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**Research Article**

**What is Capitalism? A Serpent Eating Its Own Tail or a Phoenix Rising from the Ashes?: A Philosophical, Methodological and Ideological Comparison of Marx and Schumpeter's Approach to Long-Term Economic Cycles**

**Dündar Murat Demiröz<sup>a</sup>**

**Abstract**

**Introduction:** This article aims to explain the philosophical, ideological and methodological differences and similarities in the analyses of modern capitalism by Karl Marx and Joseph Alois Schumpeter. This study is important in terms of showing that two economists and thinkers who are known as opponents and substitutes for each other actually complement each other at many points.

**Method:** The research compares the differences and complementary points of the two thinkers in terms of philosophical foundation, ideological perspective and method used, based on the expressions in the works of Karl Marx and Joseph Alois Schumpeter. The article discusses the methodological foundations and historical basis of the crisis perceptions of these two thinkers; it also questions the validity of these approaches in the context of today's digital economy and technological transformations. In this respect, the method of the article is descriptive comparison.

**Results or Findings:** Marx views capitalism as crisis-prone and historically limited; Schumpeter sees it as self-renewing through creative destruction. Both adopt dynamic disequilibrium frameworks from differing ideological standpoints.

**Discussion or Conclusion:** There are similarities as well as differences in the analysis of both thinkers. In terms of similarities, both thinkers say that the crises of capitalism stem from its own nature, while Marx argues that the process will lead to the final crisis of capitalism, Schumpeter puts forward the view that crises will lead to capitalism renewing itself. The conclusion reached by the article is as follows: As a result, capitalism can have a structure that, on the one hand, produces its own crises, and on the other hand, feeds on these crises.

*Keywords:* crisis dynamics of capitalism, Marx, Schumpeter, critique of capitalism, defense of capitalism, the crisis of contemporary capitalism

*JEL Codes:* B13, B14, B25, B31, E30

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**Araştırma Makalesi**

**Kapitalizm Nedir? Kendi Kuyruğunu Yiyen Yılan mı, Yoksa Küllerinden Doğan Anka Kuşu mu?: Marx ve Schumpeter'in Uzun Vadeli Ekonomik Döngülere Yaklaşımının Felsefi, Metodolojik ve İdeolojik Karşılaştırması**

**Dündar Murat Demiröz<sup>a</sup>**

**Öz**

**Giriş:** Bu makale Karl Marx ve Joseph Alois Schumpeter'in modern kapitalizmi analizlerinde hangi felsefi, ideolojik ve yöntemsel farklılıklar ve benzerlikler bulunduğunu açıklamayı amaçlamaktadır. Bu çalışma birbirine muhalif ve birbirinin ikamesi olarak bilinen iki iktisatçı ve düşünürün aslında birçok noktada birbirini tamamladıklarını göstermesi açısından önemlidir.

**Yöntem:** Araştırma Karl Marx ve Joseph Alois Schumpeter'in eserlerindeki ifadelerinden yola çıkarak her iki düşünürün felsefi temel, idolojik bakış açısı ve kullanılan yöntem açısından birbirinden farklılıklarını ve birbirini tamamlayan noktaları karşılaştırmaktadır. Makale, bu iki düşünürün kriz kavrayışlarının yöntemsel temellerini ve tarihsel dayanaklarını tartışmakta; ayrıca günümüzün dijital ekonomisi ve teknolojik dönüşümleri bağlamında bu yaklaşımların geçerliliğini yeniden sorgulamaktadır. Bu açıdan makalenin yöntemi betimsel karşılaştırmadır.

**Sonuçlar ya da Bulgular:** Marx, kapitalizmi krizlere açık ve tarihsel olarak sınırlı görür; Schumpeter ise onu yaratıcı yıkım yoluyla kendini yenileyen bir sistem olarak değerlendirir. Her ikisi de farklı ideolojik bakış açılarından dinamik dengesizlik modelleri benimser.

**Tartışma ya da Yapılan Çıkarımlar:** Her iki düşünürün analizinde farklılıklar kadar benzerlikler de bulunmaktadır. Benzerlikler açısından her iki düşünür de kapitalizmin krizlerinin kendi doğasından kaynaklandığını söylerken, Marx sürecin kapitalizmin nihai krizine gideceğini savunurken, Schumpeter krizlerin kapitalizmin kendisini yenilemesine yol açacağı görüşünü ileri sürmektedir. Makalenin ulaştığı sonuç şudur: Sonuç olarak, kapitalizm, bir yandan kendi krizlerini üretirken bir yandan da bu krizlerden beslenen bir yapıya sahip olabilir.

**Anahtar Kelimeler:** kapitalizmin kriz dinamikleri, Marx, Schumpeter, kapitalizmin eleştirisi, kapitalizmin savunusu, çağdaş kapitalizmin krizi

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## Introduction

Since its birth, the capitalist system has been defined not only by its relations of production and distribution, but also by its crises. Sometimes financial speculations, sometimes overproduction, and sometimes technological transformations have been seen as the triggers of these crises. However, a deeper and more structural question emerges beyond all these historical examples: Why does capitalism produce its own crises? This question is not limited to a technical analysis of economic cycles; it also necessitates a philosophical inquiry into the system's internal logic, contradictions, and capacity for transformation. Is the fact that capitalism generates crises from within a coincidental malfunction or a structural necessity?

In order to make sense of this question, the two metaphors in the title of the article, “the serpent eating its own tail” – or Ouroboros – and “the Phoenix rising from the ashes” offer quite meaningful images. Ouroboros is a symbol of both destruction and rebirth in ancient mythologies and alchemical traditions. By eating its own body, the snake both consumes itself and reproduces itself. This metaphor provides a powerful intellectual tool for understanding how capitalism destroys or transforms itself through crises. Marx's view of capitalism as a system that is being dragged into destruction due to its own internal contradictions reminds us of Ouroboros. On the other hand, the Phoenix is a legendary bird that originates from Ancient Egyptian, Greek and Roman mythologies. It is generally depicted as a bird with golden-red feathers and an extraordinarily long life (living for 500-1000 years). When the Phoenix's life ends, it lights a fire or burns itself under the sun and is reborn from its ashes. This cycle represents concepts such as death and rebirth, eternity, and renewal. The hope symbolized by the Phoenix is defined as change, reconstruction, and rebirth after difficult times. Schumpeter's evaluation of crises as the engine of creative destruction is closely related to the Phoenix metaphor. According to this analogy, we can say that while Marx sees capitalism as a snake eating its own tail, Schumpeter defines it as the Phoenix rising from its ashes.

Although Marx and Schumpeter addressed the crisis dynamics of capitalism on different philosophical, historical and analytical foundations, it is clear that both thinkers grasped the instability of the system as a structural feature. For Marx, crisis is a necessary result of the contradictions that capital encounters in the accumulation process; the decline in profit rates, overproduction and class antagonisms are the dialectical moments of this process. For Schumpeter, crisis is the direct result of the entrepreneur's innovative activity; creative destruction, not stability, is the norm. Both thinkers saw capitalism not as a static but as a dynamic structure; they conceptualized crises, which are the carriers of this mobility, through the fundamental internal logic of the system. At this point, especially in light of phenomena such as the 2008 global financial crisis, the digital revolution and ecological destruction, the re-evaluation of the analyses of these two thinkers has become a great intellectual need.

The method to be followed in this study will be to compare the crisis understandings of Marx and Schumpeter through a conceptual analysis of classical texts. The texts of both thinkers will be examined not only within their historical contexts but also within the framework of their own internal consistency, ontological assumptions and definitions of crisis. In this context, the approach of the study will be interpretive like a historian of economic thought and analytical like a theoretical structuralist. The author's own position is not to take sides between these two thinkers, but to rethink them in each other's mirror and to investigate the conceptual possibilities that may arise from this thinking.

The article will consist of four main sections. In the first section, the philosophical backgrounds of Marx and Schumpeter, their understanding of history and the meaning they attribute to crises will be discussed. The second section will comparatively examine the methodological approaches of both thinkers and their analyses of long-term fluctuations. The third section will discuss the ideological background of both approaches in the context of their critique or defense of capitalism. In the last section, the conclusions that can be drawn from this comparison will be evaluated and an intellectual framework on the crisis of contemporary capitalism will be proposed.

## **Philosophical Ground**

### **Marx**

The philosophical structure behind Marx's understanding of crisis is directly related to his understanding of historical materialism. According to Marx, human history is the history of conflicts between those who own the means of production and those who do not. The basis of social formations is the contradiction between modes of production and the productive forces and relations of production that these modes contain. In capitalist society, this contradiction takes the form of class struggle between the bourgeoisie and the proletariat. This class structure determines not only the economic relations of exploitation but also the origin of crises. Because crisis is a historical threshold at which the productive forces can no longer be constrained by the existing relations of production. Marx expresses this situation with the following words: "The social productive forces become incompatible with bourgeois relations of production... These relations turn from their mode of development into a fetter" (Marx, 1867/1990, p.529 ). In this context, Marx understands the crisis not only as a statistical distribution, but as an explanation of an outburst in the region.

This historical necessity is explained by Marx's dialectical materialism. The process of capital accumulation has an internally contradictory structure. On the one hand, the productive forces develop, capital expands and labor productivity increases; on the other hand, this development also contains tendencies that erode capital's own foundation: the abstraction of the labor process, the tendency for profit rates to fall, overproduction, social alienation. Capital also consumes the conditions that make its own growth possible. Marx formulates this dialectic as follows: "The real obstacle to capitalist production is capital itself. This system cannot allow wealth to develop on its own foundation" (Marx, 1867/1990, p.567) These contradictions show that the system can be overcome not with temporary reforms but with a structural transformation. Therefore, in Marx, crisis is not a random or external event; it is a dialectical necessity arising from the internal logic of capital: capital accumulates → contradictions deepen → crisis occurs → the system begins to dissolve.

The teleological understanding of history that Marx developed within this framework constructs the historical development of humanity in a progressive and directional manner. Capitalism represents a more advanced stage compared to previous modes of production; however, this superiority does not make it the final stop. On the contrary, capitalism is doomed to be overcome by its own internal contradictions. The historical process makes room for the next mode of production by resolving its own contradictions. In this sense, the capitalist mode of production creates its own gravedigger – the proletariat – while at the same time preparing the historical preconditions for a higher social formation, namely communism. The following statements by Marx are a clear summary of this understanding: "The bourgeoisie produces, first of all, its own gravediggers. Its collapse and the victory of the proletariat are both inevitable and historically necessary" (Marx, & Engels, 1848, p.21). For Marx, history is a necessary

process of transformation that progresses not by chance but through internal contradictions; and crisis is both the messenger and the trigger of this process.

### **Schumpeter**

Schumpeter's understanding of history differs significantly from Marx's historical materialism; his approach is based on a Weberian individualism that emphasizes historical realism and the role of individual actors. Schumpeter evaluates historical processes not through structural necessities, but through the creative actions of actors that emerge in specific historical contexts. According to him, the main source of economic change is not rational expectations or class struggles, but the entrepreneurial individual who creates "new combinations." This individual is the engine of history. Schumpeter formulates this approach as follows: "Economic development is initiated by the entrepreneur who carries out new combinations... The historical process becomes intelligible only through the deeds of individuals" (Schumpeter, 1934,p.87).

This individual-centered understanding of history merges with the innovative entrepreneur figure that Schumpeter places at the center of his explanation of capitalist development. In his eyes, capitalism is not a static structure, but a constantly transforming process that creates revolution from within. This revolution occurs not through technological innovations, but through the entrepreneur who puts these innovations into production. In this context, Schumpeter's famous concept of "creative destruction" is not only an economic mechanism, but also the symbol of a historical dialectic. Every innovation of the entrepreneur brings with it the collapse of the old order. "The opening up of new markets, the organizational development... incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism" (Schumpeter, 1942, p.83).

Contrary to Marx's construction of crisis as a historical necessity, Schumpeter sees crises as probabilistic transformation processes inherent in the system. Crises are not the collapse of the system, but the means of its restructuring. The stability of capitalism depends on its ability to produce imbalances. Schumpeter breaks away from static equilibrium analyses of capitalism and conceives it as a dynamic, unpredictable, but systematically progressing structure. Therefore, crises are not the "disease" of capitalism, but an indicator of its healthy functioning. "Capitalism is by nature a form or method of economic change and not only never is but never can be stationary" (Schumpeter, 1942,p.82).

### **Comparison at a Philosophical Level: Marx and Schumpeter**

The fundamental distinction behind Marx and Schumpeter's crisis analyses is embodied in the question of who makes history: Structures or individuals? According to Marx, history is shaped by the contradictions between production relations and productive forces; individuals assume supporting roles in this process but cannot go beyond structural necessities. In contrast, for Schumpeter, history flows through the ruptures created by individuals – especially innovative entrepreneurs. While in Marx, crisis is the necessary result of structural contradictions, in Schumpeter, crisis is the imbalance caused by the creative energy of the individual. For this reason, while Marx's historical materialism interprets freedom within structural necessity, Schumpeter identifies freedom with individual initiative and creativity. Therefore, between Marx's dialectical understanding of history and Schumpeter's interpretation of evolutionary capitalism, philosophical oppositions such as necessity and freedom, structure and agency, materialism and individualism are decisive. Both thinkers see capitalism as a

dynamic and crisis-prone structure; but they differ radically on the source and meaning of this dynamism.

**Table 1**  
*Comparative Philosophical Table: Marx ↔ Schumpeter*

Philosophical Dimension	Marx	Schumpeter
Who Makes History?	Structures: Mode of production, class relations	Individuals: Innovative entrepreneurs
Necessity Freedom	– Necessity in the foreground; history flows with a dialectical necessity	Possibility and individual initiative are emphasized
Philosophical Basis	Historical materialism, dialectical materialism	Historical individualism, understanding of evolutionary process
Source of Crisis	Internal contradictions of capital (fall in the rate of profit, overproduction)	Innovation process and creative destruction
Meaning of Crisis	Sign of the collapse of the system and the transition to a new social formation	System renewal and evolutionary transformation
Understanding of History	Teleological: Tendency towards communism	Evolutionary: Uncertain, cyclical and open-ended
Social Agent	Proletariat (class)	Entrepreneur (individual)
Ethical Position in Crisis	Criticism of capitalism and the need to overcome	Inevitable part and even power of the dynamics of capitalism

Note. Created by the author.

### Methodological Distinctions

#### Marx

In Marx’s analysis, the method is not simply historical narrative or abstract theoreticality; he develops a structural-analytical approach that can be defined as the reconstruction of the concrete through abstraction. The method followed in *Capital* is aimed at revealing not the superficial phenomena of political economy, but the structural logic of the relations of production behind them. In this context, the general laws of motion of capital are reached by starting from the analysis of commodities and values. Marx writes the following about his method: “The concrete is concrete because it is the concentration of many determinations, hence unity of the diverse... the method of rising from the abstract to the concrete” (Marx, 1993, p.101). Within this structure, crises are analyzed not only as external shocks but within the internal logic of the production process itself. Marx’s method is based on a structural analysis that constantly reestablishes the distinction between appearance and essence.

The most striking outcome of this method is Marx’s theory of crisis. The law of the tendency of the rate of profit to fall, especially discussed in Volume III of *Das Kapital*, shows the destructive moment that the process of capital accumulation carries within itself. The systematic fall of the rate of profit in the face of an increasing organic component (*c/v* ratio) weakens the ability of capital to reproduce at some point. Marx defines this tendency as follows:

“The law of the tendency of the rate of profit to fall... expresses a peculiar form of the internal contradiction of the capitalist mode of production” (Marx, 1990, p.319).

When this decline is combined with overproduction, crisis becomes inevitable. Crisis is a disaster for capital, but it is also the condition for the system to reorganize itself. At this point, Marx evaluates overproduction not only as excess, but also in the context of the limited capacity for consumption: “There is no doubt that the real barrier of capitalist production is capital itself” (Marx, 1990,p.358).

Marx understands capitalist development not only as a linear growth process, but within the cycle of the rise and fall of accumulation regimes. Each wave of capital accumulation begins with an expansion phase, followed by saturation, then contraction and crisis. However, these cycles are not technical, like Schumpeter’s business cycles, but rather historical and structural in content. Crisis is not just an economic contraction, but the mode of production hitting its historical limits. Marx expresses these processes as follows: “At a certain point, the development of the productive forces becomes a barrier for capital; hence the forces must be destroyed or shackled” (Marx,2020, p. 257). Marx’s cyclical thought is thus a temporal condensation of the internal contradictions of capitalism, ultimately leading to a system transformation.

### **Schumpeter**

Schumpeter's method of analyzing the capitalist system is shaped by the concepts of innovation and business cycle, especially those presented in *The Theory of Economic Development*. Schumpeter explains capitalist development not only with the supply-demand balance, but also with internal shocks that occur over time. These shocks occur when innovations - new products, production methods, marketing forms - are integrated into the economic process. Each wave of innovation disrupts the previous balance and triggers a business cycle. These cycles are not limited to short-term fluctuations. Schumpeter argues that the Kitchin (3-5 years), Juglar (7-11 years), Kuznets (15-25 years) and Kondratieff (40-60 years) cycles overlap throughout economic history: “The process of industrial mutation — if I may use that biological term — incessantly revolutionizes the economic structure from within, destroying the old one, creating a new one. This is the essential fact about capitalism” (Schumpeter, 1942,p.83)

Schumpeter’s methodological break is his departure from the static equilibrium analysis of classical economics and his focus on a dynamic system approach. He argues that general equilibrium theories are inadequate in understanding capitalism because he argues that capitalism is inherently based on producing imbalance rather than balance. Entrepreneurial innovations rapidly affect investment, employment and consumption, quickly moving the system away from its previous equilibrium state. Therefore, Schumpeter’s analysis is not about static systems, but about structures that are disrupted and rebuilt: “Without development, there is no history in the economic sense; only circular flow. Development disturbs the circular flow and changes its structure” (Schumpeter, 1934,p. 63). This approach positions capitalism not only as a production-consumption system, but as a set of structures that are constantly revolutionizing.

However, Schumpeter’s method is not established with the formal mathematical models of neoclassical economics, but with an analytical but historicist approach. In his analysis, business cycles trace theoretical structures supported by empirical data, but this tracing is not done directly with formal equations, but through the classification of economic historical facts.

While trying to trace entrepreneurial behavior and structural transformations in certain cyclical structures, he bases himself on qualitative distinctions, not quantitative tools. “The explanation of the business cycle lies in the mechanism of economic development... which proceeds in waves and cannot be understood by equilibrium theory alone” (Schumpeter, 1939, p.172). In this respect, Schumpeter’s method is positioned on a structural-evolutionary level rather than a formal one in its effort to understand the dynamic structure of capitalism.

### Comparison of Methodological Approaches

Marx and Schumpeter's analyses of capitalist crises have significant differences not only in terms of content but also in terms of their methodological frameworks. Marx develops a structuralist and dialectical method that attempts to reveal the deep structural relations of the system by going beyond its superficial appearances. He positions crises as expressions of capital's internal contradictions and sees these contradictions as historically inevitable. In contrast, Schumpeter grasps capitalism not through static equilibrium analyses but within a dynamic and historical evolution. In his approach, crises are moments of transformation arising from the system's own internal creativity. In Marx's analysis, contradiction and necessity are at the forefront, while in Schumpeter's, innovation and possibility are at the forefront. While Marx acts with a search for structural integrity, Schumpeter follows individual revolutions within historical continuity. Thus, the methodological differences of the two thinkers cause a deep divergence in their approaches to the nature and function of crises.

**Table 2**

*Methodological Comparison Table: Marx ↔ Schumpeter*

Methodological Dimension	Marx	Schumpeter
Type of Analysis	Structural, dialectical, from abstract to concrete	Evolutionary, historical, individual-centered
Conception of Crisis	The necessary result of internal contradictions	Creative imbalance resulting from innovation
Conception of Time	Dialectic transformation proceeding through historical moments	Evolutionary progress in perpetual motion
Perpetrator Approach	Classes (especially the proletariat)	Entrepreneurial individual (innovator)
Methodological Tools	Theoretical abstraction, law of value, analysis of production relations	Business cycle analysis, historical sampling, factual explanation
Modeling	Conceptual systematic, non-mathematical structural analysis	Empirical monitoring, non-mathematical but cyclical structure construction
Function of Crisis	The harbinger of internal systemic dissolution and historical transition	A tool for systemic restructuring and renewal
Theoretical Goal	Criticism and overcoming of capitalism	Understanding the inner workings of capitalism, explaining its evolution

Note. Created by the author.

### Ideological Ground

#### Marx

Central to Marx’s critique of capitalism is the idea that this system is doomed by its own internal contradictions. Although capitalism has the ability to develop the productive forces to unprecedented levels, its failure to manage these forces and to align them with social needs is its own downfall. Capitalist production concentrates the means of production in order to create

more value, abstracts labor power, and reduces social needs to market profit. This process causes the system to exhaust its own material basis—labor power and nature. Marx states this clearly: “Capitalist production...tends towards the absolute impoverishment of the working class. It undermines the original sources of all wealth—the soil and the laborer” (Marx, 1867/1990, p.554).

In this context, according to Marx, crisis is not a temporary deviation of capitalism, but a historical impulse towards its surpassing. Crisis is not the moment when the system loses its capacity to reproduce itself, but the moment when that system hits its historical limits. Every crisis carries within itself the preconditions for a more advanced social structure. The contradictory nature of capital accumulation makes crisis both a destructive and a constitutive moment. Therefore, Marx’s crisis analyses contain not only technical or economic, but also historical-strategic meanings: “The real barrier of capitalist production is capital itself. It is this contradiction which causes explosions, crises and finally the violent overthrow of the system.” (Marx, 1867/1990, p.530).

This potential for historical transformation is closely tied to Marx’s labor theory of value and the function he attributes to the proletariat as a revolutionary subject. Labor is both an exploited and a transforming force. The labor theory of value reveals the contradiction embedded in the foundation of capitalist production: while the source of surplus value is labor, this labor is commodified in the production process and separated from its free potential. This alienation is a sign of the decay not only of the individual but of the entire social system. However, this same labor, when organized historically, is the only force capable of overthrowing the existing mode of production. Marx’s words are the essence of this ideological framework: “The proletarians have nothing to lose but their chains. They have a world to win.” (Marx & Engels, 1848, p.35 ).

### **Schumpeter**

Schumpeter accepts that capitalism is full of contradictions; however, he does not see these contradictions as destructive processes like Marx, but rather as regenerative and creative processes. According to him, the competition and entrepreneurship inherent in capitalism constantly destroy old structures and build new ones in their place. Therefore, crises are not moments that disrupt the stability of the system, but rather moments that enable its evolution. In Schumpeter’s eyes, capitalism is a system that feeds on constant change and organizes this change through the forces of production. This approach is concentrated in his famous concept of “creative destruction”: “The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers’ goods, the new methods of production... and the new forms of organization that capitalist enterprise creates” (Schumpeter, 1942,p.83).

However, for Schumpeter, this process of constant renewal involves not only an economic but also a sociological and cultural transformation. This creative power of capitalism erodes its own institutions over time. The institutionalization of innovations, large-scale enterprises, and individual dynamism in social life leads to the bureaucratization of entrepreneurship, the pacifying effect of consumerism, and the conflict of democratic demands with economic logic. For this reason, Schumpeter argues that capitalism cannot remain internally alive and will weaken over time due to its own successes: “Can capitalism survive? No. I do not think it can. But this failure will not be due to its economic weakness, but to its success” (Schumpeter, 1942,p.61).

Despite this view, Schumpeter's approach is not that capitalism should be historically overcome, as Marx's did. He sees the dissolution of capitalism not as a historical necessity but as a sociological tendency. And the direction of this tendency is toward socialism; however, the socialism he envisions is much more technocratic and governance-oriented than Marx's revolutionary vision. Schumpeter's understanding of socialism is as much about administrative rationality as it is about public ownership. In this respect, while he praises the potential of capitalism, he develops a calm resignation to its historical destiny. His basic feeling about capitalism is admiration, and about socialism, inevitability: "What we have to accept is that the capitalist process, by its very success, tends to destroy the institutional framework which it creates and on which it depends" (Schumpeter, 1942,p.134).

### Comparison of Ideological Approaches to Capitalism

Marx and Schumpeter's assessments of capitalism are based not only on different philosophical or methodological positions, but also on a deep ideological divide. For Marx, capitalism is a historical mode of production that alienates human labor, plundered nature, and institutionalized class exploitation. His critique is nourished by a historical belief that this system will resolve itself through internal contradictions and give way to a higher formation. Schumpeter, on the other hand, argues that capitalism transforms itself through the same contradictions; crises are not points of dissolution of the system, but opportunities for restructuring. Despite this optimism, however, Schumpeter also accepts that capitalism will be weakened in the long run by its own successes. Thus, while Marx conceives capitalism as a structure that must be overcome, Schumpeter sees capitalism as an organism that is admired but is historically doomed to extinction. While one calls for revolution, the other prepares for a nostalgic farewell.

