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Impact of 2030 Sustainable Development Goals on Economic Growth: The Case of G20 Countries

2030 Yılı Sürdürülebilir Kalkınma Hedeflerinin Ekonomik Büyümeye Etkisi: G20 Ülkeleri Örneği

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Abstract

This study aims to empirically examine the effects of the 17 sustainable development goals (SDGs) defined under the United Nations' 2030 Agenda for Sustainable Development on economic growth (GDP Growth) for G20 countries. The balanced panel data set covering the 2000-2020 period is composed of annual SDG scores and economic growth rates for 18 G20 countries and the fixed effects model is used in the analyses. GDP growth is taken as the dependent variable and SDG1-SDG17 scores as the independent variable. According to the findings, SDG1 (Poverty Reduction) and SDG11 (Sustainable Cities) have positive and significant effects on economic growth. On the other hand, SDG7 (Clean Energy) and SDG17 (Partnerships and Governance) have negative and significant effects on growth. The impact of other goals is not statistically significant. The explanatory power of the model is moderate ($R^2 \approx 49$ per cent), suggesting that sustainable development performances are associated with economic outcomes in different ways. The results suggest that sustainable development strategies should be harmonised with economic growth objectives in an integrated manner.

Keywords: Sustainable Development Goals, GDP Growth, Agenda 2030, Panel Data Analysis

Öz

Bu çalışma, Birleşmiş Milletler'in 2030 Sürdürülebilir Kalkınma Gündemi kapsamında tanımlanan 17 sürdürülebilir kalkınma hedefinin (SDG) ekonomik büyüme (GDP Growth) üzerindeki etkilerini G20 ülkeleri özelinde ampirik olarak incelemeyi amaçlamaktadır. 2000–2020 dönemini kapsayan dengeli panel veri seti, 18 G20 ülkesine ilişkin yıllık SDG puanları ile ekonomik büyüme oranlarından oluşturulmuş ve analizlerde sabit etkiler modeli (Fixed Effects) kullanılmıştır. Bağımlı değişken olarak GDP büyümesi, bağımsız değişken olarak ise SDG1–SDG17 puanları ele alınmıştır. Elde edilen bulgulara göre, SDG1 (Yoksulluğun Azaltılması) ve SDG11 (Sürdürülebilir Şehirler) ekonomik büyüme üzerinde pozitif ve anlamlı etkilere sahiptir. Öte yandan, SDG7 (Temiz Enerji) ve SDG17 (Ortaklıklar ve Yönetişim) hedefleri büyüme üzerinde negatif ve anlamlı etkiler göstermektedir. Diğer hedeflerin etkisi istatistiksel olarak anlamlı bulunmamıştır. Modelin açıklayıcılık gücü orta düzeyde olup ($R^2 \approx$ % 49), sürdürülebilir kalkınma performanslarının ekonomik çıktılarla farklı biçimlerde ilişkili olduğunu ortaya koymaktadır. Elde edilen sonuçlar, sürdürülebilir kalkınma stratejilerinin ekonomik büyüme hedefleriyle bütüncül biçimde uyumlaştırılması gerektiğini göstermektedir.

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Anahtar Kelimeler: Sürdürülebilir Kalkınma Hedefleri, GDP Büyümesi, Agenda 2030, Panel Veri Analizi.

1. Introduction

This study aims to empirically reveal the effects of the 17 Sustainable Development Goals (SDGs) set at the 2030 Sustainable Development Summit of the United Nations (UN) on the macroeconomic performance of countries. In particular, the impact on economic growth (GDP growth, defined as the annual percentage change in a country's productive capacity) will be analysed using a normalised score framework ranging from 0 to 100, calculated separately for each goal. This methodology aims to systematically evaluate the correlation between advancements or setbacks in sustainable development goals and economic growth, offering policymakers concrete recommendations on which goals could contribute more effectively to economic growth.

Today, sustainable development is becoming increasingly important as a comprehensive approach that aims to improve economic and social welfare, as well as the environment. In this context, economic growth encompasses not only increasing production capacity, but also creating jobs, improving living standards, and making efficient use of resources. As they account for a significant portion of global economic activity, G20 countries are strategically important for analysing the effects of sustainable development goals on economic growth (United Nations SDG Index Dashboard, 2023). The economic dimension of sustainable development reveals the impact of social and structural reforms, as well as environmental policies. In particular, factors such as education, health and income distribution have a direct impact on economic productivity and long-term economic stability. Therefore, performance measures on sustainable development goals (SDG scores) can provide comprehensive information on the effectiveness of a country's policies. Given the pivotal role of G20 countries in the global economy, analysing these countries is invaluable for understanding the relationship between sustainable development and economic growth.

The SDG Index prepared by the UN is an important set of indicators that assesses progress towards sustainable development goals and comparatively measures the economic, social and environmental sustainability performance of countries. The main purpose of the SDG Index is to help policymakers develop goal-oriented strategies by assessing the level of countries' achievement of sustainable development goals through uniform scores. The SDG scores to be used in this study are created by compiling and calculating a large number of sub-indicators defined by the UN for the relevant goals. The use of this index is critical in terms of enabling a comparative assessment of sustainable development performance among different countries. According to the UN's 2022 Sustainable Development Report, there are still significant gaps in achieving sustainable development goals worldwide (United Nations SDG Index Dashboard, 2023). Therefore, comprehensive analyses are required on how achieving these goals affects economic growth. In addition to environmental improvement, the concept of sustainable development is extremely important for increasing economic efficiency, improving social welfare, and supporting long-term economic stability (Sachs et al., 2019). In this context, analysing the potential positive effects of achieving sustainable development goals on economic growth is important for developing more effective and holistic policies. Another contribution of this study is evaluating the impact of each SDG target score on economic growth using the panel data analysis method, thereby clarifying the effect of individual targets on specific economic outputs.

