

Table 2: Coefficients of the model

The coefficients table (Table 2) reveals significant insights into the relationship between the predictor variable, valuescore, and the dependent variable, total wellbeing. The unstandardized coefficient for valuescore is 20.036, indicating that for each unit increase in valuescore, total wellbeing is expected to increase by approximately 20.036 units, holding all else constant. The standardized coefficient (Beta) of 0.620 suggests a strong positive relationship, indicating that valuescore accounts for a substantial portion of the variance in total wellbeing. The t-value of 712.396 and the associated significance level ($p < .001$) confirm that this relationship is statistically significant, suggesting that valuescore is a critical predictor of total wellbeing. This coefficient indicates that a one-unit increase in the Value Index is associated with an increase of approximately 0.62 units in the Total Well-Being Score, holding other factors constant.

The regression equation can therefore be expressed as:

TWS=β0+0.62·V.I.+ϵ

The positive sign of the coefficient β1 suggests a significant positive relationship as individuals exhibit higher Value Index scores—indicative of a greater balance of altruistic and cooperative traits relative to negative traits—one can expect an improvement in their overall well-being.

This outcome suggests that as the Value Index increases, reflecting a greater balance of positive characteristics relative to negative ones, the total well-being of individuals correspondingly improves. Thus, the findings of this regression analysis provide compelling evidence for the relevance of the Value Index as a predictor of individual well-being within the context of the simulated socio-economic environment.

Limitations and Future Direction of Research

This model provides a holistic representation of diverse individual characteristics that influence well-being, such as altruism and materialism, thereby capturing the complexity of social interactions. Its dynamic simulation of agent interactions allows for the exploration of how these traits impact collective well-being, while the incorporation of resource management highlights the ecological aspects of individual welfare. The model's adjustable parameters promote flexible experimentation, and the integration with regression analysis provides a robust empirical foundation for insights into well-being determinants. Additionally, the ability to visualize results enhances interpretability, making the findings relevant for both research and real-world applications focused on improving social welfare. Having said that this agent-based model (ABM) presents several limitations that should be acknowledged. First, the simplified representation of individual characteristics and their influence on well-being may not encompass the complexity of human behavior and interactions. The model relies on fixed probabilities for materialism, altruism, and other traits, which may not reflect their dynamic nature in real-world contexts. Furthermore, the interaction model relies on simplistic logic for partner interactions, which may overlook more complex social dynamics that can influence well-being.

Future research could expand upon this work by integrating longitudinal data to track changes in individual traits and well-being over time, allowing for a deeper exploration of causal relationships. Considering more realistic interaction dynamics among agents, such as varying influence based on relationship history or context, could enhance the model's fidelity. Additionally, incorporating broader and more diverse demographic variables would facilitate a better understanding of how different backgrounds and contexts affect well-being outcomes. Integrating the findings from this ABM with regression analyses could provide insights into correlations between specific characteristics and well-being while allowing for a quantitative evaluation of the model's assumptions. Finally, exploring the impacts of policy interventions designed to promote positive traits or resource management strategies could lead to practical implications for enhancing social well-being in various settings.

Conclusion

In concluding this research, the investigation illuminated the intricate relationship between societal values and overall well-being, employing agent-based modeling (ABM) to effectively simulate these dynamics. The study revealed that the diverse attributes represented by the model’s turtles, which ranged from materialism and selfishness to altruism and cooperation, significantly influenced both individual wellbeing and the collective wellbeing of the community. By varying value indices, the analysis uncovered a strong positive correlation, reflected in a beta coefficient of 0.62, indicating that shifts towards more altruistic and cooperative (eudemonic) values markedly enhanced societal well-being.

These findings not only underscore the importance of understanding how differing value orientations impact community welfare and resource sustainability but also provide empirical validation for Ibn Haldun’s cyclical theory of history. Haldun's theory posits that civilizations undergo phases of growth and decline largely driven by the strength of social cohesion—an assertion supported by this study’s results (Duran, 2021). Through the mathematical framework developed in this research, relationships were articulated and measured, facilitating a detailed analysis of agents’ interactions within a simulated environment. Global variables such as total well-being and total energy offered insights into the cumulative effects of individual behaviors on community welfare.

The model successfully accounted for 38.5% of the variance in total well-being; however, the unexplained variance indicates the complexity inherent in the construct of well-being, shaped by various factors, including socio-economic conditions and psychological influences. This highlights the necessity for future research to integrate additional variables for a more comprehensive understanding of societal well-being.

Ultimately, this study contributes significantly to ongoing discussions regarding the ethical foundations of social structures, advocating for policy interventions that promote eudemonic values such as cooperation and altruism to enhance societal health (Boer & Fischer, 2013; Özakpınar, 2013; Ratnawat R.G, 2018; Ryan et al., 2013; Sagiv et al., 2017). It establishes a crucial link between value systems and community well-being, supporting an integrated approach in policymaking that emphasizes the cultivation of values conducive to sustainable resource management. In doing so, it lays a foundational basis for further explorations at the intersection of values, behavior, and societal health.

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