**Table 3**

*Ideological Approach Table: Marx ↔ Schumpeter*

Ideological Dimension	Marx	Schumpeter
General Attitude to Capitalism	Harsh system critique; structurally unsustainable	Admiration and acceptance; but historically destructible
Crisis Perception	The harbinger of internal disintegration, revolutionary moment	Agent of renewal, internal dynamism of the system
Revolutionary Potential	Proletariat; overcoming the system through class struggle	Entrepreneurial individual; transformation from within the system
Understanding of Socialism	Historical necessity; abolition of private property and classless society	Sociological tendency; technocratic management and administrative rationality
Concept of Labor	Source of value; exploited but transformative power	Not productive, but responsive element; not carrier of innovation
Ideological Sense	Anger, criticism, revolutionism	Admiration, irony, nostalgia

Note. Created by the author.

### Conclusion

Marx and Schumpeter's predictions about capitalism are gaining new meaning in the first quarter of the 21st century, especially in light of global crises and technological transformations. Marx's idea that capital accumulation is heading towards collapse due to internal contradictions seems to be reaffirmed by current developments such as increasing income inequality, deepening environmental crises and the abstraction of productive labor through digitalization. On the other hand, Schumpeter's approach centered on innovation and

creative destruction has an impressive explanatory power in the context of the rise of digital platform capitalism, the globalization of the entrepreneurial cult and the structural transformations caused by information technologies. This situation shows that the analyses of the two thinkers may not have opposing but rather complementary aspects. Depending on these aspects, one may need to understand in what cases of contemporary economies and societies Marx and Schumpeter's frameworks may be helpful to the researchers. Two paragraphs below may humbly represent some of these.

The contemporary capitalist system, especially since the 1980s, has increasingly evolved into a financialized structure where the accumulation of capital is detached from productive labor and anchored in speculative markets. This decoupling resonates deeply with Marx's critique of capital abstraction and the alienation of labor. The rise of derivatives, algorithmic trading, and the dominance of global financial institutions have expanded the "fictitious capital" layer Marx anticipated, intensifying contradictions between the real economy and financial markets. Moreover, the digitalization of labor – gig work, algorithmic management, and platform-based employment – furthers the commodification of human labor into fragmented, precarious forms. This abstraction of labor from social reproduction ties back to Marx's analysis of capital's self-destructive tendencies, as the foundations of value creation – labor and social needs – become increasingly marginalized.

In contrast, the digital revolution has brought Schumpeter's vision of innovation-driven capitalism into a new era. Platform capitalism – characterized by global giants like Amazon, Uber, and Airbnb – exemplifies the dynamic of creative destruction in its purest form. These platforms disrupt traditional industries, reorganize labor markets, and reshape consumer behavior, reflecting Schumpeter's thesis that innovation is the primary engine of capitalist transformation. Yet, this new entrepreneurial landscape also highlights the ambivalence of Schumpeter's theory: while fostering unprecedented growth and efficiency, it concentrates market power and creates monopolistic tendencies, challenging the very dynamics of competition. In this sense, the rise of digital entrepreneurship illustrates both the vitality and the potential exhaustion of Schumpeterian capitalism in the 21st century.

The global financial crisis of 2008 was a historical turning point that revived the theories of both thinkers. On the one hand, the crisis revealed that the financialized form of capital accumulation had hit the limits of speculative expansion and an updated version of Marx's "tendency of falling profit rates," while on the other hand, the digitalization boom in the post-crisis period was a concrete staging of Schumpeter's concept of creative destruction. The crisis was both destructive and constitutive, structural and technological; this duality provided fertile ground for reinterpreting the ideas of Marx and Schumpeter. The crisis is not only a mirror of the past but also of the future.

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**Research Article**

**Factors Determining Capital Structure in the Turkish Banking Sector: A MARS Approach**

**Süleyman Kale<sup>a</sup> & Kübra Yılmaz<sup>b</sup>**

**Abstract**

**Introduction:** This study examines bank-specific and macroeconomic factors that may influence the capital structure of the Turkish banking sector. The health of the banking sector fundamentally depends on two aspects; the soundness of asset structure and the robustness of capital structure. Therefore, analyzing capital adequacy in the banking sector is of great importance.

**Method:** The study utilizes the MARS (Multivariate Adaptive Regression Splines) method using monthly data from 64 banks covering the period from October 2012 to December 2024.

**Results or Findings:** The analysis successfully reveals the nonlinear relationships in the data, with the selected variables explaining 79.0% of the variation in the capital adequacy ratio. The variables "Total Cash Loans/Total Deposits, Non-Performing Loans/Total Cash Loans, and Total Securities/Total Deposits" have a significant impact on capital adequacy, while the ratios "Net Profit for the Period/Average Equity, Net Profit for the Period/Average Assets, and Liquid Assets/Total Assets" have a relatively smaller effect. The variables "Non-Interest Income/Non-Interest Expenses, BIST 100 Index, Broad Money Supply, Real Effective Exchange Rate, Industrial Production Index, and CPI change rate" were found to have no significant impact on capital adequacy.

**Discussion or Conclusion:** In general, it can be stated that bank-specific factors have a significant influence on capital adequacy, while macroeconomic factors do not have a notable effect.

**Keywords:** MARS, capital adequacy ratio, capital structure, Turkish banking sector

**JEL Codes:** B22, B23, C51, C53, G21

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**Araştırma Makalesi**

**Türk Bankacılık Sektöründe Sermaye Yapısını Belirleyen Faktörler: MARS  
Yaklaşımı**

**Süleyman Kale<sup>a</sup> & Kübra Yılmaz<sup>b</sup>**

**Öz**

**Giriş:** Bu çalışmada Türk Bankacılık Sektörünün sermaye yapısını etkileyebilecek bankaya özgü ve makroekonomik faktörler ele alınmıştır. Bankacılık sektörünün sağlıklı olması temelde iki tarafa bağlıdır: Varlık yapısının sağlıklı olması, sermaye yapısının sağlam olması. Bu nedenle, bankacılık sektöründe sermaye yeterliliğinin analiz edilmesi büyük önem taşımaktadır.

**Yöntem:** 64 bankanın 2012:10-2024:12 dönemi aylık verileri ile MARS (Çok Değişkenli Uyarlanabilir Regresyon Eğrileri) yöntemi kullanılmıştır.

**Sonuçlar ya da Bulgular:** Yapılan analiz, verilerin doğrusal olmayan ilişkisini başarılı bir biçimde ortaya koymuş, kullanılan değişkenler sermaye yeterlilik oranının %79.0 oranında açıklamıştır. “Toplam Nakdi Krediler/Toplam Mevduat, Takipteki Alacaklar/Toplam Nakdi Krediler, Toplam Menkul Değerler/Toplam Mevduat” değişkenleri sermaye yeterliliği üzerinde önemli derecede; “Dönem Net Kârı/Ortalama Özkaynaklar, Dönem Net Kârı/Ortalama Aktifler, Likit Varlıklar/Toplam Aktifler” oranları göreceli olarak daha az oranda etkili olmuştur. Faiz Dışı Gelir/Faiz Dışı Gider, BIST 100, Geniş Tanımlı Para Arzı, Reel Efektif Döviz Kuru, Sanayi Üretim Endeksi ve TÜFE değişim oranları sermaye yeterliliği üzerinde etkili bulunmamıştır.

**Tartışma ya da Yapılan Çıkarımlar:** Genel olarak bankaya özgü faktörlerin sermaye yeterliliği üzerinde etkili olduğu, makroekonomik faktörlerin ise etkili olmadığı söylenebilir.

**Anahtar Kelimeler:** MARS, sermaye yeterlilik oranı, sermaye yapısı, Türk bankacılık sektörü

**JEL Kodlar:** B22, B23, C51, C53, G21

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## Giriş

Finansal sistemin istikrarı ve ülkenin gelişiminde bankacılık sektörü önemli bir işlev üstlenmektedir. Bankalar, aracılık işlevinin gereği olarak bir taraftan tasarruf sahiplerinin birikimlerinin değerlendirilmesinde, diğer taraftan sermayenin gerekli kaynaklara doğru tahsis edilmesinde, likiditenin sağlanmasında ve ekonomik büyümenin gerçekleştirilmesinde rol oynamaktadır. Bankacılık sektörünün doğru ve etkin çalışması, para politikalarını, finansal piyasaları, tüketim ve yatırım kararlarını doğrudan etkilemektedir. Bankacılık sektörü Türkiye ve benzeri Avrupa tipi bankacılıkta, doğrudan ve dolaylı sahiplikle finansal sistemin en önemli kurumları haline gelmektedir. Bu nedenle ekonomi politikalarının yürütülmesinde para ve/veya maliye politikalarının yanı sıra makro-ihtiyati tedbirlerle bankaların çalışma koşulları üzerinde sürekli etki edilmeye çalışılmaktadır. Reel ve finansal sektörde bu kadar önemli bir yer tutan bankaların sermaye yapılarının sağlam olması ve olası krizlerden etkilenmemesi öteden beri önemli olmuştur. Özellikle sabit kur sistemlerinin çöktüğü, uluslararası sermaye akımlarının arttığı, finansal krizlerin sıklaştığı 1970'lerden sonra, bankaların bu türbülanslardan etkilenmemesi ve sermaye yapılarının güçlü tutulması ulusal ve uluslararası düzenleyici ve denetleyici otoritelerin ana faaliyetlerinden biri olmuştur.

Amerika Birleşik Devletleri'nde bankaların yanı sıra sermaye piyasaları da reel sektörün fon kaynağını oluştururken, Avrupa ve Türkiye'de birey ve şirketlerin temel fon sağlayıcısı bankalar olmuştur. Türkiye'deki bankacılık sektörü de geçirdiği 1980 Bankerler Krizi, 1994 Krizi, 1997 Krizi 2000 ve 2001 Krizleri sonrası önemli değişimler geçirmiştir. Bu değişim hem değişen ekonomik koşulların getirdiği bilanço yapısındaki değişim, hem de krizlerin getirdiği yeniden yapılanma ihtiyacı nedeniyle yapısal olmuştur. Mevduat ağırlıklı pasif, kamu kağıtları ağırlıklı aktif bilançolardan 2001 sonrasına yine mevduat ağırlıklı pasif ancak bu kez kredi ağırlıklı aktif şeklinde bir değişim yaşanmıştır. Pasif tarafa, mevduat kadar ağırlıkta olmasa da ihraç edilen menkul kıymetler de eklenmiştir. BDDK faaliyete geçmiş, bankaların risk ve denetim birimleri kurmaları zorunlu hale getirilmiş, izleme ve denetim artmış, geçmiş deneyimlerden ders çıkaran sektör risk yönetimine daha fazla dikkat eder hale gelmiştir.

Global Finansal Kriz bütün dünyada finansal sistemi derinden etkilemiş, uzun yıllara yayılan ve bugüne kadar görülmemiş destekleme politikaları ile bankaların sağlıklı yapılarının devamı ve kredi verme işlevlerinin sürdürülmesine çalışılmıştır. Ekonomik açıdan bu kadar önemli olan bankacılık sektörünün sağlıklı olması temelde iki tarafa bağlıdır. Aktif tarafta varlık yapısının sağlıklı olması, pasif tarafta ise sermaye yapısının sağlam olması. Sağlıklı olmayan aktif yapısı aynı zamanda sermaye yapısının da bozulmasını beraberinde getirmektedir.

Türkiye'de 2024 Aralık dönemi itibari ile 64 banka faaliyet göstermekte ve toplam aktif büyüklükleri 32.657.234 Bin TL olarak finansal sistemin yaklaşık olarak %85'ini oluşturmaktadır (BDDK, 2024). Finansal sistem üzerinde bu kadar büyük bir etkiye sahip olan bankacılık sektörünün etkin çalışması ve olası risklere karşı dayanıklı olması son derece önemlidir.

Bankaların sermaye yapısı, faaliyetlerini yerine getirirken ve olası riskleri yönetirken borç ve özkaynak bileşiminin ne şekilde olacağını ifade etmektedir. Bankacılık sektörünün temel işlevi, pasiflerden aktiflere yönelen süreçte maliyet ve getiri farkından net faiz geliri elde etmektir. Para yaratan finansal kurumlarda, bu hareket genellikle kredi talebi nedeniyle aktiften başlar. Hatta para yaratma mekanizmasında, bankaların merkez bankaları kadar önemli bir işleve sahip oldukları öne sürülmektedir. McLeay Radia ve Thomas, 2014 yılında Money Creation in the Modern Economy konulu çalışmalarında mevduat bankalarının Bank of England'a göre daha fazla para yarattıklarını ifade etmektedirler. Bankaların faiz dışındaki gelir

kaynakları, net faiz dışı gelirler olarak sınıflandırılabilir. Bütün bu işlevleri yerine getirirken özkaynakların ana işlevi, esas olarak aktif taraftaki yatırımları finanse etmekten çok, olası risklere karşı bir koruma kalkanı olarak görev yapmaktır. Özkaynakların az olması koruma kalkanının güçlü olması anlamına gelirken, çok olması bankanın kaynaklarını verimli kullanmaması anlamına gelebilir.

Özkaynakların ne kadar olması gerektiği, düzenleyici ve denetleyici kurumlar nezdinde öteden beri bir araştırma konusudur. Özkaynaklar, temel işlevi aktifin finansmanı olmamakla birlikte olası risklere dayanabilecek ve her durumda ana fonksiyonu olan kredi faaliyetlerini sürdürebilecek miktarda olmalıdır. 1980’li yıllardan itibaren uluslararası düzenleyici otoriteler, özkaynakla bankacılık riskleri arasında bir ilişki geliştirmiş, bu ilişkiyi sermaye yeterlilik oranı (SYO) olarak ifade etmişlerdir.

Sermaye yeterliliği, finansal kurumların maruz kaldıkları riskler karşısında likit varlıklarının yükümlülüklerinin ne kadarını karşılayabileceğini göstermektedir. Bankaların sermaye yeterliliği uygulamasının temel amacı, bankaların sağlam bir mali yapıyla faaliyetlerini sürdürebilmesini ve tasarruf sahiplerinin zarar görmelerinin engellenmesidir. Bu nedenle, sermaye yeterliliği standardına göre bankaların %8 sermaye yeterlilik oranını tutturmak ve idame ettirmek zorundadırlar. Bu oran, bankaların faaliyetlerinden kaynaklanan risk ağırlıklı varlıklarından doğabilecek kayıpların ne kadarının bankanın özkaynakları tarafından karşılanabileceğini göstermektedir (Reis & Kötüoğlu, 2016).

1988’de geliştirilen Basel I sürecinde önce kredi riski, sonra piyasa riski ile özkaynaklar arasında ilişki kurulurken, 2004 yılındaki Basel II ile risklere operasyonel risk de eklenmiştir. Basel II’de, sermaye yeterlilik oranının yanı sıra, piyasa disiplini ve düzenleyici kurumların denetimi diğer önemli unsurlar olmuştur. 2010’daki Basel III ile birlikte kaldıraç ve likidite oranları getirilmiş, sermayenin nitelik ve niceliği artırılmıştır. 2017’deki Basel III reformlarının nihai hale getirilmesi düzenlemeleri, risk ağırlıklı varlıkların değerlendirilmesine, kredi ve piyasa riski ölçümlerine, sistemik öneme sahip bankalar için kaldıraç oranına ilave yükümlülükler getirme ve risk yönetimi ile sermaye yeterliliği konusunda kamuya daha kapsamlı açıklama zorunlulukları gibi yeni yaklaşımlar getirmiştir (BIS, 2017). Sonuç olarak SYO, bankacılık sektörünün en önemli oranlarından biridir ve bankaların sağlıklı yapısını temin etme yönündeki tartışmalar devam etmektedir.

Bankaların mali yapısının önemli bir göstergesi olan sermaye yeterliliğini etkileyen faktörler akademik literatüre sıklıkla konu olmaktadır. Sermaye yeterliliğini etkileyen faktörlerin belirlenmesi olası risklerin yönetilmesi konusunda rehber oluşturmaktadır. Ampirik çalışmalar sermaye yeterliliğini etkileyen bankaya özgü değişkenlerin etkisi ve yönünü belirlemeye çalışmaktadırlar. Bu nedenle literatürde yer alan ampirik çalışmalar incelendiğinde lineer zaman serileri analizleri ve panel veri analizlerinden sıklıkla yararlanıldığı görülmektedir.

Bu çalışmanın amacı, Türk bankacılık sektörünün sermaye yapısını etkileyen unsurları ortaya çıkarmaktır. Çalışmada bağımlı değişken olarak sermaye yeterliliği rasyosu, bağımsız değişkenler olarak ise IMF’in belirlemiş olduğu bankaların finansal sağlık göstergelerinden yola çıkılarak bankaya özgü göstergeler olarak belirlenmiştir. Çalışmada parametrik olmayan ve uygulama esnekliği sağlayan Multivariate Adaptive Regression Splines (MARS, Çok Değişkenli Uyarlanabilir Regresyon Eğrileri) yöntemi ile SYO üzerinde etkili olan değişkenler analiz edilecektir.

Çalışmada geleneksel regresyon yöntemlerinin dışında, esnek veriye dayalı, lineer olmayan bir araç olan MARS ile farklı bir açıdan sermaye yeterliliğini etkileyen faktörler ve

etkinin boyutu araştırılacaktır. Elde edilen bulgular, politika yapıcılar, bankalar, finansal kurumlar, düzenleyicilere yol göstermesi bakımından önem taşımaktadır.

### **Literatür Taraması**

Sermaye yapısı bir firmanın yatırımlarını, büyümesini, uzun süreli faaliyetlerini sürdürmesi için gereksinim duyduğu özkaynak ve borç bileşimini ifade etmektedir. Sermaye yapısı, bir firmanın mali yapısının sağlam olması ve piyasa değeri bakımından önem taşımaktadır. İyi yapılandırılmış bir sermaye yapısı finans maliyetini düşürüp şirket değerini artırabilmektedir (Amidu, 2007; Avcı & Çatak, 2016; Harun et al., 2020).

Sermaye yapısının oluşumu ile ilgili teorik yaklaşımlar bulunmaktadır. Net gelir yaklaşımı, mümkün olduğunca borcun payının artırılıp, ağırlıklı ortalama sermaye maliyetinin düşürülmesini, böylece firma değerinin artacağını savunmaktadır. Geleneksel yaklaşım, belirli bir noktaya kadar bunun mümkün olduğunu ancak artan borç yapısının mali riski artıracığını, bunun özkaynak ve borç maliyetini artıracığını, dolayısıyla belirli bir noktadan sonra sermaye maliyetinin artacağı ve firma değerinin düşeceğini savunmaktadır. Finansman Hiyerarşisi Teorisi (Pecking Order Theory) sermaye yapısını oluştururken firmaların sırasıyla, iç kaynakları, borcu ve hisse senedi ihracını düşündüklerini öne sürmektedir (Harun et al., 2020). Denge Teorisi (Trade-off Theory) sermaye yapısının oluşturulurken, vergi avantajı ile mali risk ve iflas riskinin getirdiği maliyet arasındaki dengenin gözetildiğini öne sürmektedir (Akpınar, 2016; Kwan, 2009). Temsil Teorisi (Agency Theory) hisse sahipleri ile borç verenler arasındaki çıkar çatışmasına odaklanmaktadır (Akpınar, 2016). Modigliani ve Miller (1958) teorisine göre, sermaye yapısı ile ilgili yaklaşımlarda temel teşkil etmiştir (Modigliani & Miller, 1958). Bu teoriye göre etkin bir piyasada, belirli koşullar altında sermaye yapısının firma değerini etkilemesi söz konusu değildir. Firma değeri tamamen faaliyet gelirleri ile maruz kaldığı risklerden etkilenmektedir (Khan et al., 2023; Vo, 2017). Bütün bu tartışma ve yaklaşımlar aslında pratikte sermaye yapısı kararlarının ne kadar karmaşık olduğunu göstermektedir (Harun et al., 2020; Klepczarek, 2015).

Sermaye yapısını etkileyen faktörleri araştıran çalışmalarda firmaya özgü pek çok faktörün sermaye yapısı kararlarını etkilediği tespit edilmiştir. Karlılık en önemli faktörlerden biri olarak öne çıkmaktadır. Bu çalışmalarda, karlılığı yüksek firmaların dış kaynağa daha az gereksinim duydukları tespit edilmiştir. Duran varlıkları yüksek firmalar, teminat gösterme kolaylığı nedeniyle dış kaynaklara daha kolay erişebilmektedir. Varlık bileşiminin de finansal kaldıraçta etkili olduğu görülmüştür. Likiditesi yüksek firmalar, kısa vadeli borç ödeyebilme gücü nedeniyle borca yönelirken, likiditesi düşük firmalar daha çok özkaynak finansmanını tercih edebilmektedir (Harun et al., 2020).

Makroekonomik göstergeler de sermaye yapısı kararlarını önemli derecede etkilemektedir. Büyüme dönemlerinde kaldıraç etkisini kullanmak isteyen firmalar borç miktarını artırırken, küçülme dönemlerinde riskten kaçınmak için borcu azaltmaktadır. Ekonomik döngüler ve krizler de sermaye yapısı üzerinde etkili olmaktadır. Örneğin 2001 likidite krizi, firmaların sermaye yapılarını gözden geçirmeye ve daha istikrarlı bir yapı için borçtan özkaynağa dönmelerine neden olmuştur. Durgunluk dönemlerinde kredi riski algısı yükselmektedir. Sonuç olarak hem reel sektörde, hem bankacılıkta makroekonomik faktörlerle, sermaye yapısı arasında, risk yönetimi ve mali planlama açısından önemli bir ilişki bulunmaktadır (Aras & Aslan, 2011)

Banka gibi finansal kurumlarda, sermaye yapısını etkileyen sektöre özgü faktörler bulunmaktadır. Bankacılık sektörünün sermaye gereksinimleri yasal düzenlemelere tabidir. Bir banka reel sektörde olduğu gibi borç-sermaye bileşimini istediği gibi ayarlayamaz. Düzenleyici

otorite bankaların belirli sermaye yeterliliği oranlarını tutturmalarını zorunlu tutmaktadır. Tarihsel deneyimlerden süzülüp gelmiş ve global ölçekteki analizlerle sermaye yeterliliğinde uyulması gereken sınırlar ortaya konmuştur. Reel sektörden farklı olarak bir bankanın, olası kayıpları karşılayacak kadar sermaye bulundurması zorunlu hale getirilmiştir. Sermaye ile ilgili düzenlemeler, bankaların risk alma davranışlarını da etkilemektedir. Reel sektörde sermaye yapısı kararları daha çok piyasa ve firma kararı (Sheikh & Qureshi, 2017) sonucu şekillenirken, bankacılıkta yasal düzenlemelerle belirlenmektedir (Abdullah vd., 2022; Harun vd., 2020; Terzioğlu, 2017; Vo, 2017).

Bankaların sermaye yapısını etkileyen faktörlere ilişkin literatür incelemesi, ulusal ve uluslararası bağlamda zengin bir akademik birikime dayanmaktadır. Bu çalışmalar, sermaye yeterliliği oranını şekillendiren çok boyutlu dinamikleri sistematik bir şekilde ele almakta ve bankalara özgü içsel faktörlerden çevresel ve düzenleyici unsurlara kadar geniş bir yelpazeyi kapsamaktadır.

Ampirik çalışmalar, bankaların sermaye yapısının şekillenmesinde, yasal düzenlemelerin daha önemli olduğunu, piyasa dinamiklerinin ikincil planda kaldığını göstermektedir (Harun vd., 2020).

Likidite yapısı ve olası mevduat çekilişlerine hazırlıklı olma zorunluluğu da bankaların sermaye yapısını şekillendirmektedir. Likidite, karlılık ve sermaye yönetimi arasında denge gözetilmelidir (Göçmen & Sahin, 2014)

Barrios ve Blanco (2003), İspanyol bankacılık sektöründe yasal sermaye zorunluluklarının etkisini incelemiş ve sermaye yeterliliği düzenlemelerinin bankaların sermaye kararlarını bir ölçüde yönlendirdiğini ortaya koymuştur. Ancak, bu düzenlemelerin ötesinde, piyasa kaynaklı sermaye gereksinimlerinin bankaların sermaye taleplerini açıklamadaki baskın rolü dikkat çekicidir. Bu bulgu, düzenleyici çerçevenin bankaların sermaye yapısını şekillendirmede tamamlayıcı ancak belirleyici olmayan bir unsur olduğunu göstermektedir.

Amidu (2007), 1998-2003 yılları arasında Gana'daki 19 bankanın sermaye yapısını panel regresyon yöntemiyle analiz etmiş ve karlılığı (ROA), vergi oranı, gelir büyümesi, varlık yapısı ve banka büyüklüğü gibi bankaya özgü değişkenlerin sermaye yapısını şekillendiren temel faktörler olduğunu ortaya koymuştur. Bu çalışma, sermaye yapısının bankaların operasyonel ve finansal performansıyla sıkı sıkıya bağlantılı olduğunu sistematik bir şekilde göstermektedir.