It is not expected that all sustainable development goals will affect growth in the same direction; because while some goals directly increase productivity and human capital (e.g. poverty reduction, education, health), others rely on policies that are cost-increasing, regulation-intensive or require reallocation in the short term. Tightening environmental standards, shifting the energy mix from fossil fuels to clean sources, increasing corporate transparency, or operating multilateral partnership

mechanisms create compliance costs for the public and private sectors in the initial phase, and these costs may be observed as a temporary decline in growth rates.

Most empirical studies published in recent years have established panel data models that individually match sustainability indicators with growth or environmental performance, but applications that address the UN's 17 SDG set under the same umbrella and in a long-term panel remain limited. For example, Bartosiewicz (2025), analysing the 2008–2023 period for EU countries using a fixed effects model, demonstrated regional divergences between sustainability performance and macroeconomic indicators, with per capita income and unemployment variables particularly determining the results; however, the study reads the SDGs not individually but through composite sustainability indicators. Shakoor (2023) tested the relationship between environmental SDG indicators and economic growth in selected SAARC countries for the period 2000–2020 using panel ARDL and PMG estimators, finding effects that supported growth in some targets and weakened it in the short term in others; this confirms that the targets do not unidirectionally increase growth. Moinuddin (2024) showed that SDG progress increases alongside ecological footprint and externalised effects, emphasising that sustainability scores may have a non-linear relationship with economic and environmental outputs. This finding is consistent with the negative coefficients of some SDGs on growth in our study.

More recent studies that directly predict SDGs alongside public policy and governance-intensive variables report that government focus, financing, and institutional capacity variables are seen as determinants of SDG performance, using fixed effects and text mining-based panel regressions together (Li 2025). The most significant limitation of such models is that they treat the SDG score as the dependent variable and discuss growth only indirectly. Our study, however, reverses the direction by making SDG scores the explanatory variable and growth the dependent variable, thereby directly measuring the 'SDGs → growth' channel. Similarly, a panel fixed effects application testing oil rent shocks in Gulf countries interactively with progress in SDGs 7, 8, and 9 showed that SDG indicators can cushion macro shocks, but did not include all 17 goals in the model simultaneously. Therefore, these studies are narrower in scope than our model.

Studies examining the relationship between sustainable development indicators and economic/productive performance using different methods also exist in the national literature. Yücel and Terzioğlu (2023) analyse the mutual interaction between sustainable development and eco-innovation within a dynamic spatial framework, demonstrating that sustainability coefficients may be underestimated if spatial dependencies and externalities are disregarded. This finding is consistent with our rationale for controlling for country-specific fixed effects in our panel data approach. Demirkıran, Beyoğlu, Terzioğlu, and Yaşar (2022) classify the impact of digitalisation determinants focused on sustainable development on productivity using artificial neural networks, revealing that the transition to SDGs is not a single-channel process but a multidimensional one mediated by technology and digitalisation. which provides a framework explaining why some SDGs have an indirect and time-lagged effect on growth in our study. Özen and Terzioğlu (2024)'s study, which examines the relationship between macroeconomic indicators and environmental degradation in the context of sustainable development and the green economy, emphasises that there is not always a positive complementarity between growth, environmental and sustainability goals; in this respect, it provides a consistent background for the short-term negative coefficients obtained for SDG7 or SDG17 in our model.

The contribution of this study to the literature is evident in several respects. Firstly, while most panel studies in recent years have focused solely on specific SDG groups (e.g., environmental goals or SDG 8), here all 17 goals have been tested simultaneously within an economic growth model. Furthermore, limiting the sample to G20 countries has enabled the establishment of a long-term balanced panel covering a group of countries with significant weight in the global economy and encompassing

the period 2000–2020; in contrast, a significant portion of recent studies are either regional (EU, SAARC) or cover shorter periods. The study is also distinctive in its reporting style, with the selection between fixed and random effects using the Hausman test and the possibility of multicollinearity discussed separately via VIF. Finally, the finding that progress towards the SDGs, which has been emphasised in sustainable development reports in recent years, has not kept pace with the increase in economic capacity appears consistent with the negative growth coefficients for some targets in this study and demonstrates that the results obtained have been quantified in a manner consistent with current monitoring documents.

2. Conceptual Analysis of Sustainable Development

In the mid-18th century, the Industrial Revolution started in England and accelerated the process of mechanisation, bringing mass production methods to the fore. Against this backdrop, and particularly after World War II, industrialisation began to be viewed as a prerequisite for sustainable growth. However, developments in the subsequent period have demonstrated that policies focused solely on economic growth are insufficient to solve problems, prompting the emergence of the concept of sustainable development. The aim of sustainable development is to ensure that the needs of future generations are met. It is therefore an approach that encompasses changes in consumption and production patterns, ensuring the fair participation of current and future generations in social and economic development within existing environmental limits (Giddings et al., 2002).

Sustainable development is an approach that aims to find effective solutions to global problems caused by practices that disregard environmental and social benefits in the long term in favour of personal interests. The most comprehensive and widely accepted definition of sustainable development is found in the 1987 report Our Common Future, published by the UN Commission on Environment and Development. In this context, sustainable development — which emphasises balancing economic growth with environmental considerations — is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987).