Türkiye özelinde, Asarkaya ve Özcan (2007), 2002-2006 döneminde 20 bankanın verilerini panel sistem genelleştirilmiş momentler yöntemiyle incelemiş ve portföy riski, ekonomik büyüme, sektör ortalaması sermaye düzeyi ve gecikmeli sermaye oranının sermaye yeterliliğiyle pozitif bir ilişki sergilediğini bulmuştur. Buna karşılık, banka büyüklüğü ve mevduat oranının sermaye yeterliliğini negatif yönde etkilediği saptanmıştır. Bu sonuçlar, sermaye yapısının hem makroekonomik hem de sektörel dinamiklere duyarlı olduğunu ortaya koymaktadır.

Ahmad vd. (2008), 1995-2002 döneminde Malezya'daki 42 bankayı statik panel veri modeliyle analiz etmiş ve banka büyüklüğü ile faiz marjının sermaye yeterliliğini olumsuz etkilediğini; likidite, sermaye düzeyi, iflas riski ve takipteki kredilerin ise pozitif bir etkiye sahip olduğunu belirlemiştir. Bu bulgular, risk yönetimi ve likidite politikalarının sermaye yapısı üzerindeki belirleyici rolünü öne çıkarmaktadır.

Okuyan (2013), aktif kârlılık ile sermaye yeterliliği arasında anlamlı bir ilişki bulmamış; ancak özkaynak kârlılığı, ekonomik büyüme ve kredi oranının pozitif, risk ve mevduat oranının ise negatif bir etkiye sahip olduğunu tespit etmiştir. Bu analiz, sermaye yapısının bankaların kârlılık yapısından ziyade ekonomik konjonktür ve risk profiline daha duyarlı olduğunu göstermektedir.

Aktas vd. (2015), Güneydoğu Avrupa'daki 10 ülkede 71 bankanın verilerini panel veri analiziyle inceleyerek, banka büyüklüğü, aktif kârlılık, kaldıraç, likidite, net faiz marjı ve risk gibi faktörlerin yanı sıra çevresel unsurların sermaye yeterliliği üzerinde anlamlı bir etkiye sahip olduğunu saptamıştır. Bu çalışma, sermaye yapısının yalnızca banka içi dinamiklerle değil, aynı zamanda bölgesel ve çevresel faktörlerle şekillendiğini sistematik bir şekilde ortaya koymaktadır.

Us (2015), 2002Q4-2015Q3 döneminde Türk bankalarının performansını analiz etmiş ve yabancı para varlıkların yükümlülükler oranı, faaliyet giderlerinin toplam aktiflere oranı, banka yaşı ve döviz rezervlerinin toplam varlıklara oranının sermaye düzeyini anlamlı bir şekilde artırdığını bulmuştur. Bu sonuçlar, sermaye yapısının bankaların döviz pozisyonu ve operasyonel geçmişine bağlı olarak farklılaştığını göstermektedir.

Reis ve Kötüoğlu (2016), 2009Q1-2015Q4 döneminde Türk bankacılık sektöründe En Küçük Kareler yöntemiyle yaptıkları analizde, kârlılık ROA ve özkaynak karlılığı, likidite ve kredilerin takibe dönüşüm oranının sermaye yeterliliği üzerinde pozitif ve anlamlı bir etkiye sahip olduğunu; banka büyüklüğünün ise bu ilişkiyi anlamlı bir şekilde etkilemediğini tespit etmiştir. Bu bulgular, sermaye yapısının bankaların risk yönetimi ve kârlılık performansı ile güçlü bir bağ içinde olduğunu doğrulamaktadır.

Koç ve Karahan (2017), 2005-2015 döneminde Türkiye'deki ticari bankaların verilerini inceleyerek, sermaye yeterliliğinin finansal varlık-toplam aktif oranı, gelir çeşitlendirme, aktif kârlılık ve likidite gibi içsel faktörlerden pozitif ve anlamlı bir şekilde etkilendiğini ortaya koymuştur. Bu çalışma, bankaların sermaye yapısının stratejik finansal kararlarla şekillendiğini sistematik bir şekilde belgelemektedir.

Genel olarak, literatürdeki çalışmalar, bankaların sermaye yapısının çok katmanlı bir etkileşim ağı içinde şekillendiğini göstermektedir. Bankaya özgü faktörler (kârlılık, likidite, risk profili), makroekonomik koşullar (ekonomik büyüme, enflasyon, piyasa gereksinimleri) ve düzenleyici çerçeve, sermaye yeterliliğini belirleyen temel unsurlar olarak öne çıkmaktadır.

## **Yöntem, Değişkenler ve Veriler**

### **Değişkenler ve Veriler**

Çalışmada Türk bankacılık sektörünün sermaye yapısını etkileyebileceği düşünülen bankalara özgü faktörler ve makroekonomik faktörler ele alınmıştır. 35 mevduat, 9 katılım, 20 kalkınma ve yatırım bankası olmak üzere toplam 64 banka verisi analize dahil edilmiştir.

Bankaya özgü değişkenlerin seçiminde IMF'in bankalar için belirlemiş olduğu finansal sağlamlılık göstergeleri ve literatür araştırmaları göz önünde bulundurulmuştur. Bağımlı değişken olarak sermaye yapısının en temel göstergesi olan sermaye yeterliliği oranı kullanılmıştır.

Bankacılıkla ilgili bağımsız değişken olarak sektörün aktif kalitesi, aktif yapısı, aktif-pasif dengesi, gelir ve karlılıkla ilgili göstergeler seçilmiştir. Makroekonomik değişkenler olarak sektörü yakından etkilediği düşünülen sanayi üretim endeksi, tüketici fiyat endeksi artış oranı, geniş para arzındaki değişim ve USD reel efektif döviz kurundaki değişim seçilmiştir.

Bankacılıkla ilgili değişkenler BDDK'dan, makroekonomik göstergeler TCMB elektronik veri dağıtım sisteminden alınmıştır. Hem verilerin mevcudiyeti, hem 2000-2001 kriz sonrası göreceli istikrarlı dönemi yansıtması bakımından 2012-2024 dönemi aylık verileri kullanılmıştır. Veriler, açıklamaları ve kaynağı ile ilgili bilgiler Tablo 1'de gösterilmiştir.

**Tablo 1**

*Çalışmada Kullanılan Değişkenler*

Değişkenler (%)	Kısaltma	Alınış Amacı	Kaynağı
Sermaye Yeterlilik Oranı	SYO	Sermaye yapısı	BDDK
Takipteki Alacaklar (Brüt) / Toplam Nakdi Krediler	Takip_Krd	Aktif kalitesi	BDDK
Toplam Nakdi Krediler / Toplam Mevduat	Krd_Mevd	Aktif yapısı	BDDK
Toplam Menkul Değerler / Toplam Mevduat	MK_Mev	Aktif yapısı	BDDK
Likit Varlıklar/Toplam Aktifler	Lik_Aktif	Aktif Yapısı	BDDK
Faiz Dışı Gelirler / Faiz Dışı Giderler	FDGel_FDGid	Gelir yapısı	BDDK
Dönem Net Kârı (Zararı) / Ortalama Aktifler	ROA	Aktif karlılığı	BDDK
Dönem Net Kârı (Zararı) / Ortalama Özkaynaklar	ROE	Özkaynak karlılığı	BDDK
TÜFE'deki değişim	Tüfe	Enflasyon	TCMB
Sanayi Üretim Endeksi'ndeki değişim	San	Büyüme	TCMB
Reel Efektif Döviz Kuru (USD)'ndeki değişim	REDK	Döviz Kuru	TCMB
M3'teki değişim	MSupp	Parasal Genişleme	TCMB
BIST 100'deki değişim	Bist100	Borsa	TCMB

Açıklama. Yazar tarafından üretilmiştir.

### **MARS Modeli**

Multivariate Adaptive Regression Splines (MARS), (Çok Değişkenli Uyarlamalı Regresyon Analizi) Jerome H. Friedman tarafından 1991 yılında geliştirilen parametrik olmayan bir regresyon yöntemidir (Friedman, 1991). MARS, özellikle bağımlı değişken bağımsız değişkenler arasındaki doğrusal olmayan ilişkilerin modellenmesinde kullanılmaktadır. Önceden tanımlanmış fonksiyonel bir ilişki öngörmez, verilerden modeller oluşturan esnek bir yöntemdir ve karmaşık veri desenlerini analiz etmekte kullanılır.

MARS yönteminde, "spline" kelimesi, eğrileri esnek bir şekilde parçalara ayırarak modelleme yapmayı ifade etmektedir. MARS, bu şekilde verileri anlamlı bölgelere bölerek her bölge için uygun basit modeller oluşturur; böylece parçalı doğrusal fonksiyonlar kullanılarak regresyon modelleri analiz edilmiş olur. MARS yöntemi ile doğrusal olmayan karmaşık ilişkiler modellenmektedir. Doğrusal regresyonlardan farklı olarak verilerin dönüştürülmesine gerek yoktur.

Klasik doğrusal modeller, özellikle doğrusal olmayan ilişkilerin bulunduğu durumlarda hatalı sonuçlara yol açabilmektedir. MARS modeli, bu tür karmaşık ilişkilerin analizinde daha uygun bir seçenek olarak öne çıkmaktadır. Tüm veriye tek bir büyük doğru uydurmak yerine, MARS verinin farklı bölümlerine farklı doğrular uydurarak daha esnek ve daha doğru bir model oluşturur. Modelin kullanımı için bağımlı ve bağımsız değişkenler arasında belirli bir fonksiyonel form gerekmemektedir. Ayrıca, değişkenler arasında herhangi bir katı varsayımın olmaması, MARS'ın farklı veri türleriyle esnek bir şekilde çalışmasına olanak tanımaktadır.

MARS modeli, verileri parçalara ayırarak her parçayı ayrı ayrı modelleme ve bu modelleri eğitip yönetme stratejisini benimsemektedir (Chen et al., 2019).

MARS modeli, parçalı küçük modellerin toplamıdır, genel yapısı 1 nolu denklemde gösterilmektedir.

$$f(x) = \delta_0 + \sum_{i=1}^n \beta_i B_i(x) \quad (1)$$

Burada,  $\delta_0$  sabit terim,  $x$  bağımsız değişken,  $B_i(x)$ .temel (parçalara ait) fonksiyonlar,  $n$  temel fonksiyon sayısı,  $\beta_i$  her temel fonksiyonunu katsayısını ifade etmektedir.

MARS her parçayı oluşturmak için temel fonksiyonları kullanır. Modelde kullanılan temel fonksiyonların genel yapısı 2 nolu denklemdeki şekildedir:

$$B_i(x) = \max(0, K - x) \text{ veya } B_i(x) = \max(0, x - K) \quad (2)$$

Burada,  $x$  bağımsız değişken,  $K$  parçanın değiştiği düğüm noktasıdır. Temel fonksiyonlar hakkında daha detaylı gösterim 3 nolu denklemde sunulmuştur:

$$B_i(x) = \prod_{t=1}^{L_m} S_{l,m}(x_{v(l,m)} - k_{l,m}) \quad (3)$$

Burada  $L_m$  etkileşim derecesi,  $k_{l,m}$  düğüm noktasını,  $x_{v(l,m)}$  bağımsız değişkeni ifade etmektedir.

MARS modeli, ileri ve geri yönelimli olmak üzere iki aşamada çalışmaktadır. İlk aşamada, ileri algoritma kullanılarak çok sayıda küçük doğru parçası oluşturur. Doğru parçaları, esasen girdilerin bölündüğü noktalardır ve birleşim noktaları düğüm olarak adlandırılır. Bu aşamada olası bütün parça ve düğümler kullanıldığı için çok karmaşık ve verilere mükemmel derecede oturan bir fonksiyon ortaya çıkar. Bu adımdan sonra, geri yönelimli algoritma devreye girer. Modelin öngörü gücüne en az katkıda bulunan bölümler (fonksiyonlar) kaldırılır, böylece açıklayıcılığı yüksek ve daha sade bir model elde edilmeye çalışılır. Bu sadeleştirme süreci 'budama (pruning)' olarak adlandırılmaktadır. Budama işlemi, model karmaşıklığı ile tahmin doğruluğu arasındaki dengeyi sağlayan Genelleştirilmiş Çapraz Doğrulama (GCV) kriterine dayanır. Budama sırasında, en düşük GCV değeri ve en yüksek  $R^2$  değerine ulaşmayı hedeflemektedir. Budama işlemi kriterini gösteren en düşük GCV değeri ve en yüksek  $R^2$  değerine ulaşıldığında nihai sonuca ulaşılmaktadır (Sephton, 2001).

MARS modelinin performansını değerlendirmek için uyum iyiliği kriterleri arasında  $R^2$ , Düzeltilmiş  $R^2$ , standart sapma, değişim katsayısı (CV (%)), görel mutlak hata (RAE), ortalama hata kare (RMSE), ortalama mutlak sapma (MAD) ve ortalama mutlak hata yüzdesi (MAPE) gibi ölçütler kullanılmaktadır.

MARS modelinde nihai modele ulaşıldıktan sonra, modelde kullanılan bağımsız değişkenlerin nispi (görel) önemi belirlenmektedir. Bu aşamada, görel önemi belirlenmek istenen değişkeni içeren tüm terimler modelden çıkarılır ve bu değişkenin modelden

çıkarılmasıyla ortaya çıkan uyum iyiliği kaybı hesaplanır. Aynı işlem tüm değişkenler için tekrarlanır ve her bir değişken, 0 ile 100 arasında bir skor alır. Elde edilen skorun büyüklüğü, değişkenin önemini göstermektedir (Abar, 2020).

MARS modeli bankacılık, finans, ekonomi, sigortacılık, yaşam analizi, pazarlama ve satın alma, dolandırıcılık ve terörle mücadele gibi birçok alanda kullanılmaktadır. Doğrusal olmayan modellerin oluşturulmasında kullanılan MARS modeli parametrik olmayan bir regresyon modelidir. Bağımlı ve bağımsız değişken için belirli bir fonksiyonel kalıba ihtiyaç duymayan MARS modeli bağımlı değişkenin kesitsel veri olduğu durumlarda yüksek başarı sağladığından modelin kesitsel veriler için kullanımının daha uygun olduğu düşünülmektedir. Ancak parametrik ve doğrusal olmayan MARS modeli birçok veri tipi için esnek bir kullanım alanı sağlamaktadır. Aynı zamanda büyük ve küçük veri setlerinde de yüksek başarı göstermektedir. Literatürde finans alanında özellikle logit-probit modeller ile MARS modelinin tahmin sonuçlarının karşılaştırıldığına dair çeşitli çalışmalar yer almaktadır. Parametrik ve doğrusal olmayan MARS modeli ile krizlerin, enflasyon, döviz kuru, altın fiyatları, enerji tüketimine ilişkin tahmin sonuçlarında önemli üstünlükler sunmaktadır. Literatürde bankacılık krizlerinin tahmin edilmesinde MARS modelinden yararlanıldığı görülmektedir.

MARS modelinin literatürde çeşitli alanlarda kullanıldığı çalışmalar bulunmaktadır. Kim (2000), kişilerin sosyoekonomik durumlarının ve bazı bireysel özelliklerinin gençlerin uyuşturucu kullanımı üzerindeki etkisini inceledikleri çalışmalarında bağımlı değişkenin kategorik olduğu durumda da MARS modelinin tahmin gücünün kuvvetli olduğunu ortaya koymuşlardır. Kuhnert vd. (2000) 1 Şubat 1997 ve 31 Ocak 1998 döneminde Avustralya’da motorlu taşıt kazalarından kaynaklanan yaralanmalar üzerine MARS ve CART modellerini kullanarak bir vaka-kontrol çalışması yapmışlardır. Septhon (2001), zaman serisi verilerini kullanarak resesyonu MARS modeli ile tahminlemeye çalışmış ve MARS modelinin nonlineer verilerde de tahmin gücünün kuvvetli olduğu sonucuna varmışlardır. Tunay (2001), Türkiye’de 1987-2000 döneminde farklı parasal büyüklüklere göre paranın gelir dolaşım hızlarını MARS modeli ile tahmin etmiştir. Kolyshkina ve Brookes (2002), sigorta riskini karar ağaçları (CART-Classification and Regression Trees) ve MARS modeli ile tahmin etmişlerdir. Kriner (2007), Alman Kalp Merkezi’nin akut miyokard enfarktüsü geçiren hastalara ilişkin verileri kullanarak yaşam analizini MARS modeli ile incelemişlerdir. Mina (2010), engelli kişilerin iş seçimi ile ilgili yaptıkları çalışmalarında parametrik lojistik regresyon ve MARS yöntemlerini kullanarak sonuçları değerlendirmişlerdir. Kayri (2010), internet bağımlılığını (The Internet Addiction Scale -IAS) MARS modeli ile tahmin etmişlerlerdir ve MARS modelinin tahmin ettiği altı temel fonksiyonda günlük ortalama internet kullanım süresi, internet kullanım amacı, öğrencilerin sınıf seviyesi ve annelerin mesleklerinin internet bağımlılığı üzerinde anlamlı bir etkisi olduğunu ortaya koymuşlardır. Tunay (2010), Türkiye’de bankacılık krizlerini MARS modeli ile tahmin etmiş ve finansal krizlerin, döviz açık pozisyonunun ve ihracatın ithalatı karşılama oranının bankacılık krizleri üzerinde önemli etkisi olduğunu gözlemlemiştir. Samui ve Kothari (2011), ortalama hava sıcaklığı, ortalama rüzgar hızı, güneşlenme süresi, ortalama bağıl nem değişkenleri ile depolardaki buharlaşma kayıplarını MARS modeli ve yapay sinir ağları (ANN) modeli ile karşılaştırmışlardır ve geliştirilen MARS modelinin depolardaki buharlaşma kayıplarının tahmininde güçlü ve güvenilir bir model olduğunu tespit etmişlerdir. Topak (2011), Türkiye’de faaliyet gösteren firmaların kurumsal başarısızlığını MARS modeli ile tahmin etmiş olup, karlılık performanslarının, sermaye yapısı kararlarının ve makroekonomik koşulların firmaların risk profilleri üzerinde önemli bir etkisi olduğunu tespit etmişlerdir. Tunay (2011), Uluslararası Ekonomik Araştırmalar Bürosu’nun (National Bureau of Economic Research-NBER) tanımlamalarını temel alarak Türkiye’de ekonomik durgunların MARS modeli ile tahmin ve kestirimini yapmış ve MARS modelinin kestirim performansının yüksek olduğu görülmektedir. Abar (2020), Ocak 2015 – Haziran 2020 döneminde altın

fiyatlarını kestirimini MARS modelini kullanarak yapmış ve ABD TÜFE değişkeninin altın fiyatları üzerinde en yüksek etkiye sahip olduğunu tespit etmiştir.

MARS modeli doğrusal olmayan ilişkileri ve değişken etkileşimlerini etkili bir şekilde modelleyebilmesi sayesinde ekonomik göstergelerin tahmininde güçlü bir araç olarak öne çıkmaktadır. Model doğrusal olmayan ilişkileri modelleme yeteneğine sahip olduğundan altın ve petrol fiyatları gibi doğrusal olmayan zaman serilerinin tahmininde başarılı ve tutarlı sonuçlar elde edilmiştir. MARS modeli bağımsız değişkenlerin bağımlı değişkeni hangi modellerin ne oranda tahmin ettiğini ve en yüksek etkiye sahip değişkeni belirleyebilmektedir. Kategorik verilere, nicel verilere ve zaman serisi verilerine uygulanan MARS modeli yalnızca değişkenler arasında bir nedensellik ilişkisi ortaya koymamaktadır. Örneğin altın fiyatlarını en iyi tahmin eden MARS modeli belirlendikten sonra, tahmin edilen model ile nedensellik ilişkisi araştırılarak daha verimli sonuçlar ortaya koyulabilir. Ancak bu çalışmada olduğu gibi bankaların sermaye yapısını tahmin eden en uygun model MARS modeli ile tahmin edilmeye çalışılmıştır. Literatürde sermaye yapısının belirlenmesinde MARS modelini kullanan doğrudan bir çalışma bulunmamakla birlikte finansal analizlerde MARS modelinin kullanıldığı çalışmalar bulunmaktadır. Martin (2011), MARS modeli ve Bulanık C-Means kümeleme ile bankaların iflas tahmini için kullanmış ve yüksek doğruluk elde etmiştir. Nguyen vd. (2020), Vietnam'da faaliyet gösteren ilaç firmalarının finansal performanslarını etkileyen faktörleri belirlemek için MARS modelini kullanmışlardır.

Yukarıda MARS modelinin kullanım alanlarını incelediğimizde MARS modelinin sermaye yapısının belirlenmesine yönelik doğrudan bir çalışmaya rastlanmamakla birlikte, finansal kararlarda başarılı sonuçlar verdiği görülmektedir. Bu bağlamda, bu çalışma MARS modelinin bankaların sermaye yapısının belirlenmesinde kullanılması ile literatüre katkı sağlayacağı düşünülmektedir.

### **Bulgular, Analiz ve Değerlendirmeler**

Çalışmada kullanılan değişkenlerin tanımlayıcı istatistikleri Tablo 2'de sunulmuştur. Tablodan anlaşılacağı üzere sermaye yeterlilik oranı, her zaman yasal sınırların oldukça üzerinde seyretmiştir ve düşük standart sapmasıyla istikrarlı bir yapı sergilemiştir. En yüksek değişkenliğe sahip göstergeler, BIST 100 endeksi ile sanayi üretim endeksi olmuştur. Likit varlıkların toplam varlıklara oranı ise değişkenliği en düşük göstergedir.

**Tablo 2***Değişkenlerin Tanımlayıcı İstatistikleri (n=147).*

Değişken	Ortalama	Std. Sapma	Minimum	Maksimum
SYO	17.16	1.31	14.64	20.39
Takip_Krd	3.05	0.89	1.49	5.36
Krd_Mevd	109.88	14.55	80.71	128.04
MK_Mev	27.42	3.05	21.59	36.75
Lik_Aktif	1.11	0.05	0.99	1.29
FDGel_FDGid	98.26	1.13	95.63	100.72
ROA	0.98	0.70	0.07	3.66
ROE	10.51	9.18	0.72	49.92
Tüfe	1.78	2.14	-1.44	13.58
San	0.49	4.07	-29.32	18.66
REDK	81.93	18.34	50.28	112.46
MSupp	2.27	2.61	-4.64	15.44
Bist100	1.54	7.28	-18.24	20.20

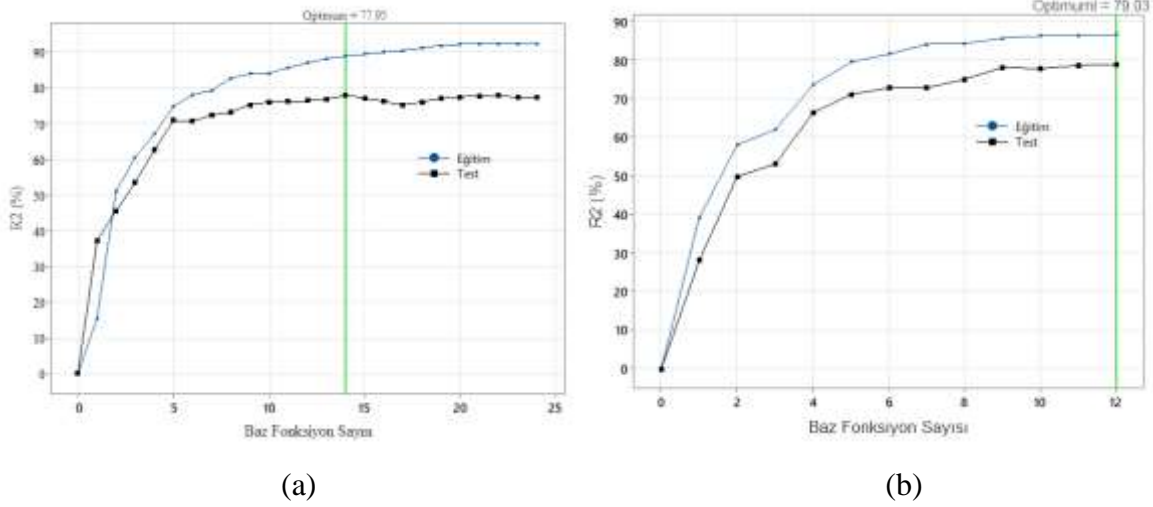
Açıklama. Minitab istatistiksel yazılım kullanılarak yazarlar tarafından üretilmiştir

MARS modelinde maksimum temel fonksiyon sayısı, düğümler arasındaki en az gözlem sayısı, düğüm optimizasyonu için serbestlik derecesi için uygun değerler kullanıcı tarafından belirlenerek model tahmin edilmektedir.

Maksimum temel fonksiyon sayısı 14'e indirildiğinde ve önceki modelde etkili olmayan Faiz Dışı Gelir/Faiz Dışı Gider, BIST 100, Geniş Tanımlı Para Arzı, Reel Efektif Döviz Kuru ve Sanayi Üretim Endeksi değişkenleri çıkarılarak oluşturulan modelin R<sup>2</sup>'leri Şekil 1 (b)'de gösterilmektedir. Şekil 1'de yer alan grafik incelendiğinde 12 temel fonksiyon sonucunda modelin en uygun tahmin değerine ulaştığı görülmektedir. Eğitim ve test kümesindeki R<sup>2</sup> değerleri sırasıyla %86.6 ve %79.0 olarak gerçekleşmiştir. Daha az temel fonksiyonla test kümesinde daha yüksek R<sup>2</sup>'ye ulaşılmış, modelin eğitim ve test kümesindeki açıklayıcılıkları birbirine yaklaşmıştır. Temel fonksiyonları azaltmak ve etkisi olmayan değişkenleri çıkarmak, modeli daha genel ve istikrarlı hale getirmiştir.

## Şekil 1

Baz fonksiyon sayısı ile R2 ilişkisi.

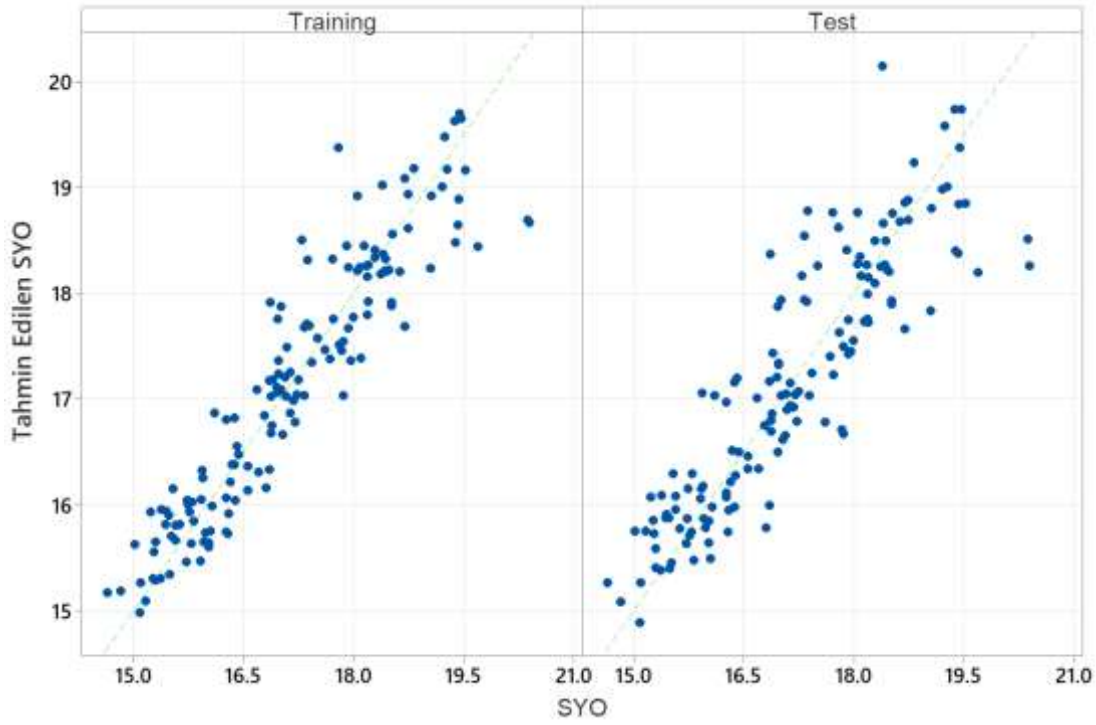


Açıklama. Minitab istatistiksel yazılım kullanılarak yazarlar tarafından üretilmiştir

SYO'nun bağımlı, diğer bütün değişkenlerin bağımsız değişken olduğu MARS modeli, maksimum temel fonksiyon sayısının 14 olarak kullanılmasının yeterli olduğunu, 14'ün temel fonksiyon sayısının artırılmasının  $R^2$ 'yi iyileştirmediğini göstermektedir (Şekil 1, (a)). Eğitim setinde  $R^2$  %88.9 iken, test kümesinde %78.0 olarak gerçekleşmiştir. Faiz Dışı Gelir/Faiz Dışı Gider, BIST 100, Geniş Tanımlı Para Arzı, Reel Efektif Döviz Kuru ve Sanayi Üretim Endeksinin SYO üzerinde etkili olmadığını göstermiştir. SYO üzerinde etkili olan en önemli 6 değişken banka ile ilgili faktörlerden oluşmaktadır. Genel olarak makroekonomik değişkenlerin sermaye yapısı üzerinde etkili olmadığı görülmektedir.

## Şekil 2

Eğitim Kümesi ve Test Kümesi İle Hesaplanan Sermaye Yeterlilik Oranları.



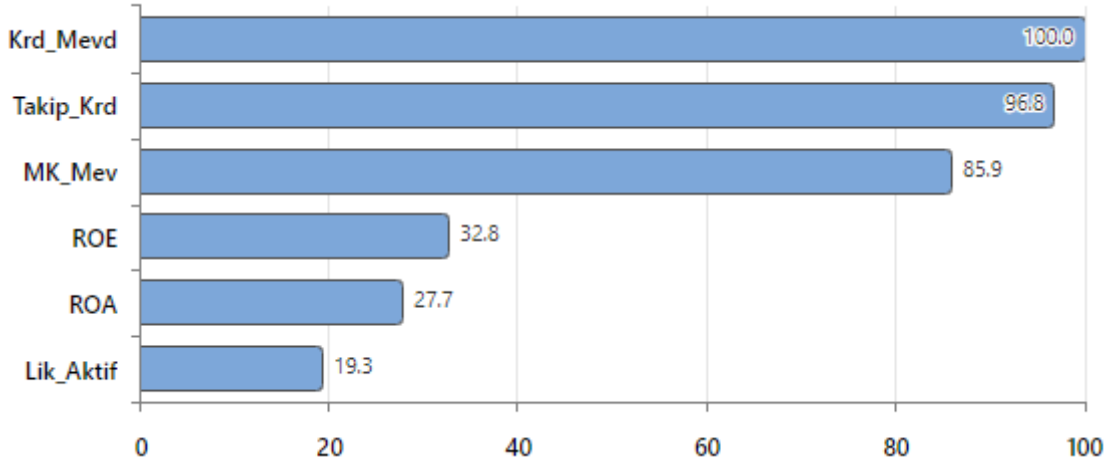
Açıklama. Minitab istatistiksel yazılım kullanılarak yazarlar tarafından üretilmiştir

Şekil 2’de eğitim kümesi ve test kümesi dağılımının benzer olması, sermaye yeterliliği oranının yüksek oranda tahmin edildiğini göstermektedir. MARS modeli ile tahmin edilen SYO tahmin gücünün yüksek olduğu görülmektedir.

Şekil 3’te değişkenlerin önem düzeyi gösterilmektedir. Şekilde değişkenlerin nisbi önem dereceleri önem düzeyine göre sıralanmıştır. Analiz sonucunda “Toplam Nakdi Krediler/Toplam Mevduat, Takipteki Alacaklar/Toplam Nakdi Krediler, Toplam Menkul Değerler/Toplam Mevduat” değişkenlerinin sermaye yeterliliği üzerinde önemli derecede etkili olduğu görülmektedir. “Dönem Net Kârı/Ortalama Özkaynaklar, Dönem Net Kârı/Ortalama Aktifler, Likit Varlıklar/Toplam Aktifler” oranları göreceli olarak daha az etkilidir. “TÜFE’deki değişim” oranının etkisi ise gözardı edilebilir seviyelerdedir.

### Şekil 3

Değişkenlerin Göreceli Önem Düzeyi



Açıklama. Minitab istatistiksel yazılım kullanılarak yazarlar tarafından üretilmiştir

Yapılan MARS analizinde belirlenen 14 temel fonksiyon içerisinde belirlenen 12 temel fonksiyon Tablo 3'te gösterilmiş, 4 nolu denklemde yer alan genel model tahmin edilmiştir.

$$\begin{aligned} SYO = & 20.873 - 0.346 \times BF1 + 0.142 \times BF2 + 0.280 \times BF3 \\ & - 2.012 \times BF4 + 2.163 \times BF5 + 0.301 \times BF6 + 0.207 \\ & \times BF7 + 0.364 \times BF8 - 1.875 \times BF10 - 2.346 \times BF12 \\ & + 1.609 \times BF13 - 3.595 \times BF14 \end{aligned} \quad (4)$$

Tablo 3'te yer alan MARS modeli tahmin sonuçları incelendiğinde "Toplam Nakdi Krediler/Toplam Mevduat, Takipteki Alacaklar/Toplam Nakdi Krediler, Toplam Menkul Kıymetler/Toplam Mevduat, Toplam Nakdi Krediler/Toplam Mevduat, Dönem Net Kârı/Ortalama Özkaynaklar, Dönem Net Kârı/Ortalama Aktifler, Likit Varlıklar/Toplam Aktifler" değişkenlerinin sermaye yeterlilik oranını %79 oranında açıkladığı görülmektedir. Aynı zamanda bilgi kriterlerinin ve genelleştirilmiş çapraz doğrulama kriterinin (GCV) küçük olması modelin kestirim performansının iyi olduğunun bir göstergesidir.

**Tablo 3**  
*Değişkenlerin Tanımlayıcı İstatistikleri*

Temel Fonksiyon	Yorum	Katsayı	SYO'ya Etkisi
Sabit		20.873	
BF1 = max(0, Krd_Mevd - 95.55)	Krd_Mevd > %95.55	-0.346	Krd_Mevd yükseldikçe SYO azalır
BF2 = max(0, 95.55 - Krd_Mevd)	Krd_Mevd < %95.55	0.142	Krd_Mevd düştükçe SYO artar
BF3 = max(0, Takip_Krd - 4.54)	Takip_Krd > %4.54	0.280	Takip_Krd yükseldikçe SYO artar
BF4 = max(0, 4.54 - Takip_Krd)	Takip_Krd < 4.54%	-2.012	Takip_Krd düştükçe SYO azalır
BF5 = max(0, MK_Mev - 24.35)	MK_Mev > 24.35	2.163	MK_Mev arttıkça SYO artar
BF6 = max(0, 24.35 - MK_Mev)	MK_Mev < 24.35	0.301	MK_Mev düştükçe, SYO artar
BF7 = max(0, ROE - 0.72)	ROE > 0.72%	0.207	ROE yükseldikçe SYO artar
BF8 = max(0, Krd_Mevd - 103.39)	Krd_Mevd > 103.39	0.364	Krd_Mevd yükseldikçe SYO artar
BF10 = max(0, MK_Mev - 23.46)	MK_Mev > 23.46	-1.875	MK_Mev yükseldikçe SYO azalır
BF12 = max(0, ROA - 0.92)	ROA > 0.91%	-2.346	ROA yükseldikçe SYO azalır
BF13 = max(0, 0.92 - ROA)	ROA < 0.91%	1.609	ROA düştükçe SYO artar
BF14 = max(0, Lik_Aktif - 0.99)	Lik_Aktif > 0.99	-3.595	Lik_Aktif yükseldikçe SYO azalır

Not: Gözlem Sayısı=147, R<sup>2</sup>=0.79, GCV=0.1667, RMSE=0.598, MSE=0.357 MAD=0.447

Açıklama. Minitab istatistiksel yazılım kullanılarak yazarlar tarafından üretilmiştir

Sermaye Yeterlilik Oranı ile göreceli olarak önemli değişkenlerin ilişkisi Şekil 4'te sunulmaktadır. Şekil incelendiğinde MARS analizinin verilerdeki doğrusal olmayan ilişkiyi başarılı bir biçimde ortaya çıkardığı ve sermaye yeterliliği oranı ile ilgili yeni bakış açıları getirdiği görülebilir. Özellikle “Toplam Nakdi Krediler/Toplam Mevduat, Takipteki Alacaklar/Toplam Nakdi Krediler, Toplam Menkul Değerler/Toplam Mevduat” değişkenlerinde önemli kırılım noktaları tespit edilmiştir.

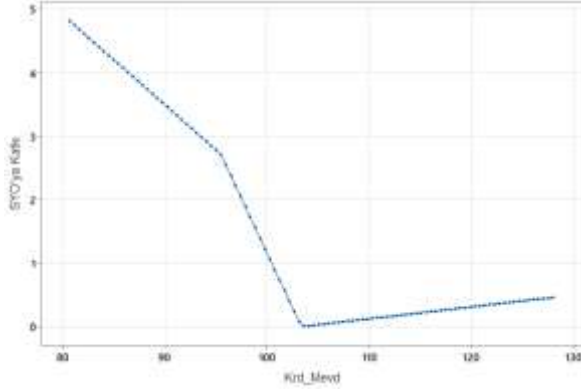
Şekil 4 (a)'da yer alan şekil incelendiğinde Toplam Nakdi Krediler/Toplam Mevduat ile Sermaye Yeterliliği Oranı arasında, ilk dönemlerde negatif bir ilişki olduğu daha sonra %103.39'den itibaren ilişkinin pozitif yöne çevrildiği görülmektedir. Belirli bir düzeye kadar hızlı artan kredi riski SYO'yu düşürken, bu düzeyden sonra azaltıcı etki ortadan kalkmakta, hatta olumluya dönmektedir. Kredi riski yükselen bankalar belirli bir noktadan sonra özkaynaklarını artırarak risk etkisini azaltıyor olabilir. Krediler arttığında, düzenleyici otoritenin sermaye yeterliliğine dikkat etmeleri konusunda bankaları yakından izlemesi ve zorlaması da söz konusu olabilir. Aynı durum Takipteki Alacaklar/Toplam Nakdi Krediler açısından da benzer görünmektedir. Şekil 4 (b)'de Takipteki Alacaklar/Toplam Nakdi Krediler ve Sermaye Yeterliliği Oranı arasında pozitif bir ilişki olduğu ancak %4.54'ten sonra ilişkinin zayıfladığı anlaşılmaktadır.

Şekil 4 (c) Toplam Menkul Değerler/Toplam Mevduat ile Sermaye Yeterliliği Oranı arasında doğrusal olmayan ilişkiyi göstermektedir. Başlangıçta negatif yönlü olan ilişki, %24.35 seviyesinden sonra pozitif dönmüştür. Düşük Toplam Menkul Değerler/Toplam Mevduat düzeylerinde bankalar daha çok kredilere yoğunlaşmakta, artan krediler bankaların SYO oranlarını düşürmektedir. Yüksek Toplam Menkul Değerler/Toplam Mevduat düzeyleri, bankaların kredilerden ziyade devlet iç borçlanma senetlerine ağırlık verdikleri dönemleri ifade etmektedir. Devlet iç borçlanma senetleri, kredi ve piyasa riski düşük varlıklardır, SYO oranını düşürücü bir etki göstermez. Yüksek Toplam Menkul Değerler/Toplam Mevduat düzeyleri,

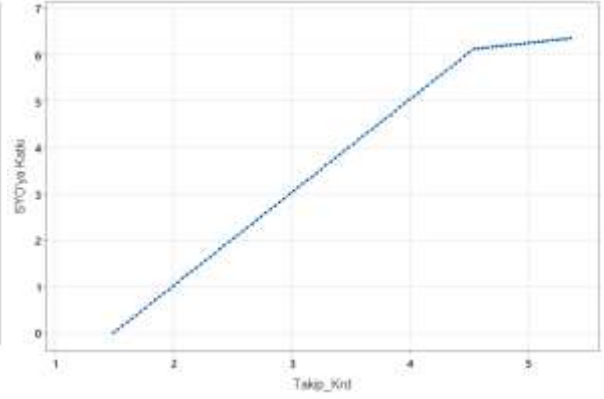
düşük Toplam Nakdi Krediler/Toplam Mevduat, dolayısıyla yüksek SYO dönemleri ile ilişkili görünmektedir. Kredilerin ve menkul değerlerin mevduata oranı ele alındığında, istikrarlı bir SYO açısından kredi ve menkul değerler portföyünün dengeli olması gerektiği ifade edilebilir.

#### Şekil 4

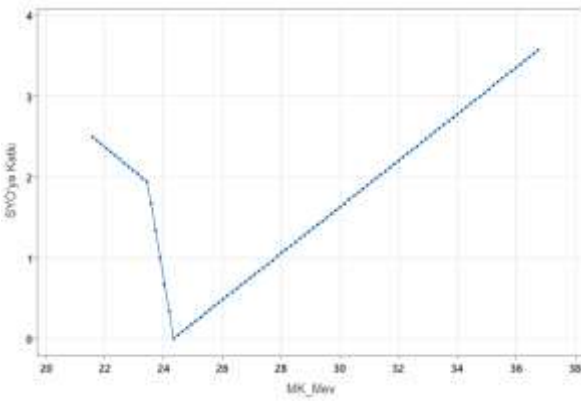
##### Sermaye Yeterlilik Oranı ile Önemli Değişkenlerin İlişkisi



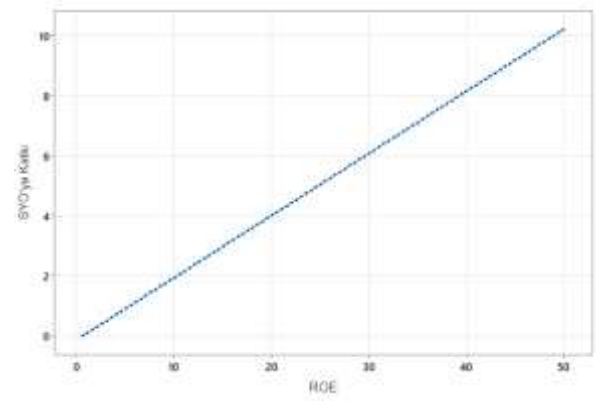
(a) SYO ile Toplam Nakdi Krediler/Toplam Mevduat İlişkisi



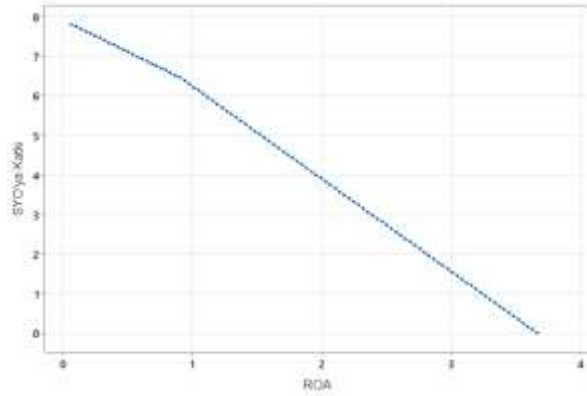
(b) SYO ile Takipteki Alacaklar/Toplam Nakdi Krediler İlişkisi



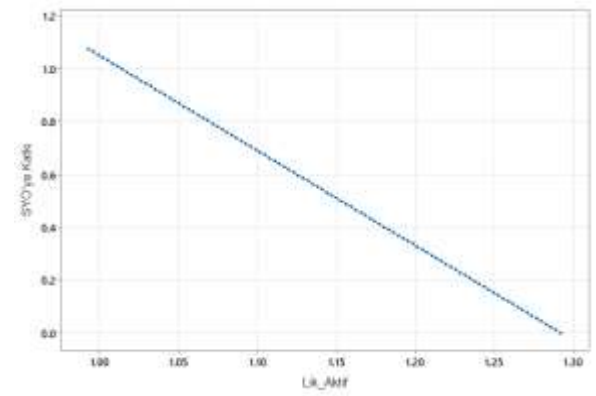
(c) SYO ile Toplam Menkul Değerler/Toplam Mevduat İlişkisi



(d) SYO ile Toplam Dönem Net Kârı Ortalama Özkaynak İlişkisi



(e) SYO ile Toplam Dönem Net Kârı/Ortalama Aktifler İlişkisi



(f) SYO ile Likit Varlıklar/Toplam Aktifler İlişkisi

Açıklama. Minitab istatistiksel yazılım kullanılarak yazarlar tarafından üretilmiştir

MARS modeli, açıklayıcı değişkenlerin hem ayrı ayrı katkılarını hem de birbirleriyle etkileşimlerini bağımlı değişkeni tanımlamakta kullanarak temel fonksiyonlarını belirlemektedir. MARS modeli, gerek her bir açıklayıcı değişken için ve gerekse değişkenler arasındaki etkileşimler için belirlenen temel fonksiyonların doğrusal bir kombinasyonu olarak ifade edilmektedir. Bu nedenle MARS algoritmasına göre seçilen değişkenlerin optimal dönüşümleri ve eğer aralarında etkileşim varsa, bu etkileşimlerin kombinasyonları grafikler ile gösterilmektedir.

Şekil 4 (d) SYO ile ROE arasında pozitif, Şekil 4 (e) SYO ile ROA arasında negatif ilişkiye işaret etmektedir. Özkaynak karlılığı, beklendiği gibi bir süre sonra özkaynak artışı ve daha olumlu bir sermaye yeterliliği getirebilir. BDDK bankaların kâr dağıtımına kısıtlama getirmiş, kârların özkaynaklarda kalmasını sağlamıştır. Nitekim dönem dönem, özellikle zor dönemlerde ROA'daki artış bankanın aktiflerini daha verimli kullandığı anlamına gelmektedir. Aktifler büyürken, genellikle risk ağırlıklı varlıklar da artar. Aktif büyümesi, menkul kıymetlerden çok krediler gibi daha riskli varlıkların artışı ile gerçekleşiyorsa ROA artarken, SYO düşebilir.

Şekil 4 (f) ise Likit Varlıklar/Toplam Aktifler oranının negatif etkisini göstermektedir. Bankanın likit varlıklarının artması, karlılığının nispi olarak düşmesi ve özkaynak büyümesinin sınırlı kalmasını sağlayabilir.

Genel olarak bakıldığında, bankaya özgü faktörlerin sermaye yapısı üzerinde daha etkili olduğu, kârlılığın sermaye yapısını olumlu etkilediği, risk yapısının ve likiditenin olumsuz etkilediği söylenebilir. Bulgular Amidu (2007), Harun vd. (2020), Koç ve Karahan (2017) ve Reis ve Kötüoğlu (2016) çalışmaları ile uyumludur. Bu durum düzenleyici otoritenin sermaye yeterliliğini yakından takip etmesi ile ilişkili olabilir. Makroekonomik koşullar SYO üzerinde kayda değer bir etkiye sahip bulunmamıştır.

## Sonuç

Bu çalışmada Türk Bankacılık Sektörünün sermaye yapısını belirleyen faktörler analiz edilmiştir. Daha önce yapılmış çalışmalardan farklı olarak, bankacılık sektörü ile ilgili bir dizi faktör ile makroekonomik faktörlerin doğrusal olmayan etkileri araştırılmıştır.

Sektördeki 64 mevduat, katılım ve yatırım bankasının 2012:10-2024:12 dönemi aylık verileri ile doğrusal olmayan parametrik bir analiz yöntemi olan MARS yöntemi kullanılmıştır. MARS modelinin en önemli avantajlarından biri açıklayıcı değişkenlerin etkilerinin yanında nisbi önem derecelerini de göstermektedir.

Yapılan analiz MARS yönteminin, verilerin doğrusal olmayan doğasını başarılı bir biçimde kavradığını ve oldukça başarılı sonuçlar verdiğini göstermektedir. Model, 12 temel fonksiyon ile en uygun tahmin değerine ve test kümesindeki %79.0 açıklayıcılık değerine ulaşmıştır. Analiz sonucunda “Toplam Nakdi Krediler/Toplam Mevduat, Takipteki Alacaklar/Toplam Nakdi Krediler, Toplam Menkul Değerler/Toplam Mevduat” değişkenlerinin sermaye yeterliliği üzerinde önemli derecede; “Dönem Net Kârı/Ortalama Özkaynaklar, Dönem Net Kârı/Ortalama Aktifler, Likit Varlıklar/Toplam Aktifler” oranlarının nispeten daha az etkili olduğu tespit edilmiştir. Faiz Dışı Gelir/Faiz Dışı Gider, BIST 100, Geniş Tanımlı Para Arzı, Reel Efektif Döviz Kuru, Sanayi Üretim Endeksi ve TÜFE değişim oranlarının SYO üzerinde anlamlı bir etkisi olmadığı tespit edilmiştir. Genel olarak bankaya özgü faktörlerin sermaye yeterliliği üzerinde etkili olduğu, makroekonomik faktörlerin etkili olmadığı söylenebilir. BIST 100, Geniş Tanımlı Para Arzı, Reel Efektif Döviz Kuru, Sanayi Üretim Endeksi, TÜFE Değişim oranlarının teorik olarak bankacılık sektörünü ve SYO üzerinde etkisinin olması beklenirken, MARS modeli ile bu etkinin doğrudan olmadığı

görülmektedir. MARS modeli SYO'nun tahmin edilmesinde etkili bir yöntem olmakla birlikte, makroekonomik göstergelerin etkisinin zamana yayıldığı ve dolaylı olduğu düşünülmektedir. Bu nedenle MARS modeli ile tahmin edilen bu modelde makroekonomik değişkenlerin anlamlı bir etkisinin bulunmaması bu değişkenlerin SYO üzerinde nedensellik ilişkileri çerçevesinde ve daha uzun vadeli dinamiklerle değerlendirilmesi gerektiği düşünülmektedir. Bankaya özgü faktörlerin SYO üzerinde etkili olması düzenleyici otoritenin sermaye yeterliliğini yakından takip edip banka bazında önlem alması ile açıklanabilir. Aktif kalitesi ve aktif yapısını gösteren finansal göstergelerin sermaye yapısının belirlenmesinde daha yüksek göreceli öneme sahip olduğu görülmektedir. Bankaların mevduatlarını ne ölçüde krediye dönüştürdüğünü gösteren toplam nakdi kredi/toplam mevduat oranı bankaların daha fazla kredi vererek karlarını artırma eğiliminde olduğunu gösterirken, olması gerekenden yüksek olması likidite riskini ve sermaye yeterliliğini olumsuz etkileyebilir. Bu nedenle düzenleyici otoriteler kredi genişlemesini yakından takip ederek bankaların aşırı risk alma eğilimini sınırlandırmak için likidite yeterlilik oranı, net istikrarlı fonlama oranı ve sermaye tamponu gibi düzenlemelere tabi tutmaktadır. Banka yönetimleri de bu düzenlemeler çerçevesinde hem karlılık hem sermaye yeterliliği dengesini gözetmektedirler. Toplam Nakdi Krediler/Toplam Mevduat oranındaki artış, 103.39 seviyelerine kadar sermaye yeterliliğini artırırken, bu seviyelerden sonra azaltmaktadır. Takipteki alacak oranının artması kredi riskinin arttığının ve bankanın varlık kalitesinin zayıfladığının bir göstergesi olabildiğinden, düzenleyici otoriteler “Kredilerin Sınıflandırılması ve Bunlar İçin Ayrılacak Karşılıklara İlişkin Usul ve Esaslar Hakkında Yönetmelik” kapsamında karşılık ayırma yükümlülüklerini düzenleyip denetlemektedir. Hen düzenleyici kurumlar hem banka yöneticileri bahse konu yönetmeliğe uygun olarak kredi tahsis süreçlerinde daha temkinli davranmakta ve erken uyarı sistemleri ile risk temelli fiyatlandırma gibi önlemler ile aktif kaliteyi korum stratejileri geliştirmeleri gerekmektedir. Toplam Menkul Değerler/Toplam Mevduat ile Sermaye Yeterliliği Oranı arasında da %24.35'e kadar negatif olan ilişki, bu seviyelerden sonra, daha az riskli aktif yapısına paralel olarak pozitif dönmüştür. Menkul kıymet yatırımlarının daha düşük riskli ve likit varlık olması bankasının risk profilini dengelemekte ve SYO'yu destekleyici bir rol oynadığı düşünülmektedir. Ancak aşırı menkul kıymetleşme kredi verme kapasitesini kısıtlayabilir ve faiz marjını düşürebilir. Bu nedenle düzenleyiciler portföy yapısının denetimini yakından takip ederken; banka yönetimleri risk-getiri dengesini gözeterek menkul değer yatırım stratejilerini optimize etmeleri beklenmektedir.