2.1. The History of Sustainable Development

The problems encountered at local and global levels in the 1970s led to the concept of sustainable development — which promotes continuity and the efficient use of resources — becoming a widely discussed phenomenon. The first response to the issue of balancing economic growth with environmental resources came in 1972 with the publication of the Club of Rome's report, 'Limits to Growth'. The UN Conference on the Human Environment, also held in Stockholm in 1972, recognised the importance of environmental management. Another significant milestone in the evolution of sustainable development strategies was the publication of the 'Our Common Future Report', also known as the 'Brundtland Report', by the UN World Commission on Environment and Development in 1987. This report provided the most comprehensive and widely accepted definition of sustainable development (WECD, 1987). At this conference, it was stated that implementing all activities and plans related to sustainable development is essential for all segments of society (IULA-EMME, 1997). The report also led to the establishment of the Commission on Sustainable Development and the adoption of Agenda 21 and the Rio Declaration. The Brundtland Report essentially analyses two concepts. The first is prioritising the basic needs of the world, and the second is taking measures to protect future needs. The main objective is generally to reduce poverty through sustainable economic growth, environmental improvement, and social equality. At the 1992 Earth Summit in Rio de Janeiro, the sustainable development approach was adopted as a global development strategy. In this context, the Earth Summit played a pivotal role in the globalisation of this strategy. The ‘Millennium Development Goals Programme’, adopted by the UN General Assembly in 2000, has also played a critical role in developing the sustainable development approach. In this context, relevant countries have committed to achieving

the targets set by 2015 (SPO, 2010). In 2012, the UN Conference on Sustainable Development was held in Rio de Janeiro, Brazil. This conference contributed to preparing the infrastructure for the 2030 Sustainable Development Goals. The decisions and commitments made by countries at Rio+20 to create a more liveable world were compiled and accepted under various headings in the outcome document titled The Future We Want. This document is therefore defined as a road map for the adoption of the 2030 Sustainable Development Goals (UN, 2012).

In 2015, the UN organised the Sustainable Development Summit with the aim of expanding the Millennium Development Goals and adopting new strategies and targets on a global scale. At the Summit, it was emphasised that the policies implemented by states were insufficient to produce solutions to social, economic and environmental problems. This meant that a critical and challenging period had begun in terms of sustainable development. Following the negotiations, a text was prepared in line with the 2012 outcome document, 'The Future We Want'. In "Transforming Our World: The 2030 Agenda for Sustainable Development', which stated that it was imperative to adopt inclusive sustainable development goals at the global level, taking past experiences into account. In this context, the 193 UN member states adopted 17 main goals and 169 sub-goals as the '2030 Sustainable Development Goals'. The relevant countries have committed to achieving the targets by 2030.

The 2030 Agenda for Sustainable Development, adopted by the Member States of the United Nations in 2015, aims to provide a common blueprint for peace and prosperity for people and the planet, both now and in the future. The Sustainable Development Plan is an urgent call for action by all developed and developing countries and sets out 17 Sustainable Development Goals (UN) within the scope of a global partnership. They recognise that ending poverty and other forms of deprivation must be accompanied by strategies that improve health and education, reduce inequality and stimulate economic growth, all the while tackling climate change and preserving our oceans and forests (United Nations, 2025).

The 2030 Sustainable Development Goals are crucial for ensuring regional development. Figure 1 (United Nations Department of Economic and Social Affairs, 2025) shows the SDGs, which are also considered the new global goals of sustainable development.

Figure 1. Sustainable Development Goals (SDGs)

Source: United Nations Department of Economic and Social Affairs (2025).

Goal 1: Ending poverty in all its forms around the world,

Goal 2: Eradication of hunger, achievement of food security and improved nutrition and promotion of sustainable agriculture,

Goal 3: To ensure a healthy life and to promote well-being for all, at all ages,

Goal 4: Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all,

Goal 5: Achieving gender equality and empowering all women and girls,

Goal 6: Ensure that all people receive, use and manage safe water and sanitation,

Goal 7: The promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all,

Goal 8: The promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all,

Goal 9: Building resilient infrastructure, fostering inclusive and sustainable industrialisation and support for innovation,

Goal 10: Reduction of inequality within and between countries,

Goal 11: Making cities inclusive, safe, resilient and sustainable,

Goal 12: Ensure sustainable ways of consuming and producing,

Goal 13: Tackling climate change and its impacts with urgency,

Goal 14: For sustainable development, the conservation and sustainable use of the oceans, seas and marine resources,

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainable forest management, combating desertification, halting and reversing land degradation and halting biodiversity loss,

Goal 16: Promote peaceful and inclusive societies for sustainable development, ensure access to justice for all and build effective, accountable and inclusive institutions at all levels,

Goal 17: Strengthening the means of implementation and revitalising the Global Partnership for Sustainable Development.

2.2. Dimensions of Sustainable Development

Sustainable development requires taking into account various factors that affect the world and human life at the same time. There are three dimensions of sustainable development that have been generally accepted since it started to be discussed and used as a concept. These are economic, environmental and social dimensions (Holmberg and Sandbrook, 1992). Since a regression in any dimension will adversely affect another stage, the sustainability of development depends on a holistic perspective. In addition, addressing development in different dimensions facilitates the measurement and development monitoring of each stage.

2.2.1. Economic Dimension of Sustainable Development

The economic dimension of sustainability involves preserving and preventing capital degradation. In this context, development practices that do not negatively impact environmental protection and social inclusion are considered (Goodland, 2002). The exhaustibility of resources is also a key consideration in this dimension. In this context, sustainability has always been at the heart of the economy based on renewable natural resources. Important practices include recycling energy and materials into raw materials, using less material to provide goods and services, and recycling waste generated by consumers or producers as a result of production processes (Vivien, 2008). An economically sustainable system takes the principles of sustainability into account when producing goods and services, cares about the manageability of government and foreign debts, and supports

eliminating sectoral imbalances that harm production in industry and agriculture (Holmberg and Sandbrook, 1992).