Bu çalışmada Türk Bankacılık Sektöründe Sermaye Yapısı MARS modeli kullanılarak belirlenmeye çalışılmış ve elde edilen sonuçlar genelleştirilmiş en küçük kareler yöntemi, panel veri analizi, logit modellerden elde edilen tahmin sonuçları ile tutarlı sonuçlar ortaya koymaktadır. Bu çalışma, bir dizi bankacılık sektörü ve makroekonomik faktörün sermaye yeterlilik oranı üzerindeki doğrusal olmayan ilişkisi ile ilgili yeni yaklaşımlar getirirken, daha fazla değişken kullanarak farklı yöntemlerle bu ilişkileri desteklemekte ve daha geniş bir çerçeveye oturtmakta yarar bulunmaktadır. Aynı zamanda makroekonomik faktörlerin etki alanının geniş olmasından dolayı sermaye yeterlilik oranı üzerindeki etkisinin bankaya özgü göstergelerin etkisi oranında olmadığı görülmektedir. Bu nedenle MARS modeli ile tahmin edilen uygun modeller kullanılarak makroekonomik faktörlerin sermaye yapısı üzerindeki etkisini daha yakından incelemek için ilerleyen çalışmalarda nedensellik analizlerinin yapılması da yararlı sonuçlar verecektir.

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**Research Article**

**Implications of Human Capital Flight in the Health Sector on Nigeria's Life Expectancy (2015-2024)**

**Joseph A. Adekeye<sup>a</sup> & Rosemary N. Barnabas<sup>b</sup>**

**Abstract**

**Introduction:** Human capital flight refers to the migration of professionals from one country to another in search of better opportunities while life expectancy is the average life span of citizens in a given country. The inability of existing literature to determine the implications of human capital flight in the health sector on life expectancy in Nigeria and the inability of government to find solution to the issue of human capital flight in the health sector made it necessary for the conduct of this study.

**Method:** The study adopted a qualitative technique through the desk content analysis of documents obtained from academic databases (World Health Organizations (WHO), Medical and Dental Council of Nigeria (MDCN), National Bureau of Statistics (NBS) and national dailies).

**Results or Findings:** The analysis of research findings indicated that human capital flight in the health sector has impacted negatively on life expectancy in Nigeria due to low budgetary allocation to the sector by successive administrations.

**Discussion or Conclusion:** The analysis of result reveals that pain and gain factors are responsible for human capital flight. The paper concludes that increase in budgetary allocation to 15% will address the challenges confronting the health sector and improve life expectancy situation in Nigeria.

*Keywords:* human capital flight, health professionals, life expectancy, health workers

*JEL Codes:* H30, I18, J18

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**Araştırma Makalesi**

**Sağlık Sektöründen Beyin Göçünün Nijerya'daki Yaşam Süresi Beklentisi  
Üzerindeki Etkileri (2015-2024)**

**Joseph A. Adekeye<sup>a</sup> & Rosemary N. Barnabas<sup>b</sup>**

**Öz**

**Giriş:** Beyin göçü, profesyonellerin daha iyi fırsatlar arayışıyla bir ülkeden başka bir ülkeye göç etmesini ifade ederken; yaşam beklentisi, belirli bir ülkedeki vatandaşların ortalama yaşam süresini ifade etmektedir. Mevcut literatürün, sağlık sektöründeki beyin göçünün Nijerya'daki yaşam beklentisi üzerindeki etkilerini yeterince ortaya koyamaması ve hükümetin bu alandaki beyin göçüne yönelik etkili çözümler geliştiremeyişi, bu çalışmanın gerçekleştirilmesini gerekli kılmıştır.

**Yöntem:** Bu çalışma, Dünya Sağlık Örgütü (WHO), Nijerya Tıp ve Dış Konseyi (MDCN), Ulusal İstatistik Bürosu (NBS) ve ulusal basın organlarından temin edilen belgelerin, masa başı içerik analizi yöntemiyle nitel bir perspektiften sistematik olarak incelenmesine dayanmaktadır.

**Sonuçlar ya da Bulgular:** Araştırma bulgularının analizi, sağlık sektöründe yaşanan beyin göçünün, ardışık hükümetlerin sektöre yönelik yetersiz bütçe tahsisleri nedeniyle Nijerya'daki yaşam süresi beklentisini olumsuz yönde etkilediğini ortaya koymuştur.

**Tartışma ya da Yapılan Çıkarımlar:** Elde edilen sonuçların analizi, sağlık sektöründeki beyin göçünün temelinde itici (acı) ve çekici (kazanç) faktörlerin etkili olduğunu ortaya koymaktadır. Çalışma, sağlık sektörüne yönelik bütçe tahsisatının %15 seviyesine çıkarılmasının, sektördeki yapısal sorunların giderilmesine katkı sağlayacağı ve Nijerya'da yaşam beklentisinin artırılmasında önemli bir rol oynayacağı sonucuna ulaşmaktadır.

**Anahtar Kelimeler:** beyin göçü, sağlık profesyonelleri, yaşam beklentisi, sağlık çalışanları

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## Introduction

Human capital flight refers to the mass exodus of trained personnel from third world to developed countries in search of better condition of life. It could take the form of geographical, organizational or industrial and situational dimensions; The geographical movement involves a change of location by professionals to another country. The organizational or industrial human capital flight is the migration of professionals from one companies to another in order to secure better offer(s) whereas the situational migration means the exodus of intelligentsia between a particular region to another due to change of whether, flooding, insecurity, epidemics, war, outbreak of communicable disease or other related occurrences (Okonkwo et al., 2022).

Migration is an inevitable act as it has been in existence since the creation of mankind and it can be grouped into domestic and cross- border migrations. Domestic exodus is the relocation of individuals from one region to another within a country. This could be in form of rural-urban migration or movement from urban to rural area. Cross-border expedition on the other hand refers to the movement by anyone who leaves his country of origin for a several of reasons. Cross-border migration thus encompasses all forms of movements, including those caused by economic reasons, family reunification and refugee situations. (Obani & Odalonu, 2023).

The advent of industrial revolution in Europe in 18<sup>th</sup> Century created the need for more factory workers in larger numbers. Attempts to hire more factory workers created an avenue for sale of human cargo or slave trade (Allen, 2011). This was subsequently replaced with trafficking in persons from developing to developed countries. All the above activities may not necessarily lead to human capital flight since trafficked individuals may not be professionals or skilled workers. Specifically, human capital flight in the context of this paper means mass exodus of health workers from home country to another in search of greener pastures such as employment opportunities, better standard of living, access to basic amenities and the likes (Nnoruga & Osigwe, 2023).

In the case of Nigeria, medical professionals such as; doctors, nurses, medical laboratory technicians, and pharmacists are migrating abroad in search of better opportunities (Lawal et al., 2022). Available statistics reveal that 13,609 physicians migrated from Nigeria to Britain from 2021 - 2022 (UK National Statistics, 2022). As of the end of 2022, there were 10,387 physicians in Britain that have gone through professional training at home (Obani & Odalonu, 2023). Similarly, 3000 migrated from January 2020 - September 2022 alone as published by the General Medical Council in the UK (GMC, 2022). Nigeria is 3<sup>rd</sup> after India and Pakistan among the countries with the largest number of Physicians in Britain (Brennan et al., 2021). Nigerian doctors are 9 out of 20 Doctors who received their education at medical institutions in Sub-Saharan African nations and are currently working in the USA (Duvivier et al., 2017).

Human capital flight tends to impact negatively on life expectancy since it usually leads to dearth of professionals in the health sector. For instance, the migration of skilled health workers has eroded the quality of service delivery in the Nigerian health sector (Iruo & Okolo, 2021). Lack of adequate medical professionals to provide regular treatment for diseases such as HIV & AIDs, gonorrhoea, malarial, cancer, bacteria and fungi infections has resulted into high mortality rate and a drastic reduction in average life expectancy. For instance, Nigeria is ranked lowest among 200 countries investigated in life expectancy survey by Worldometer in 2024. All African countries including Chad republic are ahead of Nigeria.

The major reasons responsible for the above scenario is low budgetary allocation to the health sector in Nigeria. For instance, the highest allocation to the health sector in Nigeria since independence is less than 7% as against 15% recommended by World Health Organization (WHO). For instance, budgetary allocation to the health sector in 2022 was 4.7% while it stood at 5.57% in 2023. The relative low budgetary allocation to the Nigerian health sector is largely responsible poor remuneration for health workers, insufficient drugs, lack of adequate equipment and facilities both at Primary, Secondary and Tertiary hospitals in Nigeria.

The issue of human capital flight would be being a thing of the past if the huge amount of money being budgeted for medical tourism can be added to annual allocation to the Nigerian health sector. According to Adejoro (2024), Nigeria spent ₦ 2.38 million on medical tourism in six months (January –June) in 2024 alone. The inability of government officials to use Nigerian public hospitals for the health services related issues is largely responsible for lack of commitment to the development of Nigerian health sectors.

Several studies have been conducted on the subject matter of this paper. For instance, Akinola and Adekile (2024) examined the implications of human capital flight on unemployment and economic growth in Nigeria. Similarly, Popogbe and Adeosun (2022) carried out empirical analysis of the push factors of human capital flight in Nigeria. In the same vein, Nwafor and Clement (2024) assessed the impact of medical policies and politics on human capital flight in developing countries. However, none of the scholars in existing literature focuses on the implications of human capital flight in the health sector on life expectancy in Nigeria. This is the gap in literature that this study intends to bridge.

## **Objectives**

The aims of this paper are to:

1. Determine the issues responsible for the mass exodus of health personnel from the Global South to the Global North.
2. Assess the implication of human capital flight on average life span in Nigeria.

## **Methodology**

This paper adopted a qualitative technique through the content analysis of documents obtained from Academic databases (such as Springer, Google Scholar, Crossref, Researchgate), World Health Organization (WHO), Professional Institute on health and National Bureau of Statistics (NBS). Documents obtained from the above sources were analyzed through the use of desk examination of factors responsible (pain-gain) for mass exodus of health workers from Nigeria to western nations and the attendant implications on life expectancy in Nigeria.

## **Conceptual Analysis**

### ***Human Capital Flight***

Human capital flight means the mass exodus of skilled workers within one region and another for the purpose of obtaining better offers abroad. According to Johnson and Regets (1998), it actually started with the decision to secure admission overseas, secure employment and going back to the home country to secure a better offer. Subsequently, emigrants may decide not to return home if the environment abroad is better than the situation at home.

Equally, human capital flight according to the UK government means the movement of professionals or experts who leave UK to US and Canada between 1950s and 1960s (Cervantes & Guellect, 2002). Subsequently, the definition of human capital flight means the movement of professionals from global south to global north in search of better conditions of service. In other words, it refers to mass exodus of working population from poorer to richer nations of the world for the purpose of acquiring more skills or utilizing the skills possessed from their homeland.

On the other hand human capital flight can become brain gain if the knowledge gained abroad is used for the benefit of home country thereafter. However, it may become human capital flight if the knowledge acquired from home country is used for the position that requires lesser skill than the skill obtained at home. Dohlman et al. (2019) observed that 7 out of 10 black physicians usually relocate abroad. In the case of mass exodus of health workers from Nigeria to western nations, it can be referred to as human capital flight since the knowledge acquired from home country is utilized for the benefit of western nations in the form of technology transfer in exchange for wages and salary.

### ***Average Life Span***

This means the life expectancy of individuals in home country within a given period of time depending on the quality of life, nature of health care delivery system, social and psychological well being. In the opinion of Laranjeira and Szrek (2016), life expectancy during delivery refers to the minimum days a person lives on earth from birth based on the average death rate in a given period of time. Similarly, WHO (2010) conceives life expectancy as a situation of physical, psychological and emotional stability of individual regardless of being sick or critically ill.

Onisanwa et al. (2024) opined that average life span is the standard duration a person will exist at a specified time based on the nature of death rate according to various categories of individuals. Life expectancy is part of the four parameters being used for measuring the level of human capacity building. According to Raffin and Seegmuller (2014), life expectancy per time depends on better health condition, enhanced productivity and sustainable economic development. Similarly, Issaoui et al. (2015) conceive average life span during delivery as the days a new born baby will be alive depending on the pattern of death rates during the period. For the purpose of this study, average life span means the life expectancy of a given person before death due to access to quality health care services and high standard of living.

In the case of Nigeria, low life expectancy depends partly on health condition. For instance, the Nigeria's health sector is characterized by high rate of diseases such as; small pox, measles, malaria, polio, cancer, fungi infections, syphilis to mention a little. Other factors responsible for low life expectancy rate in Nigeria include but are not limited to high level of poverty, poor nutrition, lack of access to clean water, relatively high infant and maternal mortality rates (Onisanwa et al., 2024).

## **Empirical Review**

Several studies were conducted on matters regarding the influence of human capital flight on average life span in Nigeria. For instance, an empirical study conducted by Ogbonna and Oseiweh (2016) assessed the impact of public funding of hospitals on average life span in Nigeria. The study used the cause analysis to ascertain the static nature of variable through the use of Augmented Dickey-Fuller Test. The outcome of the paper demonstrates that government recurrent expenditure influenced the average life span in Nigeria significantly. Similarly, a study conducted by Akintunde et al. (2016) appraises the influence of life expectancy on Gross Domestic Product (GDP) in Nigeria using quantitative method for the purpose of data analysis and interpretation. The outcome of the study reveals that average life span really influenced the Nigeria's economy significantly.

Conversely, a study conducted by Osigbesan (2021) obtained information on the experiences of health practitioners who practiced outside the shore of Nigeria using the pain and gain model as a framework of analysis. The major concern of the study is to find out the reasons why health care professionals are relocating abroad and the health implications of such decisions on average citizens. A non-probability selection techniques and a face-to-face interaction were adopted to obtain the required information from selected respondents. The outcome of the paper reveals that poor budgetary allocation to the health sector is largely responsible for human capital flight from Nigeria to western nations of the world. In the same vein, a study carried out by Okwara (2023) reviewed the influence of human capital flight on the Nigeria's physical wellbeing and learning process using the pain and gain model as a framework of analysis. Qualitative technique was adopted through the content analyses of secondary data. The findings of the study demonstrated that the pain and gain variables are the root cause of human capital flight in the Nigerian health sector.

Likewise, a study conducted by Joseph and Agada (2024) evaluated the effect of government funding on average life span in Nigeria through the use of descriptive statistical tools for data gathering, categorization, measurement and analysis. The outcome of the study revealed that the impact of public government spending in the health section on average life span in Nigeria is inconsequential. By implication, public expenditure is grossly inadequate towards improving the low level of average life span in Nigeria. Lastly, a paper written by Abib et al, (2024) evaluated the implications of health spending on life expectancy disparities across gender line using the unit root test alongside the Dynamic Ordinary Least Square (DOLS) for the purpose of data analysis and interpretation. The findings of the paper exhibited that private health spending has made profound contribution to life expectancy in Nigeria with no bias with regards to gender sensitivity.

A cursory examination of the above empirical studies and existing literature reveals that most studies focused on the influence of government spending on life expectancy, impact of average life span on Gross Domestic Product (GDP) and factors responsible for brain drain. However, Organization Economic Corporation and Development (OECD, 2021) stated that the factors have the tendency life expectancy include; per capita income, high quality of life/enlightenment and access to affordable and quality health care delivery. Meanwhile, the impact of quality of life and improved living condition/literacy rate on average life span apart from quality healthcare has not been addressed in existing literature. This is the gap that this study intends to bridge.

## **Theoretical Framework**

The Push-Pull approach was adopted as theoretical underpinning for this study since it interrogates the causes and factors responsible for human capital flight or migration. The exponents of the theory are Everett Spurgeon Lee, Pan G and Natasha C. Parkins. The theory states that the reasons for the floating population, migration and immigration are because people can improve their living condition through migration. The push factors refers to unbearable conditions such as high cost of living, abject poverty, lack of access to basic amenities, unemployment, poor condition of service, under-employment, insecurity, political instability among others. The pull factors on the other hand are expectations that attract the attention of emigrants to relocate abroad. They include; employment opportunities, scholarship, better condition of service, high standard of living, access to basic amenities, political stability, quality education, availability facilities/equipment, security of life and properties (Parkins, 2010).

This theory is applicable to this study since human capital flight within the Nigerian Health sector is due to the influence of pain and gain syndrome. For instance, factors that cause pain include; political instability, insurgency, kidnapping, banditry, poor budgetary allocation to the health sectors, lack of regular training, lack of adequate facility/equipment, poor leadership style of heads of institutions, poor condition of service, unemployment, underemployment, low standard of living and environmental degradation. Meanwhile, the expected gain variables are; attractive compensation, availability of adequate facilities, access to basic amenities, conducive environment, regular training, high standard of living among others. All the above factors are responsible for mass exodus of health care professionals from Nigeria to Western nations.

### **Factors Responsible for Movement of Medical Personnel out of Nigeria to Western Nations**

The reasons responsible for mass exodus of medical professionals out of Nigeria to western nations comprise but are not limited to the following:

#### ***Endemic Poverty***

The majority of Nigerian citizens are wallowing in abject poverty due to low income and lack of access to basic amenities such as goods roads, pipe borne water, electricity, affordable health care delivery and quality education. According to the World Bank, the poverty level in Nigeria has increased from 82.9 to 85.2 and 90.0 million between 2018/19, 2020 and 2022 accordingly owing to increase in birth rates without a corresponding increase in productivity (Olawoyin, 2022). The relative increase in poverty was due to high inflationary trends without a corresponding increase in sources of income to households. For instance, Nigeria's consumers price index in second quarter, 2024 rose to 32.70 % as against 26.72% in September, 2023 (Tunji, 2024). The inability of take home pay by health workers to meet up with their basic needs is the major cause of human capital flight by medical professionals in Nigerian.

#### ***Low Budgetary Allocation***

World Health Organization (WHO, 2010) and health professionals in Nigeria (2012) recommend the allocation of a minimum of 15% of annual national funding plans for medical unit. However, available record reveals that allocation to the health sector has not exceeded 6% during the fourth republic. For instance, budgetary allocation to the health sector in 2022 was 4.7% while it stood at 5.57% in 2023. The breakdown of budgetary allocation indicated that

N1.179tn, N826.96b, N547b, N278.31b were allocated to the Nigerian health sector in year 2023, 2022 and 2021, 2015 respectively (Muauya, 2022).

### ***Lack of Equipment and Facilities***

Lack of adequate equipment and facilities are the reason for mass exodus of Nigerian health workers to the global North. According to Akinmoyeje (2024), more than 2/3 of Nigerian Primary, secondary and tertiary health care institutions lack access to basic drug and medical equipment to function. Similarly, a report released by National Health Facility Survey made available by National Bureau of Statistics (2023), observed that only 35% of medical facilities in Nigeria had essential drugs such as paracetamol, aspirin, amoxicillin and oral rehydration salts available and unexpired. The remaining 65% are either expired drugs or lack essential facilities. However, secondary health facilities were stocked with 50.6% necessary drugs but the Primary Health facilities had only 34.3% essential drugs available or unexpired. The breakdown of the report according 6 geopolitical Zones indicated that South-West led with 47% of primary health facilities, North West recorded 19.8% in drug availability, North-West led with 57.8% facilities stocked with essential medicines (Akinmoyeje, 2024).

### ***Poor Remuneration and Insecurity***

The pay package for health workers in Nigeria is arbitrarily low due to low budgetary allocation to the sector. In a paper written by Onah et al. (2022), the highest determinant of job satisfaction for doctors is a good salary which they can't get in Nigeria and the top reason for doctors' emigration is the increasing rates of insecurity which decreases their motivation and availability for effective service delivery.

Data from the Organization for Economic Corporation and Development (OECD) revealed that most Nigerian Doctors are practicing in the United Kingdom, United State, Canada, Ireland and Germany. The annual salary for Nigerian Doctors is \$5,912 whereas their counterparts in Canada, USA, UK, Germany, France and Italy receive \$75,460, \$79,400, \$63,600, \$143,500, \$83,927 and \$70,386 annual salary respectively (Uduu, 2023). Medical Doctors in Nigeria have embarked on strike several times with the demand for improved welfare package by the Federal Government has refused to do the needful. Inability of government to ensure improved condition of service for Nigerian Doctors and other health workers is largely responsible of human capital flight syndrome.

### ***Medical Tourism***

The inability of successive administrations in Nigeria to meet up with the minimum benchmark of 15% funding plan for medical unit, corruption and economic problems have led to infrastructural decay, inadequate equipment/facilities, poor remuneration, lack of regular training and poor environmental conditions. In view of the above, political office holders and heads of government agencies prefer to seek for treatment abroad. The available option of seeking for medical treatment abroad has led to the abandonment of the Nigerian health sector by the Nigerian government.

According to Adeoye (2023), the cost of medical tourism in Nigeria has risen to \$1 billion annually. The Nigeria health sector should have been among the best in the world this huge amount of resources is added to annual budgetary allocation. The inability of government to revamp the Nigerian health sector through the procurement of modern facility, improved welfare package and the creation of conducive environment has led to mass movement of health workers into western nations of the world in search of greener pasture.

## **Human Capital Flight in Medical line and Life Expectancy in Nigeria**

Successive administrations in Nigeria since independence have made frantic efforts towards curbing the menace of human capital flight in the medical aspect of the economy. However, the matter appears to be beyond control in the fourth republic. Records show that over 9,000 health medical professionals relocated from Nigeria to western nations between 2016 and 2018. Similarly, it was disclosed that over 727 physicians licensed in Nigeria migrated to Britain within the period of 6 Months (December 2021 and May 2022) (Muauya, 2022).

In 2022, a professional body responsible of issuing licenses to medical Doctors affirmed that over 100 physicians relocated from Nigeria to western nations in less than 2 years (Mussette & Mussette, 2022). Similarly, a body responsible for training newly inducted medical Doctors confirmed that nearly 12 physicians relocated from Nigeria to other countries weekly in 2018. Thirty thousand out of eighty thousand licensed physicians by professional body are practicing in Nigeria. WHO advocates for an average of 4.45 health professionals per 1,000 people in order to support universal health coverage; Nigeria has less than 2.1 (Lawal et al., 2022). In view of the identified shortage of health professional, patients have to spend long time to be attended to by physicians, under utilize available health care equipment, patronize traditional healthcare provider and seek for self-help at odd hour. These are the main causes of the nation's low health indices (Adewole & Osungbade, 2016).

The internal (pain) factors responsible for the mass exodus of health workers from Nigeria to western nations according the paper are political instability, insurgency, kidnapping, banditry, poor budgetary allocation to the health sectors, lack of regular training, lack of adequate facility/equipment, poor leadership style of heads of institutions, poor condition of service, unemployment, underemployment, low standard of living and environmental degradation. On other hand, the external factors (gain) factors responsible for human capital flight are attractive compensation, availability of adequate facilities, access to basic amenities, conducive environment, regular training, and high standard of living being experienced in western nations of the world.