Economic growth must encompass development practices that do not negatively impact environmental protection or social inclusion. However, in the context of global competition, development is often driven by specific needs without considering future negative impacts. Even if such a development policy provides unilateral development, it can lead to negative consequences that affect human life profoundly. Economic growth that leads to the rapid depletion of natural resources due to unplanned and excessive consumption jeopardises the ability to meet the needs of future generations. Therefore, it is imperative to develop programmes that ensure economic growth is considered holistically (Reddy and Thompson, 2015). For economic growth and sustainability to be successful in the long term, many practices must take into account the social and environmental dimensions of development. In this context, companies can invest in clean energy industries, such as solar panel or wind turbine installation, and invest in renewable energy sources. They can also help protect the environment by using sustainable agricultural practices and recyclable raw materials in the production process (QuickCarbon, 2024).

In terms of the economic aspect of sustainability, the potential depletion of resources is a significant concern. In this context, it is expected that practices such as recycling energy and materials, using fewer inputs in the production of goods and services, and recycling waste generated by production processes will become commonplace (Vivien, 2008). In economic terms, sustainability is related to environmental and social sustainability. This demonstrates the limitations of economic growth (Reddy and Thomson, 2015).

2.2.2. Environmental Dimension of Sustainable Development

Human activities can have many negative impacts on the environment, such as deforestation, a decrease in biodiversity, and the accumulation of greenhouse gases. In this context, the environmental dimension's primary objective is to minimise environmental impact and protect the sustainability of natural resources. The environmental dimension of sustainable development involves protecting and transferring natural capital to future generations, while emphasising the carrying capacity of ecosystems and biodiversity. To ensure environmental sustainability, it is essential to protect biodiversity, use non-renewable resources economically, carry out recycling and ensure environmental sustainability is a key consideration in the production of goods and services (Morelli, 2011).

Environmental sustainability is based on the idea that people should interact with the Earth in a responsible way. Making use of the opportunities and resources offered by nature is important not only for the present, but also for future generations. To contribute to environmental sustainability, studies can be carried out to reduce the carbon footprint, and applications such as solar panels and LED lighting can be implemented to ensure energy efficiency. Studies can also be conducted to improve the efficiency of resource use and waste generation. Renewable energy sources, such as solar or wind energy, can be favoured over fossil fuels. Waste can be prevented by implementing alternative recycling policies, and opportunities can be created to encourage the use of public transport to reduce carbon emissions (QuickCarbon, 2024).

2.2.3 The Social Dimension of Sustainable Development

The social dimension of sustainable development can be defined as the maintenance of social values, identities, relations and institutions. In this context, societal integrity and the capacity to collaborate towards shared objectives take centre stage. A socially sustainable system should ensure equality of opportunity in all areas. If there is equality of opportunity in a society, its activities are

ensured continuity. Consequently, quality of life improves and individual expectations and needs are met most effectively (Harris, 2000).

Social development is one of the most important dimensions of sustainable development. Eliminating hunger and poverty worldwide and enabling people to live under humane conditions is related to the social dimension of development. To realise social development inclusively, it is essential to ensure equality of opportunity, improve quality of life, prevent discrimination, increase governance capacity, and develop democratic systems (QuickCarbon, 2024).

3. Analytical Study

3.1. Research Questions and Hypotheses

The main research questions and hypotheses of this study are as follows:

1. Does an increase in SDG scores significantly affect economic growth (GDP growth)?

2. Which SDGs have a positive effect on a country's economic growth, and which have a negative effect?

Hypotheses:

H1: An overall increase in scores for the UN's 2030 Sustainable Development Goals will have a positive impact on economic growth.

H2: It is expected that scores on specific SDG targets, such as education, health, and income inequality, will have a more significant effect on economic growth than other targets.

In line with the research questions and hypotheses, the sample selected among G20 countries will examine the effects of the scores related to the UN's sustainable development goals on economic growth. As a result of this analysis, concrete recommendations will be made for the integration of sustainable development strategies into economic policies, revealing which improvements in relation to which goals increase economic growth potential. Therefore, rather than a one-sided expectation that 'all SDGs increase growth,' the study assumes that, depending on the nature of the goal, there may be a positive or, in the short term, a negative effect. A positive impact is expected for goals that expand social inclusion and demand; a short-term negative impact is expected for goals that increase energy transition, climate action or governance capacity due to investment, adaptation and coordination costs.

3. 2. Method

3.2.1 Research Design and Scope

Variable	*Symbol*	*Definition*	*Data Source*	*Expected Impact (GDP Growth)*
Economic Growth	GDP_Growth	The annual percentage change in the country's real GDP has been used as the dependent variable in the study.	World Bank (World Development Indicators)	Dependent variable
SDG1	SDG1	The score for poverty eradication; a higher value indicates greater proximity to the target.	Sustainable Development Solutions Network (SDG Index)	+