The inability of government to address the challenges confronting the health sector has impacted negatively on the life expectancy of Nigerian citizen. According to Onwube et al. (2021), the Nigeria's average life span for 2018 stood at 54.33 years. Nigeria is closely followed by Sierra Leone with (54.31 years), Chad (53.97 years) and Lesotho (53.70). The 2023 report indicated that Nigeria came second out of 10 countries with the least life expectancy in Africa with an average of 52.7 years (Shahara Reporter, 2023).

Unfortunately, life expectancy for 2024 reveals that Nigeria took the last position among 200 countries globally by life expectancy with an average of 54.64 years. Chad Republic took 199<sup>th</sup> position with an average of 55.24 years while Hong Kong took 1<sup>st</sup> position with an average of 85.63 years (Worldometer, 2024). In the same vein, Orekoya and Oduyoye (2018) observed that Nigeria's death rate is one of the highest among comity of nations. The above statistics reveal that life expectancy in Nigeria arbitrarily low due to the inability of average citizens to afford the high cost of medical bills, none availability of medical professionals, lack of adequate facilities and low standard of living.

## **Conclusion**

The outcome of this paper reveals that the increase in human capital flight by health professional is attributed to low budgetary allocation into the sector by successive administrations. Global bodies on health related matters recommend at least 15% annual financial plan for medical sector. However, the highest allocation to the health sector in Nigeria since independence is less than 7%. This may not be unconnected with the fact that government officials prefer to travel abroad for medical check-up instead of channeling such resources for the maintenance of health workers, upgrading of hospital equipment, procurement of latest drugs and installation of adequate facilities.

In view of the above, the annual budgetary allocation is grossly inadequate for the provision of standard equipment in elementary, intermediate and specialized medical centre across the country. Similarly, medical workers are poorly paid in Nigeria in comparison with pay package in western nations. Health workers have embarked on strike in quest for improved welfare for their members on several occasions but the outcome of such exercises are yet to produce any meaningful result. The above unmet expectations led to the mass exodus of Nigerian health worker abroad in search of greener pastures.

Human capital flight and other factors have impacted negatively on life expectancy in Nigeria greatly. For instance, Nigeria is ranked lowest among 200 countries investigated by Worldometer in 2024. All African countries including Chad republic are ahead of Nigeria. This report is a clear departure from life expectancy reports when Nigeria was referred to as “giant of Africa”.

## **Recommendation**

In the light of issues discussed, observations made and findings established, the following recommendations are considered fundamental towards the reduction in the high influx of Nigerian health workers to western nations in search of greener pastures:

1. Annual financial plans for medical matters should be reviewed upward to at least 15% as recommended by both local and international bodies. This will go a long way towards reducing the level of human capital flight in the sector through the provision of adequate facilities and improvement welfare for health workers. Similarly, a law should be enacted by the National Assembly for the purpose of preventing government officials from going abroad for medical tourism for the treatment of minor ailments such as; headache, malarial, back pain, boil among others.
2. Approved budget should be released for capital and recurrent expenditure at the beginning of each financial year in order to guide against the misappropriation or underutilization of funds in the health sector.
3. There is need for timely publication of health budget implementation report for the purpose of ensuring accountability, transparency, avoidance of duplication and waste of scarce resources.
4. Modern facilities and equipment should be provided in elementary, intermediate and specialized medical centre in Nigeria. Similarly, the condition of service for health workers should be reviewed upward in order to facilitate quick return of Nigerian medical professionals who are currently practicing abroad. This will go a long in boosting life expectancy in Nigeria.

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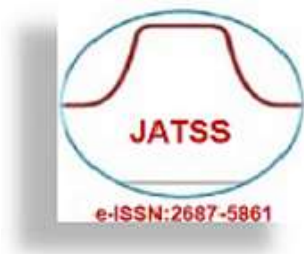
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**Research Article**

**Effects of Fairness Perception on Cheating Behavior: An Experimental Study**

**Samantha Mañuelle P. Agramon<sup>a</sup> & Jefferson A. Arapoc<sup>b</sup>**

**Abstract**

**Introduction:** This study investigates how perceptions of fairness influence individual cheating behavior. Specifically, it explores whether different reward systems—based on equity (performance-based rewards) or equality (equal rewards for all)—affect the likelihood of dishonest actions in an experimental setting.

**Method:** A two-phase laboratory experiment was conducted among 98 undergraduate students. Participants were randomly assigned to either an Equity or Equality treatment. In the second phase, they engaged in a task that allowed them to self-report outcomes tied to monetary rewards, providing a controlled measure of cheating behavior.

**Results or Findings:** The results indicate that participants who perceived the reward system as unfair were significantly more likely to cheat. Cheating behavior was more prevalent in the Equality treatment group, especially among high performers, suggesting that equal reward distribution can induce perceptions of unfairness and trigger dishonest behavior.

**Discussion or Conclusion:** The findings demonstrate the psychological importance of perceived fairness in ethical decision-making. Even in seemingly fair systems, perceptions of injustice can lead to rationalizations for dishonesty. This has implications for institutional design, particularly in education and workplace settings, where aligning incentives with perceived fairness can reduce unethical behavior.

*Keywords:* fairness perception, cheating behavior, experimental economics, incentives, equity, equality

*JEL Codes:* C91, D63, D03

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**Araştırma Makalesi**

**Adalet Algısının Aldatma Davranışı Üzerindeki Etkileri: Deneysel Bir Çalışma**

**Samantha Mañuelle P. Agramon<sup>a</sup>& Jefferson A. Arapoc<sup>b</sup>**

**Öz**

**Giriş:** Bu çalışma, adalet algılarının bireysel hile davranışını nasıl etkilediğini incelemektedir. Özellikle, eşitlik (herkese eşit ödül) veya hakkaniyet (performansa dayalı ödüller) temelli farklı ödül sistemlerinin, deneysel bir ortamda dürüst olmayan davranışların ortaya çıkma olasılığını nasıl etkilediği araştırılmaktadır.

**Yöntem:** 98 lisans öğrencisi üzerinde iki aşamalı bir laboratuvar deneyi gerçekleştirilmiştir. Katılımcılar rastgele olarak hakkaniyet (Equity) veya eşitlik (Equality) koşullarına atanmıştır. Deneyin ikinci aşamasında, katılımcılar parasal ödüllerle ilişkilendirilen sonuçları kendi kendilerine rapor ettikleri bir görevde bulunmuş; böylece hile davranışının kontrollü ve objektif bir ölçümü sağlanmıştır.

**Sonuçlar ya da Bulgular:** Sonuçlar, ödül sistemini adaletsiz olarak algılayan katılımcıların anlamlı derecede daha fazla hile yapma eğiliminde olduğunu göstermektedir. Hile davranışı, özellikle yüksek performans gösterenler arasında, eşitlik (Equality) koşulu grubunda daha yaygın olup, eşit ödül dağıtımının adaletsizlik algısını tetikleyerek dürüst olmayan davranışlara yol açabileceğini düşündürmektedir.

**Tartışma ya da Yapılan Çıkarımlar:** Bulgular, algılanan adaletin etik karar alma süreçlerindeki psikolojik önemini ortaya koymaktadır. Görünüşte adil olan sistemlerde bile, adaletsizlik algısı bireylerin dürüst olmayan davranışlarını rasyonelleştirmelerine neden olabilmektedir. Bu durum, özellikle eğitim ve iş ortamları gibi kurumsal yapılar açısından önemli sonuçlar doğurmakta; teşvik sistemlerinin algılanan adaletle uyumlu hâle getirilmesinin etik dışı davranışları azaltabileceğine işaret etmektedir.

**Anahtar Kelimeler:** adalet algısı, hile davranışı, deneysel ekonomi, teşvikler, dürüstlük, eşitlik

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## Introduction<sup>1</sup>

Cheating is a widespread issue that occurs when individuals break rules to gain personal advantage. It takes many forms—ranging from tax evasion and employee theft to corruption and falsified work outputs—and imposes serious economic costs on both public and private institutions. In economics, cheating is often explained as a rational decision based on a cost-benefit analysis: people weigh the benefits of cheating against the chances of getting caught and punished (Ariely, 2010).

While financial gain is a significant motivator for cheating, studies have shown that people don't cheat just because it's profitable. They also respond to how fair or unfair they perceive a system to be. For example, Hollinger and Clark (1983) emphasized that employees often justify dishonest acts, such as theft, when they feel they are being treated unfairly. This introduces fairness perception as a powerful, non-monetary driver of behavior. In this light, cheating can be seen not just as a rational act, but also as a form of retaliation or self-justification in response to perceived injustice.

Research in behavioral economics further supports this. Individuals are more likely to accept unequal outcomes when they believe those outcomes are based on effort or performance, rather than luck or arbitrary decisions. Conversely, when people perceive that they are being unfairly treated, especially in situations where input does not match reward, they may feel entitled to cheat as a way of restoring balance. This reaction, known as “reciprocal deviance,” is common in workplace settings, where unfair pay or sudden cuts in benefits have been linked to higher rates of employee dishonesty (Greenberg, 1990).

While many studies focus on financial motives for cheating, fewer have explored how perceptions of fairness shape dishonest behavior. Fairness perception plays a crucial role in shaping individual decisions, particularly when people perceive themselves as being treated unjustly. While traditional economic theory assumes that individuals cheat when the material benefits outweigh the risks, behavioral research shows that fairness perceptions can alter this cost-benefit calculation. People are more likely to break rules when they believe the system or its outcomes are unfair, even if the financial payoff is the same.

A number of studies support this view. Greenberg (1990) found that employee theft increased significantly following a pay cut that workers perceived as unfair. Similarly, Houser (2011) demonstrated that individuals were more likely to cheat in a task after receiving what they considered an unjust allocation of resources. These acts of dishonesty are often not random but are rooted in a psychological attempt to “correct” perceived imbalances. In this context, cheating can be viewed as a form of compensation or a means of retaliation.

Theories such as Equity Theory (Adams, 1999) and the concept of reciprocal deviance (Kemper, 1966) suggest that when people perceive they are not receiving what they deserve, based on their effort, contribution, or social comparison, they are more likely to rationalize dishonest behavior. Experiments have also shown that people are more tolerant of unequal outcomes when these are based on effort (equity) rather than chance or arbitrary equal distribution (equality). However, when inequality is seen as undeserved or disconnected from effort, individuals are more inclined to cheat (Galeotti et al., 2013).

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<sup>1</sup> The Ethics Committee Permission for this study has been obtained from the Research Ethics Committee of the University of the Philippines Los Baños, Department of Economics with Reference Code: UPLB-ECON-REC 2020-02-AGRAMON on the date of March 2, 2020.

Despite these critical insights, most existing studies focus on the effects of monetary incentives or general psychological factors on cheating. Few have directly and systematically investigated how fairness perceptions, particularly in the context of equity versus equality, influence the decision to cheat. The empirical evidence on this specific relationship remains limited, leaving a gap in our understanding of how perceptions of justice translate into dishonest behavior.

This study aims to fill that gap by investigating whether different perceptions of fairness, arising from equitable versus equal reward distributions, influence the likelihood of cheating. Using an experimental approach, the study will observe how individuals react when rewards are distributed based on either performance or equal sharing, and whether higher levels of perceived unfairness lead to greater cheating. It also aims to identify additional factors, such as effort, reciprocity, or socio-demographic characteristics, that may influence fairness perceptions and dishonest behavior.

By understanding how fairness perceptions affect ethical decisions, this study contributes to the broader conversation on governance, institutional design, and behavioral integrity in economic systems. The findings may also offer practical insights for employers, policymakers, and tax authorities seeking to reduce dishonest behavior by fostering environments perceived as fair.

### **Analytical Framework**

This study is guided by two primary theoretical foundations: Rational Choice Theory and Equity Theory, both of which are supported by developments in behavioral economics and experimental research on fairness. According to Rational Choice Theory, individuals make decisions by weighing costs and benefits, including the risks of being caught and punished. From this viewpoint, cheating is a calculated behavior that occurs when the expected benefits of dishonesty outweigh its costs (Becker, 1968).

However, this theory has been challenged by findings from behavioral economics, which show that people also consider non-material factors in decision-making. Specifically, Equity Theory (Adams, 1965) argues that individuals compare their inputs (e.g., effort, performance) with outcomes (e.g., rewards) and evaluate whether they are being treated fairly. When this balance is perceived as unfair, it can lead to feelings of dissatisfaction and actions aimed at restoring perceived justice, including dishonest behavior such as cheating.

In particular, the theory of reciprocal deviance suggests that when individuals feel wronged or disadvantaged, they may engage in deviant behaviors, such as lying or cheating, as a form of justified retaliation (Greenberg, 1990). These ideas form the backbone of this study's theoretical lens.

Drawing on these theories, the study conceptualizes cheating behavior as a result of external conditions, which are how rewards are distributed (either equally or equitably), and Internal perceptions, how fair or unfair the individual perceives these distributions to be. The study assumes that individuals assigned to either an Equality or Equity treatment will form different fairness perceptions:

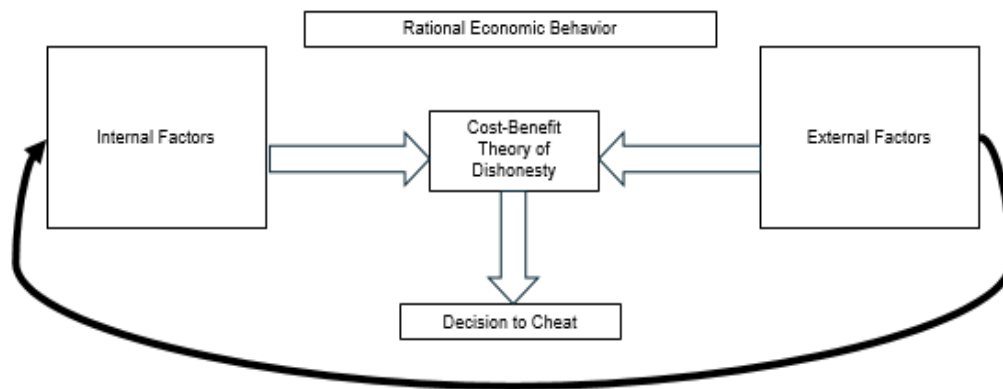
In the Equality Treatment, all participants receive the same reward regardless of effort. High performers may feel under-rewarded. In the Equity Treatment, rewards are based on performance. Low performers may feel left out or disadvantaged.

These perceptions of unfairness, whether arising from equality or equity, are expected to increase the likelihood of cheating, as individuals seek to restore what they believe to be a fair outcome.

The framework also recognizes that not all individuals cheat maximally even when given the opportunity. Theories such as Self-Concept Maintenance (Mazar et al., 2008) and Cognitive Dissonance (Festinger, 1957) help explain why people cheat just enough to benefit without feeling like they are "bad people." The central proposition is that higher levels of perceived unfairness, regardless of whether they arise from equity or equality, increase the likelihood of cheating.

**Figure 1**

*Conceptual Framework of How External and Internal Factors Affect Cheating Behavior*



Note. Created by the author.

Although various studies have highlighted fairness as a determinant of dishonesty, empirical evidence isolating fairness perception as a causal factor—particularly using controlled equity vs. equality contexts—remains limited. Most experiments either focus on monetary incentives alone or treat fairness perception as a background variable.

This study addresses that gap by using an experimental design that allows for direct observation of both fairness perception and cheating behavior. It adopts a two-phase task where participants are assigned to a reward distribution treatment and are later given a private opportunity to self-report outcomes tied to monetary gain.

The next chapter outlines the methodological approach used to test these hypotheses, detailing the experimental procedure, variable measurement, and statistical techniques employed to assess the role of fairness perception in cheating behavior rigorously.

## Methodology

This Study Employed A Laboratory Experiment With Two Treatment Groups To Examine How Fairness Perceptions—Shaped By Equity Or Equality In Incentive Distribution—Affect Cheating Behavior. The Ethics Committee Permission for this study has been obtained from the Research Ethics Committee of the University of the Philippines Los Baños, Department of Economics with Reference Code: UPLB-ECON-REC 2020-02-AGRAMON on the date of March 2, 2020.

## Participants And Setting

The Experiment Was Conducted In Four Recitation Classes Of Econ 101 At The University Of The Philippines Los Baños, With A Total Of 98 Undergraduate Students. Participants Received Fixed Monetary Reward As A Participation Incentive.

## Experimental Design

The Experiment Consisted Of Two Stages. In The First Stage, Subjects Completed A Real-Effort Task Called The *Say What You See Puzzle*, Which Consisted Of 82 Items To Be Solved In 10 Minutes. Their Performance Determined The Pooled “Class Points,” Which Served As The Reward Pool. Each Class Point Is Equivalent To A Monetary Reward, Which Will Be The Payoff That The Participants Will Receive Based On The Treatment Group They Were Randomly Assigned.

Participants Were Randomly Assigned To One Of Two Treatments:

- **Equity Treatment:** Payoffs Were Distributed Based On Individual Performance. Higher-Performing Students Received A Larger Share Of The Pooled Rewards.
- **Equality Treatment:** The Pooled Rewards Were Divided Equally Among All Participants, Regardless Of Performance.

**Table 1**

*Payoff Table of Participants under Equity Treatment*

Bracket	Ranked Score (H to L)	Incentive
A	1 <sup>st</sup> to 5 <sup>th</sup>	½ of the pooled money
B	6 <sup>th</sup> to 10 <sup>th</sup>	¼ of the pooled money
C	11 <sup>th</sup> to 15 <sup>th</sup>	1/8 of the pooled money
D	16 <sup>th</sup> to 20 <sup>th</sup>	1/16 of the pooled money
E	21 <sup>st</sup> and below	1/32 of the pooled money

Note. Created by the author.

*Payoff Formula of Participants under Equality Treatment*

$$P = \frac{X}{n} \quad (1)$$

Where.

P = payoff

X = pooled money

n = sample size

Participants then completed a questionnaire assessing their perceptions of the fairness of the payoff scheme.

Subsequently, participants engaged in a second task designed to elicit dishonest behavior. Each subject was given a box containing 20 marbles—1 red and 19 black—the distribution of which was known only to the experimenter. Participants drew from the box seven

times without replacement and privately recorded the outcomes on an answer sheet. Reporting a red marble (the "winning" marble) increased their earnings.

In the Equity Treatment, the reward for each red marble was proportional to the subject's earlier performance in the real-effort task. In contrast, under the Equality Treatment, the payoff for each red marble was uniform across all participants, regardless of performance. This design heightened the perception of unfairness particularly among high performers in the Equality group and low performers in the Equity group, thereby providing fertile ground for examining how perceived injustice influences cheating behavior.

### Classification of Cheating Behavior

To assess the extent of dishonesty in the chance-based task, participants' reports from the "Draw the Red Marble" game were used to classify cheating behavior into two categories.

**Table 2**

*Classification of Cheating Behavior*

Cheating Classification	Definition
Potential Cheaters	Participants whose individual reports fall within the realm of plausibility (e.g., reporting exactly one red marble), but who are flagged based on aggregate data—specifically, when the overall proportion of reported red outcomes significantly exceeds the expected probability of drawing a red marble. This suggests possible dishonesty at the group level, despite individual results appearing credible.
Sure Cheaters	Participants who reported drawing more red marbles than the statistically possible (e.g., drawing more than the number of actual red marbles available, or reporting all draws as red in a short trial)

Note. Created by the author.

This classification allows for distinguishing between participants who clearly cheated (sure cheaters) and those whose behavior was statistically suspicious (potential cheaters) but not definitively verifiable. The number and share of participants in each category will be presented and compared across treatment groups to explore how perceptions of fairness influence not only the likelihood but also the severity or boldness of cheating behavior.

Two analytical levels were used:

**Aggregate Analysis.** The proportion of reported red marbles was compared to the theoretical probability of drawing one red marble, using proportion tests and non-parametric tests (Wilcoxon Mann-Whitney, Kruskal-Wallis).

**Individual-Level Analysis.** Logistic regression was employed to identify predictors of cheating behavior (defined as reporting more than one red marble). Independent variables included treatment type, fairness perception levels, performance (high/low), academic and demographic factors (e.g., sex, course, GWA, number of units).

### The Logistic Regression Model and Variable Specification

To determine the individual-level drivers of cheating behavior, we employed a **logistic regression model**. The binary dependent variable is whether a participant engaged in **explicit**

**cheating**—defined as self-reporting more than one “winning” (red) marble in the second stage of the experiment.

The model takes the following form.

*The Logistic Regression Model*

$$\Pr(\text{Cheating})_i = \alpha + \sum_{j=1}^4 \beta_j \text{Fairness}_i + \beta_5 \text{Treatment} + \sum_{q=6}^{10} \beta_q X_i + \varepsilon_i \quad (2)$$

***Pr(Cheating)<sub>i</sub>***: 1 if the participant reported drawing a red marble, 0 otherwise

***Fairness<sub>i</sub>***: vector of dummy variables for Self-reported fairness score (Likert Scale)

***Treatment<sub>i</sub>***: Dummy for equity treatment

***X<sub>i</sub>***: vector of control variables

**Table 3**

*Variable of Interests Used in the Model*

Variable Type	Variable Name	$\beta$	Description	Measurement / Coding
Dependent	Cheating Behavior (Z)	N/A	Indicates if the subject is a “sure cheater”	1 = Reported >1 red marble; 0 = Otherwise
Independent	Fairness1	$\beta_1$	Fairness perception: Completely Unfair	1 = Completely unfair; 0 = Completely fair
Independent	Fairness2	$\beta_2$	Fairness perception: Unfair	1 = Unfair; 0 = Completely fair
Independent	Fairness3	$\beta_3$	Fairness perception: Slightly Unfair	1 = Slightly unfair; 0 = Completely fair
Independent	Fairness4	$\beta_4$	Fairness perception: Fair	1 = Fair; 0 = Completely fair
Independent	Treatment	$\beta_5$	Type of incentive distribution	1 = Equality; 0 = Equity
Control	PRODUCTIVITY	$\beta_6$	Productivity in real-effort task	1 = High performer; 0 = Low performer
Control	PEERScore	$\beta_7$	Perceived fairness of peer rewards	1 = Felt unfair; 0 = Felt fair
Control	Sex	$\beta_8$	Biological sex of respondent	1 = Male; 0 = Female
Control	Course	$\beta_9$	Degree program	1 = Economics major; 0 = Otherwise
Control	Units	$\beta_{10}$	Academic load during the semester	Continuous (number of enrolled units)
Control	GWA	$\beta_{11}$	General Weighted Average	Continuous (lower = better performance)

Note. Created by the author.

## Results and Discussion

This study analyzed how perceptions of fairness—specifically in equity and equality contexts—influence cheating behavior. The findings suggest that fairness perception significantly affects cheating propensity, with perceptions of unfair treatment increasing the likelihood of dishonest behavior. The results also highlight the role of individual differences, such as socio-demographic characteristics and performance levels, in shaping these behaviors.

### Descriptive Profile of Participants

The experimental sample consisted of 98 undergraduate students enrolled in ECON 101 (Introduction to Macroeconomic Theory) at the University of the Philippines Los Baños. These students were randomly assigned into two treatment groups: Equity (n=41) and Equality (n=57). This setup ensured a balanced yet heterogeneous composition in terms of sex, college affiliation, course, year level, academic performance, and financial background.

A substantial proportion of participants were female, comprising approximately 75% of the sample in both treatments. This reflects a broader demographic trend observed in many undergraduate economics classes at the university. In terms of college affiliation, the majority (around 87%) belonged to the College of Economics and Management (CEM), while the remainder came from various colleges, such as the College of Agriculture and Food Science and the College of Development Communication. This diversity ensured that the findings could be contextualized across academic disciplines.

**Table 4**

*Summary Descriptive Statistics of Subjects per Treatment*

Variable	Descriptive Statistics	
	Equity (n=41)	Equality (n=57)
<b>Sex</b>		
Male	10 (24.4%)	14 (24.6%)
Female	31 (75.6%)	43 (75.4%)
<b>Age</b>		
Mean Age	19.3	18.6
<b>College</b>		
CEM	35 (85.4%)	50 (87.7%)
Others	6 (14.6%)	7 (12.3%)
<b>Course</b>		
Econ	8 (19.5%)	11 (19.3%)
Others	33 (80.5%)	46 (80.7%)
<b>No. Of Units</b>		
Mean No. of Units	17.9	17.8
<b>Classification</b>		
Sophomore	15 (36.6%)	29 (50.9%)
Others	26 (63.4%)	28 (49.1%)
<b>General Weighted Average (GWA)</b>		
Mean GWA	2.33	2.17
<b>Daily Allowance</b>		
Mean Daily Allowance	268.5	248.9

Note. Created by the author.

With respect to course or degree program, only about 20% of participants were economics majors, with the rest coming from related fields such as Agricultural Economics, Agribusiness Management, Development Communication, and Applied Mathematics. Although participants varied in academic year classification, sophomores comprised most of

the sample, as the course is typically taken at that level. This distribution also serves as a useful proxy for relative maturity and exposure to academic norms—factors that may influence perceptions of fairness and tendencies toward dishonest behavior.

To assess academic ability and financial status, participants reported their General Weighted Average (GWA), number of academic units enrolled, and daily allowance. The mean GWA was comparable across treatments (2.33 for Equity and 2.17 for Equality), indicating similar academic performance. Likewise, the number of enrolled units and daily allowances did not significantly differ, with means of approximately 17.9 units and PHP 260, respectively. These variables helped contextualize participant stress levels and resource constraints, which may influence decision-making in tasks involving incentives and moral considerations

### **Cheating Behavior Across Treatments**

Reported red marble outcomes were used to measure dishonest behavior. Participants were asked to privately report the number of red marbles they drew over seven trials, knowing that each red marble corresponded to a reward. Since the actual probability of drawing one red marble in seven attempts from a box with only one red and nineteen black marbles is low, deviations from this expected probability were interpreted as indicative of cheating.

First, we examine cheating at the aggregate level—particularly among participants who reported drawing at least one red marble. While a report of exactly one red marble could reflect either honesty or minimal cheating, it becomes meaningful when analyzed against expected probabilities.

The theoretical probability of drawing exactly one red marble in seven draws without replacement is approximately 42%. Applying this benchmark to the sample size, we expect 40 individuals to report at least one red draw. However, as shown in Table 5, 71 participants (72%) reported at least one, significantly exceeding the expected value.

*Expected probability of drawing exactly one red marble in seven draws without replacement*

$$\frac{\binom{1}{1}\binom{19}{0}}{\binom{20}{1}} + \frac{\binom{1}{1}\binom{18}{0}}{\binom{19}{1}} + \frac{\binom{1}{1}\binom{17}{0}}{\binom{18}{1}} + \frac{\binom{1}{1}\binom{16}{0}}{\binom{17}{1}} + \frac{\binom{1}{1}\binom{15}{0}}{\binom{16}{1}} + \frac{\binom{1}{1}\binom{14}{0}}{\binom{15}{1}} + \frac{\binom{1}{1}\binom{13}{0}}{\binom{14}{1}} = 0.4176 \text{ or } 42\% \quad (3)$$

**Table 5***Actual and Expected Values of Subjects Reporting at least 1 Red Outcome*

	<b>Overall (n=98)</b>	<b>Equity (n=41)</b>	<b>Equality (n=57)</b>
<b>Expected True Value</b> ( <i>standard probability x sample size</i> )	40 individuals	17 individuals	23 individuals
<b>Actual number of subjects who reported at least 1</b>	71 individuals	22 individuals	51 individuals
<b>Expected Percentage</b> ( <i>expected number / sample size</i> )	41%	41%	41%
<b>Actual Percentage</b> ( <i>actual number / sample size</i> )	72%	54%	88%

Note. Created by the author.

The largest deviation was observed in the Equality Treatment, where the actual number of subjects who reported at least one red marble nearly doubled the expected figure (88% vs. 41%). The Equity Treatment, while lower, still showed a substantial increase (54% vs. 41%), indicating that cheating behavior exists even under performance-based incentives.

These deviations suggest that many participants likely overreported red marbles. The fact that such overreporting is significantly more pronounced in the Equality group reinforces earlier findings: equal reward systems, regardless of effort, may increase the tendency to cheat.

Notably, reporting one red draw—though not definitive proof of dishonesty—can be interpreted as incomplete or subtle cheating, particularly if the actual draw yielded none. As theorized by Shalvi (2011), individuals may balance material gain with maintaining a positive self-image, opting to cheat just enough to benefit while preserving a sense of integrity.

In sum, the aggregate data supports the central hypothesis: cheating is more prevalent under equal distribution systems, and even in equitable systems, some individuals still engage in dishonest behavior, albeit to a lesser degree.

A clear difference in behavior emerged between the two treatment groups. As shown in Table 6 and Figure 2, 52.7% of participants in the Equality group reported drawing two or more red marbles, while only 26.8% of those in the Equity group did so. These participants were classified as "sure cheaters" since their reports exceeded the expected probability and were statistically improbable. A test for equality of proportions confirmed that this difference is statistically significant ( $p < 0.05$ ).

**Table 6**

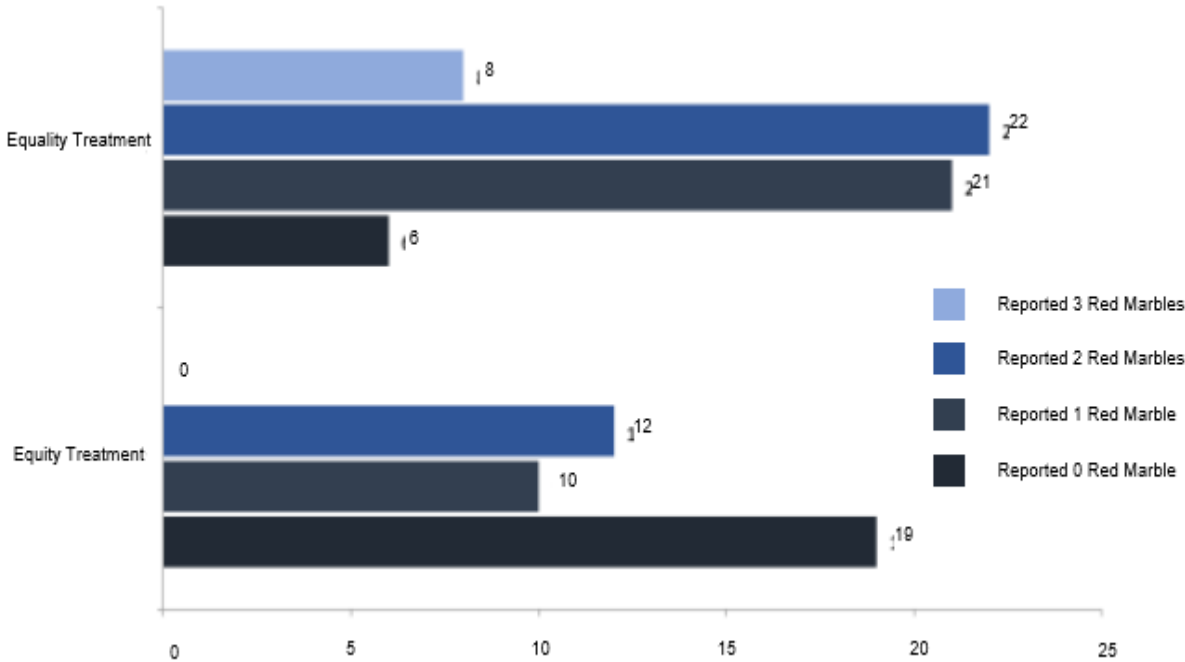
*Frequencies and Percentages of Reported Red Outcomes across Treatments*

Reported Red Outcome	Treatment				Total Percentage (n=98)
	Equity (n=41)		Equality (n=57)		
	Freq.	Percent	Freq.	Percent	
0	19	46.3%	6	10.5%	25.50%
1	10	24.4%	21	36.8%	31.60%
2	12	29.2%	22	38.6%	<b>34.70%</b>
3	0	0	8	14.1%	<b>8.10%</b>
3 and above	0	0	0	0	0.00%

Note. Created by the author.

**Figure 2**

*Differences in Reported Payoffs across Treatment*



Note. Created by the author.

Notably, no participant reported more than three red marbles, indicating that even among cheaters, there was a tendency to moderate dishonesty—possibly due to internal moral thresholds (Mazar & Ariely, 2007). Moreover, the Equality group still included many honest individuals, suggesting that perceived injustice does not uniformly lead to unethical behavior. The Equity Treatment, though more effective in reducing cheating, still saw dishonest behavior among some participants. This may reflect a calculated cost-benefit analysis, where perceived gains outweighed moral costs, consistent with rational choice theory.

Interestingly, while the cheating rate in the Equality treatment was notably higher, a significant portion of participants in the Equity group also engaged in dishonest reporting. This suggests that even in systems perceived as fair, individuals may still choose to cheat when the

potential rewards outweigh the perceived moral or reputational costs. These findings align with behavioral economic theories, which posit that individuals are not purely rational actors but weigh both internal moral constraints and external incentives in their decision-making.

The results also reflect the phenomenon of "justified dishonesty." In non-meritocratic systems, individuals may rationalize cheating as compensation for perceived unfairness. The Equality treatment, by failing to differentiate rewards based on effort, may have inadvertently encouraged this rationalization. Conversely, in the Equity treatment, where rewards were aligned with effort, the moral cost of cheating may have been perceived as higher, contributing to lower rates of dishonest behavior.

Overall, the data provide robust evidence that the structure of incentives plays a critical role in shaping ethical behavior. Systems that recognize and reward individual effort not only promote fairness but may also serve as an effective deterrent to dishonesty.

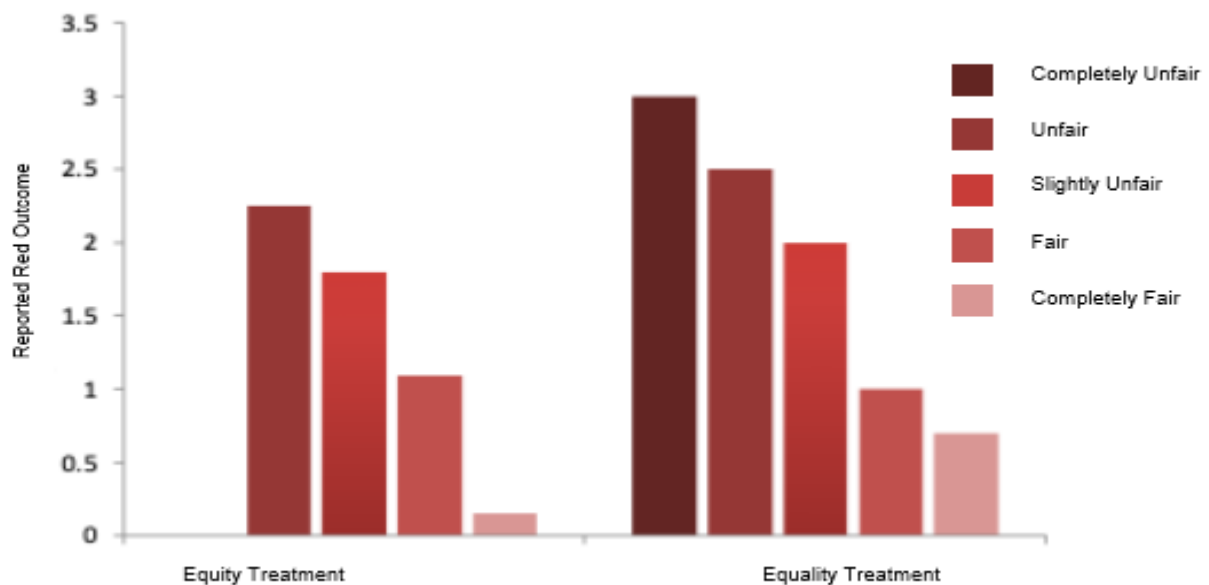
### **Association Between Fairness Perception and Cheating Behavior**

A key objective of this study was to determine whether fairness perceptions influence individuals' propensity to cheat. As established in previous sections, fairness perceptions are significantly shaped by the treatment condition—Equity or Equality—making them valid outcomes of the experimental setup. A series of statistical tests were conducted to examine the link between fairness perception and cheating behavior. A Chi-squared test confirmed a significant association between fairness perception and reported red marble outcomes ( $p < 0.01$ , Pearson  $\chi^2 = 106.82$ ), providing initial evidence of this relationship.

Figure 3 illustrates this association. Participants who rated the reward system as less fair were more likely to report higher red marble outcomes, reflecting greater cheating behavior. This trend holds across both treatment groups, though it is especially pronounced in the Equality treatment, where perceptions of unfairness and reported cheating were both substantially higher.

**Figure 3**

*Association of Fairness Perception and Cheating Behavior across Treatments*



Note. Created by the author.

To further validate these findings, a Kruskal-Wallis H test was performed to test for differences in cheating across five fairness perception categories: Completely Unfair, Unfair, Slightly Unfair, Fair, and Completely Fair. Results indicated a statistically significant difference in cheating levels across these groups ( $\chi^2(2) = 31.85, p < 0.01$ ), confirming that those who perceived the system as less fair were more likely to cheat. Conversely, those who found the system fair or completely fair had the lowest cheating rates.

These results are consistent with the idea that perceived injustice increases moral disengagement, allowing individuals to justify unethical actions. However, the presence of honest individuals, even in the most unfair settings, reflects internal moral thresholds, supporting theories like Mazar and Ariely's (2007) self-concept maintenance model.

### **Logistic Regression Results: Predictors of Cheating Behavior**

To deepen the analysis, a logistic regression model was estimated using a binary dependent variable: 1 for cheaters (those who reported 2 or more red marbles), and 0 for non-cheaters (those who reported 0 or 1). This classification avoids selection bias while preserving sample size for robust estimation. The regression results, presented in Table 7, identify both fairness-related variables and individual characteristics that significantly predict cheating behavior.

**Table 7***Logistic Regression Results*

<b>Independent Variables</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>P-value</b>	<b>dy/dx</b>
<b>Unfair5</b>	5.308*	1.38132	0.089	0.7599413
<b>Unfair4</b>	5.280***	1.464073	0.003	0.751231
<b>Unfair3</b>	2.232**	0.9192245	0.015	0.5038609
<b>Unfair2</b>	-0.442	0.8955806	0.622	-0.0876769
<b>Treatment</b>	0.972*	0.75763	0.096	0.1932053
<b>Productivity</b>	0.137*	0.6790504	0.084	0.0282767
<b>Peers' Scores Perception</b>	2.053***	0.7418467	0.006	0.4107985
<b>Pooled Points Perception</b>	0.440	0.6902973	0.524	0.0905382
<b>Sex</b>	-2.03**	1.000758	0.042	-0.3212861
<b>Course</b>	-2.072*	1.075433	0.054	-0.3074668
<b>Units</b>	-0.061	0.1537402	0.691	-0.0126005
<b>GWA</b>	1.534*	0.8588553	0.074	0.3159472
<b>Constant</b>	-4.967	3.688244	0.178	

Note. Created by the author.

Fairness perception emerged as a strong and consistent predictor of cheating. Compared to those who perceived the system as completely fair, individuals who viewed it as slightly unfair, unfair, or completely unfair were significantly more likely to cheat. The marginal effects increased with the level of perceived unfairness, with the highest cheating propensities observed among those who rated the system as completely unfair ( $dy/dx = 0.76$ ) and unfair ( $dy/dx = 0.75$ ). Those who perceived the system as slightly unfair also had a significantly elevated likelihood of cheating ( $dy/dx = 0.50$ ). Interestingly, the marginal effects for the two most severe unfairness levels were nearly identical, suggesting that once the system is perceived as unfair, further increases in perceived unfairness have limited additional effect on cheating behavior. In contrast, participants who rated the system as merely fair did not significantly differ from those who found it completely fair.

The treatment condition also had a significant impact. Participants assigned to the Equality Treatment were more likely to cheat than those in the Equity Treatment ( $dy/dx = 0.19$ ). This finding reinforces earlier results indicating that non-meritocratic reward structures heighten the risk of dishonest behavior.

Several individual-level control variables were also found to significantly affect the likelihood of cheating. Sex had a notable impact: female participants were significantly more likely to cheat than males ( $dy/dx = -0.32$ ), aligning with earlier descriptive statistics and challenging commonly held gender stereotypes. This pattern is consistent with findings from Friesen and Gangadharan (2012), who argue that women are not necessarily more honest but may exhibit comparable or greater cheating behavior under certain conditions.

Course of study also played a role. Non-economics majors exhibited a higher probability of cheating than economics students ( $dy/dx = -0.31$ ). One plausible explanation is that economics majors, having greater exposure to concepts such as rational behavior, incentives, and opportunity cost, may be more attuned to the potential risks and consequences of dishonest behavior. In contrast, students from other disciplines may lack the same cognitive framework for evaluating the trade-offs involved in cheating.

Another significant predictor was academic performance. Students with higher GWAs (i.e., lower numerical grades) had a greater likelihood of cheating ( $dy/dx = 0.32$ ). This may reflect higher performance pressure or competitiveness among academically strong students. Conversely, number of enrolled units, which could indicate academic workload, was not a significant predictor.

Among perception-based variables, the belief that peer rewards were unfair strongly predicted cheating ( $dy/dx = 0.41$ ). This highlights the role of social comparison and peer-based inequity aversion in shaping dishonest behavior. In contrast, perceptions related to the pooled points system did not significantly affect cheating propensities.

In sum, the regression results provide robust support for the hypothesis that perceptions of unfairness increase the likelihood of cheating. The effect remains significant even after accounting for demographic and academic factors, underscoring the importance of procedural fairness in reducing dishonest behavior.

### **Conclusion**

This study offers compelling empirical evidence that perceptions of fairness significantly influence dishonest behavior. Participants who perceived their environment as unfair were consistently more likely to cheat, particularly when reward systems disregarded individual effort. The Equality Treatment, designed to mirror non-meritocratic systems, resulted in substantially higher cheating rates compared to the Equity Treatment, which rewarded performance.

Importantly, the findings highlight that even when incentives are structured equitably, cheating does not vanish entirely—suggesting that other psychological and social factors also shape moral decision-making. Nevertheless, systems perceived as fair substantially reduce the motivation to cheat, validating the importance of procedural justice in ethical behavior.

Moreover, socio-demographic factors such as sex, course background, academic standing, and perceptions of peer fairness further illuminate the nuanced landscape of dishonest behavior. Female students, non-economics majors, academically high-performing individuals, and those who felt peers were unfairly rewarded were more prone to cheating. These patterns underscore that cheating is not merely a rational economic choice, but a complex interplay of fairness, identity, and perceived norms.

In a broader sense, this study emphasizes the ethical implications of institutional design. Policies and environments that prioritize equity over blind equality can foster not only better performance but also integrity. As educational institutions and organizations seek to build systems that encourage honest conduct, acknowledging the psychological weight of fairness perception is a necessary step toward cultivating more ethical communities.

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## *Ethical Committee Approval/Etik Kurul Raporu*



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2 March 2020

**Subject:** Research Ethics Clearance for *"Impacts of Fairness Perception on Cheating Behavior: An Experimental Study"*

**Reference Code:** UPLB-ECON-REC 2020-02-AGRAMON

Dear MS. AGRAMON,

The UPLB Department of Economics Research Committee has completed its review of your revised study protocol for the research project titled *"Impacts of Fairness Perception on Cheating Behavior: An Experimental Study."* We are pleased to inform you that your application has been **approved**, and you are hereby granted **ethical clearance to proceed** with the conduct of your study.

Your project has been assigned the reference code **UPLB-ECON-REC 2020-02-AGRAMON**, which should be cited in all official documentation and communication related to this research. This clearance will remain valid **until March 2, 2022**, subject to compliance with the conditions outlined below.

### **Approved Study Documents:**

1. Study Protocol Version 2 (dated March 2, 2020)
2. Final Survey Instrument (dated March 2, 2020)


### **Requirements During the Study Implementation:**

As the Principal Investigator, you are expected to notify the Committee and submit the appropriate forms should any of the following occur:

1. **Amendments** to the study protocol, particularly those that may impact participant well-being or data integrity. Use Form A – Protocol Amendment Submission Form.
2. **Changes to the informed consent process or content**, which must also be submitted through Form A.
3. **Adverse events**, whether observed or reported, using Form E – Serious Adverse Event Report.
4. **Early termination** of the study, along with justifications, using Form C – Early Termination Report Form.
5. Any incident or concern that may present **ethical implications** not previously covered.

We trust that you will adhere to the highest ethical standards in carrying out your research. We wish you continued success in your scholarly endeavors.

Sincerely,

  
Asst. Prof. Christian Marvin Zamora  
Chair, Research Ethics Committee  
UPLB Department of Economics

*Expanding the frontiers of Economics Science towards inclusive growth and development in Asia and the Pacific*

## **Information About the Article/Makale Hakkında Bilgiler**

### **The Ethical Rules for Research and Publication / Arařtırma ve Yayın Etięi**

The authors declared that the ethical rules for research and publication followed while preparing the article.

Yazarlar makale hazırlanırken arařtırma ve yayın etięine uyulduęunu beyan etmiřtir.

### **Conflict of Interests/ ıkar atıřması**

The authors have no conflict of interest to declare.

Yazarlar ıkar atıřması bildirmemiřtir.

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The authors declared that this study has received no financial support.

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The draft process of the manuscript/ Taslaęın Hazırlanma Sreci S.M.P.A./J.A.A., Writing The Manuscript/ Makalenin Yazılması S.M.P.A./J.A.A., Submit, Revision and Resubmit Process/ Bařvuru, Dzeltme ve Yeniden Bařvuru Sreci J.A.A.



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**Research Article**

**The Impact of Remittance Inflows on Human Capital Development: Exploring the Mediating Role of Education and Healthcare Accessibility in African Developing Economies**

**Oluwatoyin Babatunde Omoniyi <sup>a</sup> & Taiwo Owoeye<sup>b</sup>**

**Abstract**

**Introduction:** This study explores how access to education and healthcare influences the relationship between remittance inflows and human capital development in developing Sub-Saharan African (SSA) countries. Given the growing importance of remittances in financing development, understanding their potential to enhance human capital is critical.

**Method:** The study employed the POLS, fixed effect, and random effect models using annual data from 2010 to 2023 for 21 developing SSA countries. Key variables examined include remittance inflows, access to education, healthcare accessibility, government expenditure on education and health, governance quality, labour force participation, and skill levels.

**Results or Findings:** The results reveal that remittance inflows significantly promote human capital development in SSA. Moreover, increased access to education and improved healthcare further amplifies this positive effect. Good governance also enhances the impact of remittances on human capital development. Conversely, public spending on education and health had a negative effect, likely due to corruption, lack of transparency, and poor policy alignment. Additionally, while higher labour force participation supports human capital development, a rise in the proportion of low-skilled individuals hinders it.

**Discussion or Conclusion:** The study concludes that remittances can be a valuable tool for fostering human capital development when complemented by effective governance and improved access to education and healthcare. Policymakers are advised to implement targeted programs to channel remittances into education and health, improve the quality and accessibility of these services, ensure accountability in public spending, and invest in skills development, particularly for youth and women, to harness the full potential of human capital in SSA countries.

*Keywords:* human capital, health, education, governance, labour

*JEL Codes:* O14, F24, I15, I25

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**Araştırma Makalesi**

**Yurtdışı İşçi Havalelerinin Beşeri Sermaye Gelişimine Etkisi: Afrika'nın Gelişmekte Olan Ekonomilerinde Eğitim ve Sağlık Hizmetlerine Erişimde Aracılık Rolünün Analizi  
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**Öz**

**Giriş:** Bu çalışma, yurt dışı işçi havalelerinin insan sermayesi gelişimi üzerindeki etkisini, eğitime ve sağlık hizmetlerine erişimin nasıl şekillendirdiğini, gelişmekte olan Sahra Altı Afrika (SSA) ülkeleri özelinde incelemektedir. Gelişimin finansmanında havalelerin artan önemi göz önüne alındığında, bunların insan sermayesini geliştirme potansiyelini anlamak büyük önem taşımaktadır.

**Yöntem:** Çalışmada, 2010–2023 yılları arasındaki döneme ait 21 gelişmekte olan SSA ülkesinden elde edilen yıllık veriler kullanılarak POLS, sabit etkiler ve rassal etkiler modelleri uygulanmıştır. İncelenen temel değişkenler arasında yurt dışı işçi havaleleri, eğitime erişim, sağlık hizmetlerine erişim, eğitime ve sağlığa yönelik kamu harcamaları, yönetim kalitesi, iş gücüne katılım oranı ve beceri düzeyleri yer almaktadır.

**Sonuçlar ya da Bulgular:** Elde edilen sonuçlar, yurt dışı işçi havalelerinin SSA ülkelerinde insan sermayesi gelişimini anlamlı şekilde teşvik ettiğini göstermektedir. Eğitime ve sağlık hizmetlerine erişimdeki iyileşmeler bu etkiyi güçlendirmektedir. İyi yönetim de havalelerin etkisini artırmaktadır. Ancak, kamu harcamalarının olumsuz etkisi, yolsuzluk ve düşük politika etkinliğiyle ilişkilendirilmiştir. Ayrıca, yüksek iş gücüne katılım olumlu etki yaratırken, düşük vasıflı işgücü oranı olumsuz etki göstermektedir.

**Tartışma ya da Yapılan Çıkarımlar:** Çalışma, yurt dışı işçi havalelerinin, etkin yönetim ve eğitim ile sağlık hizmetlerine erişimin iyileştirilmesiyle birlikte, insan sermayesinin geliştirilmesinde önemli bir araç olabileceği sonucuna varmaktadır. Politika yapıcılara, havalelerin eğitim ve sağlık alanlarına yönlendirilmesini sağlayacak hedefli programlar geliştirmeleri, bu hizmetlerin kalitesini ve erişilebilirliğini artırmaları, kamu harcamalarında hesap verebilirliği sağlamaları ve özellikle gençler ile kadınlara yönelik beceri geliştirme yatırımlarını artırmaları tavsiye edilmektedir. Bu şekilde, SSA ülkelerinde insan sermayesinin tam potansiyeli değerlendirilebilir.