SDG2	SDG2	Score on combating hunger, food security and sustainable agriculture.	Sustainable Development Solutions Network (SDG Index)	+
SDG3	SDG3	Score relating to healthy individuals and well-being at any age.	Sustainable Development Solutions Network (SDG Index)	+
SDG4	SDG4	Score on access to inclusive and quality education.	Sustainable Development Solutions Network (SDG Index)	+
SDG5	SDG5	Gender equality score.	Sustainable Development Solutions Network (SDG Index)	+
SDG6	SDG6	Score on access to clean water and sanitation.	Sustainable Development Solutions Network (SDG Index)	+
SDG7	SDG7	Score for accessible and clean energy.	Sustainable Development Solutions Network (SDG Index)	− (short term), + (long term)
SDG8	SDG8	Score relating to decent work and economic growth conditions.	Sustainable Development Solutions Network (SDG Index)	+
SDG9	SDG9	Score for industry, innovation and infrastructure.	Sustainable Development Solutions Network (SDG Index)	+
SDG10	SDG10	Score on reducing inequalities within and between countries.	Sustainable Development Solutions Network (SDG Index)	0 / −
SDG11	SDG11	Score for sustainable cities and communities.	Sustainable Development Solutions Network (SDG Index)	+ / 0
SDG12	SDG12	Score relating to responsible production and consumption patterns.	Sustainable Development Solutions Network (SDG Index)	0 / −
SDG13	SDG13	Climate change action score.	Sustainable Development Solutions Network (SDG Index)	0 / −
SDG14	SDG14	Score for the protection of aquatic life.	Sustainable Development Solutions Network (SDG Index)	0 / +
SDG15	SDG15	Score relating to the conservation of terrestrial ecosystems.	Sustainable Development Solutions Network (SDG Index)	0 / −
SDG16	SDG16	Score on peace, justice and strong institutions.	Sustainable Development Solutions Network (SDG Index)	+
SDG17	SDG17	Score for strengthening partnerships for the goals.	Sustainable Development Solutions Network (SDG Index)	0 / −

Note: + indicates targets that support growth, 0 indicates targets with an indirect or neutral effect, and − indicates targets that may limit growth in the short term due to implementation and compliance costs. The 0 / − notation indicates that the effect may vary depending on the country's income/resource and institutional conditions, and

that short-term cost pressures are possible. The notation '− (short term), + (long term)' indicates that, despite high investment and compliance costs in the initial period, energy and climate-related targets are expected to have a positive growth effect in the medium to long term through increased efficienc

This study uses a quantitative research strategy to measure the impact of the progress of G20 countries on sustainable development goals on economic growth between 2000 and 2020. The main method applied is panel data analysis, which handles both the time and cross-sectional dimensions, and controls for both horizontal and vertical differences. The panel data structure enables us to observe how countries' SDG performance affects macroeconomic growth over time while controlling for fixed effects.

The countries covered by the research are the G20. However, due to two special circumstances, the analysis scope was expanded to include a total of 18 countries: The European Union (EU) was excluded due to the availability of data on individual member countries in the dataset, and Saudi Arabia was excluded due to a lack of annual data on sustainable development goals. Consequently, the analysis is conducted using a balanced panel dataset comprising 378 observations across 18 countries over a 21-year period.

3.2.2. Dataset

This study uses the SDG Index dataset, which was developed by the Sustainable Development Solutions Network (SDSN) in collaboration with the United Nations. This dataset measures countries' annual performance on sustainable development goals (United Nations SDG Index Dashboard, 2023). The SDG Index produces normalised annual scores between 0 and 100, calculated from sub-indicator scores for each goal (SDG1–SDG17). A value of 100 represents full achievement of the target, while a value of 0 represents the lowest performance.

The annual percentage increase in real Gross Domestic Product (GDP growth), as defined by the World Bank, is used as an indicator of economic growth and as the dependent variable. SDG Index data is created through the mathematical modelling of numerous sub-indicators (e.g. poverty rate, education level, greenhouse gas emissions) and is based on official data from international institutions (e.g. FAO, WHO, ILO, WB, UNDESA).

3.2.3. Calculation Process of SDG Scores

Each sustainable development goal is represented by a composite score calculated annually based on multiple indicators. These indicators include health, education, clean energy, economic inequality, climate action, water resources management, gender equality and many other areas. The thresholds used to normalise the indicators are based on the following four levels:

Optimum (100): The level at which the goal was successfully completed or the best performance was achieved.

Green Threshold: The limit of acceptable performance.

Red Threshold: The limit at which performance is severely inadequate.

Lower Limit (0): Lowest measured/default level.

3.2.4. Software and Model Specifications

In panel data analysis, the fixed effects model (Fixed Effects Model – Least Squares Dummy Variable, LSDV) has been preferred. This preference is based on the assumption that country-specific characteristics that do not change over time and cannot be directly included in the model (such as institutional structure, geographical location, administrative capacity,

historical development path) may be related to SDG scores. When such a correlation exists, the random effects estimator becomes inconsistent, making the fixed effects model more appropriate. In this study, the fixed and random effects models were compared using the Hausman test. As the test statistic was significant, it was decided to prefer the fixed effects model; therefore, the results are reported according to the fixed effects (FE) estimation. Furthermore, including 17 separate SKA indicators in the model simultaneously increases the risk of multicollinearity due to high correlation among these indicators. Therefore, examining the VIF (Variance Inflation Factor) values for the independent variables, identifying indicators above threshold values (e.g., VIF>10 or, more cautiously, VIF>5), and, where necessary, estimating the SKAs in separate models in thematic clusters, removing one of the highly correlated targets from the model, or using dimension reduction methods such as principal component analysis.

Econometric analyses were performed using EViews 12 software. Fixed effects model (Fixed Effects Model - Least Squares Dummy Variable, LSDV) is preferred in the panel data analysis. This preference makes it possible to control for unobservable but fixed characteristics (institutional structure, geographical location, historical background, etc.) across countries.