**Anahtar Kelimeler:** insan sermayesi, sağlık, eğitim, yönetim, emek

**JEL Kodlar:** O14, F24, I15, I25

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## Introduction

Education, skills, and health of people are vital components of human capital and are essential for growth and development. The World Bank has created the Human Capital Index (HCI) that estimates the potential productivity of future generations based on current investments in education and health care. Human capital enhances economic performance in aspects such as innovation, increase in earnings, and poverty reduction as noted by the World Bank (2020). However, many developing economies experience major constraints in human capital development because of low investment in education and health, high levels of poverty, and institutional problems (Sianesi & Van Reenen, 2003). These challenges show why there is a need to look for other sources of funding apart from government funding. International migration money transfers, also known as cross-border personal transfers or ‘remittances’ are cross-border payments made by migrants to their home countries to support their households. Cross-border personal transfers hit \$589 billion in 2021, exceeding FDI in numerous low- and medium-income countries (World Bank, 2021). In the case of developing countries, remittances provide an important stream of income that can increase the consumption level of households, finance education and avail better health care facilities. Research has shown that in most cases, remittances help to reduce the volatility of household income especially in areas where employment and investment opportunities are scarce or where social protection mechanisms are weak (Adams & Cuecuecha, 2010). Therefore, remittances have a high potential for contributing to human capital development, especially in underfinanced and unserved regions.

Although the role of remittance is well acknowledged in the literature, its contribution to human capital development has not been given adequate attention, particularly in the context of the HCI. Although earlier research has looked at the overall macroeconomic effects of remittances, little attention has been paid to the impact of remittances on education and health in developing countries. For instance, while remittances are employed to pay for school fees, books, or medical bills, they have a direct impact on education and health outcomes. However, the impact of these investments may differ with socio-economic and institutional factors including governance quality, income disparity and gender (Mohapatra et al., 2009). The ability of remittances to foster human capital development also depends on the way the recipient households use the remittances. Occasionally, remittances are spent on consumption and not on investment in education or health, and this is according to Chami et al. (2005). However, the part played by institutional quality cannot be overlooked. Where governance is poor, corruption rife, or infrastructure insufficient, the positive effects of remittances may be reduced, thus constraining human capital. For example, the spending of the household through remittances may be directed to productive use in countries with good governance structures than in countries with structural problems (Ratha et al., 2018).

Moreover, the impact of remittances on human capital development is also heterogeneous by region and demographic characteristics. For instance, in the rural regions of the developing world, money transfers act as a replacement for state services in the sphere of education and healthcare. However, in urban areas where access to public services is relatively better, remittances may have a different effect on human capital investments. This relationship is further conditioned by gender since women's remittance funds are more likely to be spent on education and health than those controlled by men (Brahma & Paul, 2020). However, there are still some open questions regarding the nature of remittance-driven human capital accumulation and its sustainability. Is there a uniformity in the observed benefits as a cross-section of the different components of the HCI? How do institutions either enhance or limit the effects of remittances on education and health? Is there a possibility of experiencing decreasing returns to remittances in the countries that rely on them? The answers to these questions are important

to determine how remittances can be used as a mechanism for sustainable development. This study seeks to plug these gaps by examining the link between remittance inflows and the Human Capital Index, especially in education and health in developing countries. The study will also examine the impact of household use of remittances on human capital, as well as how institutional factors mediate this process. In answering these questions, the study aims to contribute useful information to policymakers and stakeholders on how to enhance the developmental benefits of remittances in developing countries.

### **Empirical Literature**

Several research efforts have been geared toward examining the relationship between remittances and human capital across different contexts and methodologies, however, consensus was reached. For instance, Gao et al. (2021) in Kyrgyz analysed the impact of remittances on human capital of school-age children using a 5-year panel of 8000 households and the result of the fixed effect instrumental variable model showed that human capital investment and educational achievement are negatively impacted by remittances. Similarly, using a panel of 100 developing countries, Bibi and Ali (2022) examined the impact of remittances on human development with 2014 annual data and the panel OLS models results showed an insignificant positive relationship between remittance and human development while governance indicators mostly have positive impact on human capital development. However, using a panel of 30 sub-Saharan African countries, the dynamic panel regression model result of the Umar (2021) study showed that remittance had a significant positive impact on human development in 30 sub-Saharan African countries between 2004-2018. Similarly, Saydaliyev et al. (2022) examined the role of human capital in the relationship between remittance on economic growth in developed and developing countries from 2007 to 2018. The study estimated a GMM-based dynamic panel regression model and found that financial inclusion and human capital positively impact economic growth in remittance-receiving developing countries. Likewise, using a panel of 18 selected African countries, Aregbesola (2022) analysed the relationship between remittances, human capital development, and poverty and found that remittance significantly aids human capital development, particularly access to education in African countries.

Using a panel of 41 sub-Saharan African countries, Ali Bare et al. (2022) examine the mediating role of financial development on the impact of remittances on human capital using the secondary school enrolment rate as a proxy. The static panel models' results consistently showed that remittance has a significant positive impact on human capital and has a more profound effect in the dynamic model when financial development interacts with remittance. Also, Mohammed (2022) examined the relationship between institutions, remittances, and human development using a panel of 22 sub-Saharan African countries from 2004 to 2018. The result of the estimated dynamic panel models showed that remittances positively impact human development in SSA countries. The study further revealed that remittance promotes human development in countries with weak institutions but with a lesser effect in countries with developed institutions. In a similar panel-related study of the Islamic Cooperation member countries, Kamalu et al. (2022) examined the impact of remittance on human development from 1990 to 2018 and the result of the CS-ARDL model showed that remittance had a significant short and long-run impact on human development and the granger causality test result showed that remittance caused human development but not vice versa.

Recently, Orekoya and Tijani (2023) investigated the impact of remittances on human capital development in Nigeria from 1980 to 2021. Employing the ARDL model, they found that remittance inflow increased school enrolment rate and life expectancy but reduced infant

mortality rate. Also, in Sri Lanka, Mohamed-Aslam and Sivarajasingham (2023) tested for the cointegration relationship between workers' remittances and human capital formation from 1975 to 2020. In the ARDL result, remittances had a significant positive impact on human capital in the short and long run and the causality test showed a bidirectional relationship between the two. The innovation accounting further showed that remittance shock significantly contributes to the human capital variation and also raises it above the steady state. In the study conducted by Nasrin et al. (2024) using a panel of 7 southern Asian countries from 1995 to 2020, the result showed that remittance has a significant positive impact on human and gender development. The result also showed that international migration caused human development but hindered gender development. Likewise, in Pakistan, Khan et al. (2024) investigated the impact of remittance and aid on human capital from 1990 to 2021 and the result of the ARDL model showed that remittance had a positive impact on human capital in the short and long run while aid has a significant positive effect in the short run only. In a contrariwise, the study of Williams (2024) using a panel of developing countries showed that an increase in remittance inflow significantly caused a reduction in government educational spending while increasing government health spending.

## Methodology and Data

### Model Specification

In this study, two models are employed to analyse the relationship between remittances inflow and human capital development and the mediating role of education and health factors in Sub-Saharan Africa developing countries and are specified in the equations below:

$$HC_{it} = \beta_0 + \beta_1 Rem_{it} + \beta_2 Edu_{it} + \beta_3 Health_{it} + \beta_4 Gov_{it} + \beta_5 \ln GDPk_{it} + \beta_6 GexEdu_{it} + \beta_7 GexHlt_{it} + \beta_8 LPR_{it} + u_{it} \dots \dots \dots (1)$$

$$HC_{it} = \beta_0 + \beta_1 Rem_{it} + \beta_2 Edu_{it} + \beta_3 Health_{it} + \beta_4 Gov_{it} + \beta_5 (Rem_{it} * Gov_{it}) + \beta_6 \ln GDPk_{it} + \beta_7 GexEdu_{it} + \beta_8 GexHlt_{it} + \beta_9 LPR_{it} + u_{it} \dots \dots \dots (2)$$

Where HC is the human capital, Rem is the remittance inflow, Edu is the education level, Health is the health indicator, Gov is the governance quality, GDPk is the per capita GDP, GexEdu is the government expenditure on education, GexHlt is the government expenditure on health, and LPR is the labour force participation rate respectively. The first model in Equation 1 highlights the mediating roles of education level and health in the relationship between remittance inflows and human capital development. The second model in Equation 2, a modified version of the first, incorporates the interaction between remittance and governance to examine the moderating effect of governance on the impact of remittance on human capital development.

In the model, remittance inflows (Rem) enhance household income, enabling investments in education and healthcare, which directly contribute to human capital development. Education level (Edu) is one of the most basic components of human capital since it prepares people for productivity and development. Likewise, Health is important, since healthy people work more efficiently and are capable of learning and applying skills. Governance quality (Gov) has a central role in facilitating proper resource allocation and efficient delivery of public services and in providing a favourable environment for human capital development. Per capita GDP (GDPk) is used as an indicator of economic resources since it measures a country's ability to finance education and health services. Government

expenditure on education (GexEdu) and health (GexHlt) shows that human capital is valued by financing services that enhance the availability and quality of education and health services. Finally, the labour force participation rate (LPR) reflects the workforce activity, which shows how many people are involved in economic activities and gaining experience, which is important for human capital formation.

## Method of Analysis

This study employed the pooled Ordinary Least Squares (OLS), Fixed Effects (F-E) model, and Random Effects (R-E) model to examine the impact of remittance inflows on human capital development, with a focus on the mediating role of education and health in developing African economies. These econometric techniques were chosen due to the relatively short period of the dataset after adjustments were made for the included countries. The F-E and R-E models are particularly suitable for handling unobserved heterogeneity across countries, which is critical for capturing the unique characteristics of each nation while analyzing panel data. The results from the F-E and R-E models are given greater priority over the OLS estimates, as the former account for heterogeneity and provide more robust insights into the relationships under study. Additionally, diagnostics such as the redundant fixed effect test and the Hausman test were conducted to determine the suitability of the F-E or R-E model in specific cases, ensuring the reliability of the results.

## Data

**Table 1**

### *Data Description*

<b>Variable</b>	<b>Description</b>	<b>Source</b>
Human Capital	Human Capital Index	Penn World Table version 10.1
Remittance	Remittances inflow as a % of GDP	World Bank Development Indication
Education level	The average enrolment rate for pre-primary, primary, secondary, and tertiary.	World Bank Development Indication
Health	Life expectancy at birth	World Bank Development Indication
Governance	Governance indices	World Bank Development Indication
GDP per capital	GDP per capita in current USD	World Bank Development Indication
Education expenditure	Government education expenditure (% Total)	World Bank Development Indication
Health expenditure	Government health expenditure (% Total)	World Bank Development Indication
Labour participation rate	Labour force participation rate	World Bank Development Indication

Note. Created by the author.

Table 1 presents detailed information on the data sources employed in this study. Utilizing data from the World Development Indicators (WDI) of the World Bank (2012) and the Penn World Table (PWT) Version 10.1 over the period 2010 to 2023, a dataset was constructed encompassing 21 developing Sub-Saharan African countries including Angola, Benin, Burundi, Cameroon, Ethiopia, Gambia, The, Ghana, Lesotho, Madagascar, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zambia. Data on human capital were primarily sourced from the PWT 10.1; however, for the years 2019 to 2023, missing data were interpolated by the authors using a panel

autoregressive prediction model to ensure continuity and accuracy. Educational level data were computed as the average enrollment rates across pre-primary, primary, secondary, and tertiary education levels. All other variables were sourced from the WDI.

### Data Analysis

Table 2 presents the descriptive statistics showing the socioeconomic status and development status of the SSA countries. The Human Capital Index with an average of 1.8374 and a minimum of 1.1673 and a maximum of 3.0967 indicates moderate human capital formation in the region. The variation, with a standard deviation of 0.4578, shows that education and healthcare investments differ across countries and have a direct effect on productivity and economic development. Certain countries have significantly improved their human capital, while others continue to face the problem of resource scarcity.

**Table 2**

*Descriptive Statistics of Variables in Developing SSA Countries*

Variable	Mean	Std. Dev.	Max	Min
Human Capital Index	1.8374	0.4578	3.0967	1.1673
Remittances (%GDP)	4.1299	5.4630	27.302	0.0002
Education level	63.294	11.707	89.507	29.124
Life expectancy	61.513	4.9648	74.515	45.596
Governance	-0.5190	0.4752	0.8767	-1.4447
GDP per capita (\$)	4274.8	4831.5	29499	630.45
Education expenditure (%Total)	16.403	5.6047	35.010	2.8774
Health expenditure (%Total)	7.0179	3.1862	17.511	0.7344
Labour force participation rate	67.512	10.413	86.507	45.490

Note. Author's computation

The average share of remittance in SSA economies is 4.1299% of the GDP, but the standard deviation is 5.4630. This ranges from 0.0002% to a maximum of 27.302% which indicates that although remittances are important for some countries, others depend little on them. This variability is explained by the differences in migration and the role of foreign financial remittances for households' income and economic growth. The education level is also varied with the average education level being 63.294 % and the minimum being 29.124 % and the maximum being 89.507%. The standard deviation of 11.707 shows that the level of education and the quality of education in the region are not equal. In the same way, life expectancy with a mean of 61.513 and the range of 45.596 – 74.515 indicates the inequalities in health and living standards. The standard deviation of 4.9648 is still relatively low, which means that the differences in life expectancy are not as significant as the differences in other indicators. The governance quality, as captured by the governance index is not very encouraging. The average value of -0.5190 and minimum and maximum values of -1.4447 and 0.8767 respectively indicate that most of the countries have poor governance, weak institutions, and inefficiencies. The negative mean and a smaller standard deviation of 0.4752 underscore the need to undertake institutional changes to enhance accountability and policy efficiency.

The economic factors also reveal similar differences. GDP per capita with a mean of \$4274.8 and a range of \$630.45 to \$29499 underlines the income difference. The large standard deviation of 4,831.5 shows that while some countries in SSA have relatively high levels of

economic output many have low income levels that demonstrate structural vulnerabilities in their economies. The expenditure of the government is not the same. Education expenditure is on average 16.403 % of total expenditure; it varies from 2.8774 % to 35.010 %. Health expenditure is also on average 7.0179 % of total expenditure; it varies from 0.7344 % to 17.511 %. These statistics show variations in the amount of resources that different countries are willing to invest in development through education and health sectors compared to the amount of resources that are channelled to other sectors. The labour participation rate, which is on average 67.512%, with the lowest value of 45.490% and the highest value of 86.507%, shows the level of workforce participation. The coefficient of variation of 10.413 indicates that the nature and changes in the labour market vary from one SSA country to another due to demographic factors, economic status, and cultural beliefs.

**Table 3**

*Regression Estimates of Model 1*

IV	DV: Human Capital Index		
	POLS	F-E	R-E
Remittance	0.0060 (0.0052)	0.0104*** (0.0027)	0.0113*** (0.0027)
Education level	0.0054** (0.0026)	0.0003 (0.0012)	0.0004 (0.0012)
Life expectancy	-0.0012 (0.0064)	0.0189*** (0.0038)	0.0185*** (0.0037)
Governance	-0.1057 (0.0875)	0.1143** (0.0520)	0.0875* (0.0507)
ln(GDP per capita)	-0.2326*** (0.0500)	0.3052*** (0.0394)	0.2861*** (0.0385)
Education expenditure	-0.0274*** (0.0052)	0.0006 (0.0016)	0.0003 (0.0016)
Health expenditure	0.0048 (0.0088)	-0.0055* (0.0029)	-0.0058** (0.0029)
Labour force participation rate	-0.0100*** (0.0030)	0.0096*** (0.0034)	0.0090*** (0.0033)
Constant	4.4377*** (0.6242)	-2.3865*** (0.4146)	-2.1816*** (0.4158)
$R^2$	0.18	0.97	0.49
Breusch-Pagan Test	1468.4***		
Likelihood Ratio Test		1010.2***	
Hausman test			17.286**

\*\*\*  $p < 1\%$ , \*\*  $p < 5\%$ , \*  $p < 10\%$

Note. Created by the author.

Table 3 presents the regression estimates of the model in Equation 1. The result showed that remittance has a significant positive impact on human capital. Specifically, the result shows that an increase in remittance inflow raises the level of human capital by approximately 0.01 units. This finding underscores the critical role of remittances as a source of financial support for households towards human capital development in developing Sub-Saharan African (SSA) countries, where public funding for education and health is often insufficient. This result does not stand alone but finds its root in the New Economics of Labor Migration (NELM) theory (Stark & Bloom, 1985), which posits that remittances act as a risk-sharing mechanism, enabling households to improve their socioeconomic conditions. Empirically, this finding is supported by studies such as Umar (2021), Aregbesola (2022), Orekoya and Tijani (2023), Mohamed-Aslam and Sivarajasingham (2023), and Khan et al. (2024) but contrary with the studies such

as Gao et al. (2021) and Bibi and Ali (2022). In alignment with the human capital theory (Becker, 1964), which emphasizes that education is a critical investment in human capital that yields economic and social returns, the pooled OLS estimate showed that an increase in access to education results in an increase in human capital level by about 0.005 units. This result highlights the pivotal role of education accessibility in enhancing human capital development in developing Sub-Saharan African (SSA) countries. Studies such as Psacharopoulos and Patrinos (2018) demonstrated that higher levels of education significantly boost individual earnings and contribute to national economic growth. However, Glewwe et al. (2014) noted that while access to education has expanded in many developing regions, the quality of education often remains suboptimal, limiting its impact on human capital.

Furthermore, in support of the demographic transition theory (Thompson, 1929; Notestein, 1945), which posits that improvements in health and reductions in mortality are key drivers of economic and social progress, as they enable more significant investments in education and skill development, the fixed and the random effects estimates showed that a year increase in life expectancy results in an increase in human capital level by approximately 0.019 units. Reinforced by studies such as Vu (2023), this finding emphasized the critical role health and longevity played in fostering human capital development in developing Sub-Saharan African (SSA) countries. In literature, the institutional theory (Veblen, 1899; Commons, 1931; DiMaggio & Powell, 1983) posited that the quality of institutions and governance plays a pivotal role in determining economic and social outcomes and the evidence from the result supports this claim in the context of developing sub-Saharan African countries. Similar to the findings of Bibi and Ali (2022) and Mohammed (2022), the result showed that an improvement in governance increases the level of human capital by approximately between 0.08 to 0.11 units, pointing to the critical role of effective governance in shaping the conditions necessary for human capital development in the sub-Saharan African countries. The presence of effective governance will ensure that public resources are allocated efficiently, public services such as education and healthcare are accessible, and institutions operate transparently, therefore, fostering an environment conducive to human capital growth.

Furthermore, the result showed mixed results on the impact of GDP per capita on human capital accumulation. The pooled ordinary least square estimate has a negative value of -0.233, suggesting that higher GDP per capita does not necessarily translate into improved human capital. This could indicate that economic gains are unevenly distributed or that structural inefficiencies prevent the benefits of GDP growth from being translated into investments in education, healthcare, and other components of human capital. However, the other models provide stronger and more consistent evidence of a positive relationship, with coefficients ranging between 0.286 and 0.305, indicating that increases in GDP per capita are associated with significant improvements in human capital, consistent with the endogenous growth theory, which emphasizes the role of income and productivity in fostering education and health investments (Romer, 1990). Contrary to intuition, government expenditure on education and health was shown to have a negative impact on the human capital level by reducing it by approximately 0.027 units and 0.006 units, respectively, suggesting inefficiencies or mismanagement in the allocation and utilization of government spending in these critical sectors. This result reflects the situation in many developing countries, especially those in Sub-Saharan Africa (SSA), where public expenditure on education and health often suffers from corruption, lack of accountability, and misaligned priorities, which hinder the expected positive outcomes. On the other way round, it could also mean that the funds intended for improving access and quality in schools or healthcare facilities were diverted or poorly allocated, failing to generate the intended benefits for human capital accumulation. This result agreed with the

public choice theory of Buchanan and Tullock (1962) which proposed that government spending does not always align with public interest due to bureaucratic inefficiencies, corruption, and political motivations.

The pooled ordinary least squares (OLS) regression estimate reveals a negative coefficient for the labour participation rate, suggesting the potential presence of diminishing returns to labour. This could imply that as more individuals participate in the labour market without corresponding improvements in productivity or skill levels, the marginal contribution of labour to human capital accumulation decreases. Such scenarios are common in developing economies like those in Sub-Saharan Africa (SSA), where a significant portion of the labour force is engaged in low-skilled, informal employment that offers limited opportunities for human capital growth. Conversely, in line with studies such as Psacharopoulos and Patrinos (2018) and Ridhwan et al. (2022), the Fixed Effects (F-E) and Random Effects (R-E) models provide strong evidence of a positive relationship, showing that an increase in the labour participation rate raises human capital levels by approximately 0.009 units above the average. This positive impact highlights the importance of workforce engagement in fostering human capital when country-specific characteristics and unobserved heterogeneity are considered. This finding aligns with the Learning-by-Doing Hypothesis (Arrow, 1962), which emphasizes that participation in productive activities leads to experiential learning, fostering skill accumulation and efficiency improvements.

**Table 4**  
*Regression Estimates of Model 2*

IV	DV: Human Capital Index		
	POLS	F-E	R-E
Remittance	-0.0092 (0.0085)	0.0185*** (0.0035)	0.0195*** (0.0035)
Education level	0.0047* (0.0026)	-0.0002 (0.0012)	-0.0002 (0.0012)
Life expectancy	-0.0034 (0.0065)	0.0232*** (0.0039)	0.0229*** (0.0038)
Governance	0.0396 (0.1085)	0.0327 (0.0560)	0.0066 (0.0547)
Remittance*Governance	-0.0457** (0.0204)	0.0202*** (0.0058)	0.0209*** (0.0058)
ln(GDP per capita)	-0.2153*** (0.0503)	0.2709*** (0.0398)	0.2540*** (0.0389)
Education expenditure	-0.0247*** (0.0053)	0.0001 (0.0016)	-0.0001 (0.0016)
Health expenditure	0.0014 (0.0089)	-0.0059** (0.0028)	-0.0060** (0.0028)
Labour force participation rate	-0.0080** (0.0031)	0.0089*** (0.0034)	0.0082** (0.0032)
Constant	4.3777*** (0.6204)	-2.3243*** (0.4065)	-2.1337*** (0.4097)
$R^2$	0.19	0.97	0.51
Breusch-Pagan Test	1410.9***		
Likelihood Ratio Test		1018.4***	
Hausman test			16.311*

\*\*\*  $p < 1\%$ , \*\*  $p < 5\%$ , \*  $p < 10\%$

Note. Created by the author.

Table 4 presents the regression estimate for the second model in Equation 2. Comparing with the result in Table 3, it can be observed that there is consistency in the sign of the parameter estimates with Table 4; however, with insignificance of the governance parameter for any of the models. In Table 4, the interaction term between remittances and governance (Remittance\*Governance) provides critical insights into how governance quality moderates the impact of remittance inflows on human capital development. The results indicate a significant shift in the interaction effect across models. Under the Pooled Ordinary Least Squares (POLS) method, the coefficient is negative ( $-0.0457$ ), suggesting that in the absence of robust governance structures, remittances may have a diminishing impact on human capital. This could be attributed to factors such as poor allocation of remittance resources, corruption, or weak institutional frameworks that fail to channel these inflows toward productive uses like education and healthcare. In contrast, the Fixed Effects (F-E) and Random Effects (R-E) models reveal a positive and highly significant interaction effect ( $0.0202$  and  $0.0209$ , respectively, both at the 1% level). These results emphasize that in contexts where governance quality is strong, remittances contribute significantly to human capital accumulation. Effective governance likely ensures that remittance inflows are used productively, enhancing access to quality education and healthcare, which are critical components of human capital.

### **Conclusion and Recommendations**

Based on the empirical analyses of the study, it can be concluded that remittances are a significant driver of human capital development in Sub-Saharan African (SSA) developing countries. Improvements in education levels and life expectancy play critical mediating roles in fostering human capital development, underscoring the importance of investments in these areas. Additionally, the findings highlight that better governance acts as a significant booster of human capital, moderating the impact of remittances by ensuring their productive utilization. However, government expenditure on health and education shows a countercyclical effect on human capital accumulation, largely due to social factors such as corruption, lack of accountability, and misaligned priorities prevalent in SSA countries. Furthermore, a large proportion of the population with low skill levels impedes the human capital formation process, limiting the region's potential for economic and social development. It is thus recommended that governance structures be strengthened to improve accountability, reduce corruption, and ensure transparency in resource allocation; investments in quality education and healthcare be prioritized, focusing on teacher training, curriculum reforms, and healthcare infrastructure; skill development programs, particularly vocational training for youth and women, be implemented to address low skill levels; remittances be leveraged through initiatives such as incentivizing investments in education and healthcare or matching grant programs; and public expenditures on health and education be made more efficient by strengthening monitoring and evaluation mechanisms to align spending with human capital development goals.

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The authors declared that the ethical rules for research and publication followed while preparing the article.

Yazarlar makale hazırlanırken araştırma ve yayın etiğine uyulduğunu beyan etmiştir.

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