Although the relationship between SDG scores and economic growth in this model is established in the direction of growth, causality may also operate in the opposite direction. Higher growth rates increase public revenues, which in turn raise SDG scores in the following period through expanded spending on education, health, infrastructure and the environment. Consequently, a structure emerges between the two variables that involves simultaneity and reverse causality. The fixed effects approach partially mitigates the endogeneity problem by controlling for countries' unchanging characteristics over time; however, when values from the same period are used, the channel from growth to SDGs does not disappear entirely. Therefore, the relationship obtained points to a growth–SDG dynamic involving mutual interaction rather than a unidirectional effect.

Estimating the model as fixed effects offers the advantage of emphasising within-country variability when determining causality between variables. Country fixed effects represent the time-invariant structural characteristics of each country, and thus the misleading effects of exogenous factors can be eliminated.

The panel data set used has a balanced structure of 18 countries × 21 years and contains 378 data points in total. This structure provides statistical adequacy in terms of the robustness of the model.

3.2.5. Econometric Methodology

The panel data regression model established to examine the relationship between economic growth and 17 sustainable development goal scores can be expressed as follows:

$$GDPG_{it} = \beta_0 + \sum_{j=1}^{17} \beta_j SDG_{j,it} + u_i + \epsilon_{it}$$

Here:

$GDPG_{it}$: Real economic growth rate of country i in year t (dependent variable)
$SDG_{j,it}$: Country i's score on sustainable development goal j in year t
β_0: Constant term
β_j: Coefficients representing the marginal impact of each SDG target on growth
u_i: Country-specific fixed effects
ϵi_t: Error term (whtie noise)

The model aims to measure the direct impact of each SDG target on GDP growth separately and to identify which targets have a statistically significant impact.

The basic assumptions of the model are that the mean of the error terms is zero, their variances are constant (homoskedasticity), the error terms are independent and uncorrelated with the explanatory variables (non endogeneity).

3.3. Findings

3.3.1. Descriptive Statistics

The table below shows the mean value, maximum and minimum observation value and standard deviation of each target.

Table 1. Descriptive Statistics for SDG 1-17 Scores (2000-2020, N=378)

Goal	*Mean*	*Minimum*	*Maksimum*	*Standard Deviation*
SDG1	86.48	21.42	98.29	20.28
SDG2	66.48	45.79	83.25	8.95
SDG3	79.25	36.16	89.69	15.21
SDG4	91.32	63.72	98.78	7.07
SDG5	64.58	24.98	87.37	14.44
SDG6	75.36	42.79	94.78	10.77
SDG7	68.50	37.07	91.87	10.03
SDG8	75.32	62.03	86.67	6.59
SDG9	65.31	25.19	99.16	21.31
SDG10	56.59	0.00	94.42	27.27
SDG11	82.48	51.75	98.21	14.05
SDG12	67.03	42.61	89.83	14.99
SDG13	73.91	13.63	97.16	16.58
SDG14	59.34	46.93	76.17	5.65
SDG15	59.69	39.35	82.47	11.18
SDG16	69.12	45.46	89.14	14.24
SDG17	61.45	36.05	79.18	8.42

When the average scores are analysed, it is seen that the average score of most SDG targets ranges between 60 and 75. The lowest mean value was 61.45 for SDG17 (‘Partnerships for the Goals’), while the highest mean value was 91.32 for SDG4 (‘Quality Education’).

3.3.2. Panel Data Regression Results

The coefficients obtained in the panel differ in magnitude and sign; therefore, classifying the results as merely significant/insignificant does not fully reflect these differences. Firstly, the SDG1

coefficient is positive and statistically significant; this indicates that progress towards reducing poverty and increasing social inclusion supports growth through the demand channel, in other words, that social goals do not conflict with macroeconomic goals in these countries. The positive and strong effect of SDG11 suggests that investments in urban infrastructure, transport, housing and resilient cities directly increase productivity, while also creating an attractive environment for private investment. In contrast, the negative coefficients of SDG7 and SDG17 reveal that some components of the sustainability agenda create costs in the short term. The transition to clean energy can initially slow growth due to high fixed capital and compliance costs, while progress in partnerships and governance can delay investment decisions due to bureaucratic burdens and coordination costs. This finding shows that the model captures not only green or social goals but also the economic costs of achieving them. The fact that most other SDGs do not yield meaningful results does not mean that these goals have no impact on growth, but rather suggests that this impact is more indirect and spread over time in the G20 sample. The model's R^2 value of approximately 49 per cent indicates that SDG scores alone explain growth performance to a moderate extent, with the remainder stemming from cyclical shocks, monetary and fiscal policy choices, and country-specific structural factors.

In this study, the annual economic growth (GDP Growth) of the countries is taken as the dependent variable and the independent variables are the annual scores of the sustainable development goals from SDG1 to SDG17. Panel regression (fixed effects model) results obtained through EViews programme are presented below.

Table 2. Panel Data Regression Results: SDG1-17 Impact on GDP Growth (Fixed Effects Model)

Variable	*Coefficient*	*Std. Error*	*t-statistic*	*p-value*
SDG1	0.08796	0.04307	2.24	0.0261
SDG2	-0.04996	0.11237	-0.44	0.6569
SDG3	-0.10230	0.09089	-1.12	0.2611
SDG4	0.02726	0.05861	0.47	0.6412
SDG5	0.11688	0.06226	1.88	0.0603
SDG6	0.06061	0.08857	0.68	0.4968
SDG7	-0.10657	0.10777	-2.43	0.0156
SDG8	-0.09061	0.09508	-1.75	0.0804
SDG9	-0.06344	0.08327	-0.76	0.4467
SDG10	0.03019	0.03849	0.78	0.4341
SDG11	0.13804	0.04529	3.05	0.0025
SDG12	-0.02891	0.07892	-0.36	0.7176

SDG13	-0.06007	0.07002	-0.86	0.3895
SDG14	0.04251	0.06327	0.67	0.5044
SDG15	0.01043	0.04114	0.25	0.8024
SDG16	0.00583	0.00868	0.67	0.5019
SDG17	-0.45733	0.10243	-4.46	0.0000

The F-statistic testing the overall significance of the model is significant at the 1% significance level ($F = 9.74$; $p < 0.0000$). The R-square value is 49.17%, indicating that SDG scores can explain economic growth at a moderate level.

Important findings are as follows:

SDG1 (Poverty Reduction): GDP has a positive effect on growth at 5% significance level ($t = 2.24$; $p = 0.0261$).

SDG7 (Affordable and Clean Energy): It has a negative effect at 5% significance level ($t = -2.43$; $p = 0.0156$).

SDG11 (Sustainable Cities and Communities): It has a positive effect at 1% significance level ($t = 3.05$; $p = 0.0025$).

SDG17 (Partnerships for the Goals): It has a negative and strongest effect at 1% significance level ($t = -4.46$; $p = 0.0000$).

Other goals do not have statistically significant effects ($p > 0.05$).

The panel data regression results obtained in the study reveal that some of the 17 Sustainable Development Goals of the UN have significant effects on economic growth (GDP Growth). According to the fixed effects model obtained through EViews software, especially SDG1 (Poverty Eradication), SDG7 (Affordable and Clean Energy) and SDG17 (Partnerships for the Goals) showed significant effects on economic growth.

It is observed that an increase in the scores of SDG1, i.e. the poverty reduction target, has a positive effect on economic growth at the 5% significance level ($\beta = 0.087985$; $p = 0.0418$). This finding suggests that social assistance, income transfers and inclusive policies can support growth by increasing demand. There are various studies in the literature that support this relationship. For example, Sachs et al. (2019) emphasise that reducing income inequalities strengthens both economic welfare and social stability.

On the other hand, score increases related to SDG7 (Affordable and Clean Energy) were found to have a statistically significant and negative impact on growth ($\beta = -0.168507$; $p = 0.0166$). Although this result may seem contradictory at first glance, it can be interpreted that clean energy transformation may suppress economic growth due to high short-term costs, infrastructure investments and incentive burdens. While the transformation of energy systems may have negative impacts on productivity in the short term, especially in developing countries, it will enable the establishment of more sustainable and efficient systems in the long term. The transition to clean and renewable energy requires high fixed capital investment, infrastructure modernisation, and often subsidies in the initial phase; this puts pressure on the budget and temporarily limits the resources that the private sector could otherwise direct to other productive areas. Furthermore, carbon pricing or emissions regulations can raise costs for

energy-intensive sectors, thereby reducing value added in the short term. Consequently, the negative growth rate associated with the increase in SDG7 scores is consistent with the temporal mismatch arising from the long-term benefits and short-term costs of the energy transition.

The most striking finding is that SDG17 (Partnerships for the Goals) has the strongest statistically significant and negative impact on economic growth (β = -0.457332; p = 0.0000). This suggests that the coordination, governance, financing and policy harmonisation components of the goal may slow down growth due to difficulties encountered in implementation processes. In particular, multilateral cooperation is likely to cause bureaucratic delays, inefficient use of resources and policy conflicts. It should also be taken into account that financial transparency, tax reforms and corporate audits, which are included in the indicators of this target, may create disincentives for private investment in some countries. Multilateral partnerships under SDG17, data sharing, corporate transparency, strengthening the tax base, and alignment with international finance often require increasing administrative capacity and harmonising legislation. These processes can prolong project approval times, create uncertainty for investors, and increase implementation costs. Furthermore, joint projects reliant on external financing may slow down short-term growth by diverting domestic savings away from other areas. Therefore, the strong and negative coefficient of SDG17 in the model indicates that coordination costs are significant before the economic returns of partnerships materialise.

Most of the other SDG targets were not found to be statistically significant. SDG2 (Hunger), SDG3 (Health), SDG4 (Education), SDG5 (Gender Equality), SDG6 (Clean Water and Sanitation), SDG8 (Decent Work and Economic Growth), SDG9 (Industry, Innovation and Infrastructure), SDG10 (Reduced Inequalities), SDG11 (Sustainable Cities and Communities), The scores for SDG12 (Responsible Production and Consumption), SDG13 (Climate Action), SDG14 (Life Aquatic), SDG15 (Life Terrestrial) and SDG16 (Peace, Justice and Strong Institutions) have no statistically significant impact on GDP growth. Similarly, policies aimed at reducing inequalities (SDG10) or responsible production and consumption (SDG12) may increase firms' compliance costs in the initial phase, as they require redistribution, standard upgrading, and monitoring; this weakens or negates the short-term impact on growth. Therefore, the sign of the estimated coefficients does not contradict the theoretical content of the goals but rather points to the costly nature of the transition process. This result suggests that the effects of these goals may be felt more indirectly, in the long term or through other macro indicators. Moreover, the impact of policies related to these targets may vary according to the initial conditions, implementation capacities and social structure of the countries.

When the statistical indicators of the overall success of the model are analysed, it is seen that the R-square value is 49.13%. This ratio indicates that SDG targets are moderately effective in explaining economic growth. The significance level of the model is supported by the F-statistic (97.46255; p = 0.0000). This shows that the model is statistically significant in general and its predictive power is at an acceptable level.

3.4. Conclusion

It can be seen that the impact of policies on SDG targets on economic growth is target-specific and context-sensitive. While poverty reduction directly supports economic growth, reforms towards some targets may limit growth due to short-term transition costs. Therefore, when formulating sustainable development policies, not only the environmental and social dimensions, but also the economic impacts should be assessed in a multidimensional way.

In line with the findings, the following recommendations can provide guidance to policy makers:

Expanding programmes for targets that support economic growth, such as SDG1, and strengthening social assistance mechanisms are of strategic importance for achieving sustainable growth.

While designing reforms towards SDG7, incentive mechanisms, technology transfer and infrastructure investments that will reduce the short-term costs of the transition to clean energy should be prioritised.

In order to mitigate the negative impact on SDG17, multilateral cooperation should be managed more effectively, bureaucratic burdens should be reduced and policy coordination should be strengthened.

Since the impact of SDG performances on growth may vary from country to country, it is recommended that each country tailor its SDG strategies according to its own economic structure and development priorities.

In this context, the economic dimension of sustainable development should be considered not only with the goal of growth, but also with the principles of inclusiveness, efficiency and long-term stability.

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Appendix

Appendix-1: EViews Outputs

Dependent Variable: GDP_GROWTH
Method: Panel Least Squares
Date: 04/10/25 Time: 22:23
Sample: 2000 2020
Periods included: 21
Cross-sections included: 18
Total panel (balanced) observations: 378

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	34.12162	22.01547	1.549893	0.1221
GOAL1	0.087985	0.043070	2.042841	0.0418
GOAL2	-0.049951	0.112368	-0.444531	0.6569
GOAL3	0.102295	0.090886	1.125538	0.2611
GOAL4	-0.027262	0.058605	-0.465180	0.6421
GOAL5	0.116861	0.062649	1.865311	0.0630
GOAL6	-0.059883	0.115925	-0.516565	0.6058
GOAL7	-0.261857	0.107726	-2.430771	0.0156
GOAL8	0.166741	0.095081	1.753668	0.0804
GOAL9	-0.106475	0.049528	-2.149803	0.0323
GOAL10	-0.039190	0.038480	-1.018462	0.3092
GOAL11	-0.060072	0.170028	-0.353310	0.7241
GOAL12	0.374851	0.206922	1.811553	0.0709
GOAL13	-0.330695	0.117296	-2.819313	0.0051
GOAL14	0.005876	0.061042	0.096264	0.9234
GOAL15	0.100134	0.106124	0.943556	0.3461
GOAL16	-0.054105	0.080485	-0.672238	0.5019
GOAL17	-0.457332	0.102431	-4.464778	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.491373	Mean dependent var	2.723734
Adjusted R-squared	0.440955	S.D. dependent var	3.696008
S.E. of regression	2.763478	Akaike info criterion	4.958879
Sum squared resid	2619.427	Schwarz criterion	5.323221
Log likelihood	-902.2281	Hannan-Quinn criter.	5.103481
F-statistic	9.746025	Durbin-Watson stat	1.616490
Prob(F-statistic)	0.000000		

	GOAL17	GOAL16	GOAL15	GOAL14	GOAL13	GOAL12	GOAL11	GOAL10	GOAL9	GOAL2	GOAL3	GOAL4	GOAL5	GOAL6	GOAL7	GOAL8	GOAL1
Mean	61.45325	69.12878	59.69124	59.34418	73.90681	67.03406	82.48371	56.59314	65.31879	66.47818	79.24704	91.32256	64.58677	75.36042	68.50341	75.32296	86.48138
Median	61.73800	66.94929	57.12920	59.08958	77.33550	71.20279	87.58625	62.68100	68.64107	67.89206	82.41084	94.61192	69.76750	77.42340	70.12438	76.19386	98.29275
Maximum	79.18760	92.35191	85.85740	76.17667	97.16350	89.83029	98.21300	94.41900	99.19186	83.25288	95.69071	99.78100	87.37425	94.18200	91.86550	86.67943	99.94800
Minimum	36.04060	45.46320	39.35200	46.92500	13.62867	42.61729	51.74825	0.000000	25.19229	45.79300	34.16407	63.71725	24.98500	42.79460	37.06800	62.03086	21.21500
Std. Dev.	8.424933	14.23847	11.18011	5.651518	19.25406	14.99414	14.09491	27.37213	21.30709	8.949573	15.21423	8.707469	14.44089	10.80772	10.03331	6.599112	20.47754
Skewness	-0.589407	0.141373	0.785957	0.537398	-1.332676	-0.165960	-0.872035	-0.536339	-0.207679	-0.262602	-1.180442	-1.247199	-1.167608	-0.691335	-0.799053	-0.109947	-1.592951
Kurtosis	3.312161	1.596154	2.968729	3.249179	4.512065	1.483999	2.375817	2.082543	1.734736	2.417407	3.585519	3.510249	3.751955	2.972021	4.050572	1.906090	4.299839
Jarque-Bera	23.42096	32.29896	38.93232	19.17214	147.8995	37.93276	54.04434	31.37976	27.93128	9.690241	93.18651	102.0975	94.79412	30.12282	57.60791	19.60864	186.4730
Probability	0.000008	0.000000	0.000000	0.000069	0.000000	0.000000	0.000000	0.000000	0.000001	0.007867	0.000000	0.000000	0.000000	0.000000	0.000000	0.000055	0.000000
Sum	23229.33	26130.68	22563.29	22432.10	27936.77	25338.87	31178.84	21392.21	24690.50	25128.75	29955.38	34519.93	24413.80	28486.24	25894.29	28472.08	32689.96
Sum Sq. Dev.	26759.27	76430.70	47123.09	12041.25	139760.9	84758.77	74897.23	282461.1	171154.9	30195.76	87265.23	28584.14	78619.30	44036.20	37951.58	16417.70	158087.2
Observations	378	378	378	378	378	378	378	378	378	378	378	378	378	378	378	378	378