

Article

Impact of Sustainable Development Goals on Economic Growth in Saudi Arabia: Role of Education and Training

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Abstract: Sustainable development goals (SDGs) are intended to be attained as a balanced whole. However, significant interactions (the synergies and trade-offs) between the SDGs have caused the need, especially in developing economies, to identify and pursue them in line with their particular developmental needs. The research intends to empirically investigate the relationship between selected UN SDGs and GDP growth rate as a proxy for economic well-being in Saudi Arabia. We also investigate the role of education and training in achieving SDGs in accordance with the Saudi Vision 2030, which places emphasis on the knowledge economy. This research employs multiple regression analysis to explore the relationship between the SDG variables and the GDP. The results show that education and training, gender equity/women's empowerment, greenhouse gas emissions, and decent employment are positively and significantly related to the GDP growth, whereas poverty, hunger, and health appear to be negatively related. The research indicates that education and training can promote economic, socioeconomic, and health goals without compromising environmental goals. Consequently, the Saudi government should invest more in education and training to maximize synergies and minimize tradeoffs between the SDGs. This will help to promote sustainable employment generation, build human capital, improve socioeconomic empowerment through technology, and boost economic growth.

Keywords: COVID-19; education and training; GDP growth rate; regression analysis; Saudi Arabia; Saudi Vision 2030; Sustainable development goals (SDGs)



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1. Introduction

The United Nations (UN) endorsed the sustainable development goals (SDGs) in 2015 as part of its agenda for sustainable development to transform the world for the better. Each of the 17 SDGs includes multiple targets and indicators. Targets stipulate the goals, while indicators are the metrics used to pursue whether these targets are met [1,2]. The SDGs aim to attain sustainable development in economic, social, and environmental pillars in a steady and homogenized manner, with goals to be achieved by 2030 [3].

The SDGs require all nations to take action to improve the lives of all people, and nations are aware of this development agenda. In recent years, humanity has made significant advances that dramatically enhanced living standards. In addition to the developed nations, the developing and emerging countries have also made progress, as indicated by their high gross domestic product (GDP) growth rates [4]. However, while high GDP growth levels positively impact some SDGs due to synergies, there are trade-offs between the developmental goals [5] as action toward attaining one SDG may limit the achievement of the other.

Saudi Arabia, the context of this study, places increased emphasis on economic sustainability in line with its Vision 2030 to achieve a knowledge-based economy, among other objectives [6,7]. However, like most developing economies, Saudi Arabia's major problem is its ability to meet the set developmental targets in the face of the current financial and economic crisis, which has further complicated the situation [8,9]. This development has severely affected the accomplishment of many of the relevant SDGs and had direct negative effects on economic growth, employment, poverty, and several other macroeconomic indicators. What strategy, recognizing the synergies and trade-offs among the SDGs, should Saudi Arabia pursue to address its specific and critical challenges to achieve GDP growth as an emerging economy? This study aims to identify and quantify the impact of such SDGs on the GDP growth rate of Saudi Arabia. The study also seeks to determine the strategy for Saudi Arabia to maximize synergies and minimize trade-offs between the SDGs.

The choice of SDGs and their respective indicators in this paper were selected based on the Saudi Arabia's overall growth trajectory and development agenda. The United Nations collaborates with the Saudi Arabian government and other national players to achieve the SDGs and address the country's development challenges and opportunities [7,10]. Vision 2030 of Saudi Arabia aims to develop a knowledge-based economy to achieve economic growth and social welfare [11]. In accordance with Vision 2030, the nation's objective is to transform its economy into a knowledge-based economy by 2030 [12]. Consequently, it is necessary to identify and quantify the impact of SDGs that can contribute to the achievement of Saudi Vision 2030 objectives based on the policy objectives. It is also essential to determine the strategy Saudi Arabia should adopt to build a knowledge-based economy.

Successful implementation of the SDGs is dependent on setting suitable targets and selecting relevant indicators, while goals determine what is suitable in a specific area of sustainable development. Saudi Arabia has identified human capital development as one of the major channels to achieve economic diversification in the country [9,13,14]. In this knowledge society model, it is generally agreed that knowledge creation and innovation are the most important factors in driving economic and social progress. However, identifying and pursuing a strategy that maximizes synergies and minimizes trade-offs while promoting GDP growth is a challenge for most UN member countries [15], especially developing economies such as Saudi Arabia. Most developing countries are faced with multifaceted economic, social, and environmental problems simultaneously that challenge the successful implementation of UN SDGs.

Previous studies have identified interactions among SDGs resulting in synergies and trade-offs [5,16–18]. These studies agree that pursuing certain goals causes ripple effects among others, which has been identified as a significant drawback in implementing SDGs. Therefore, the SDGs should be pursued as a balanced whole to increase the efficacy of sustainable development [19,20]. There is a need for each country to identify and place more emphasis on sustainability indicators that strongly impact their GDP in line with their specific contextual realities and unique characteristics [21–25].

As nations struggle to synchronize the achievement of these development goals, the challenge is to identify a strategy that can maximize synergies and minimize trade-offs to achieve holistic and sustainable development. In line with its Vision 2030, Saudi Arabia has identified human capital development, which is related to the education and training, as a primary strategy to develop a knowledge economy, ensuring economic growth and promoting social well-being [26].

Previous studies [27–30] have documented the positive role of education and training, not only in a stable economy, but also in a depressed or recovering one (e.g., during COVID-19). Economic growth and development cannot occur until the foundations of society are strengthened, and one of the most important ways to do so is through education and training [31–33]. Previous research has examined the relationship between government spending on the education and economic growth and found a positive impact [34–38]. Ac-

Accordingly, this study considers the role of education and training as significant in achieving SDGs and economic growth.

This study builds on prior research [4,18,20] but differs in its emphasis and context. The current study examines environmental, social, and economic pillars of SDGs but focuses primarily on the social dimensions and sustainability indicators and their impact on the economic (GDP) growth. For instance, if education and training are positively and significantly associated with GDP growth rate, then perhaps policies that improve quality of education and other life-long learning opportunities should be advocated for promoting sustainable employment generation, economic growth, and technology-enabled social empowerment.

The primary objective of this study is to empirically investigate the relationship between the UN SDGs and GDP growth as a proxy for the economic well-being of Saudi Arabia from 1990 to 2020. We selected SDGs and their respective indicators, considering Saudi Arabia's emphasis on a knowledge economy under its Vision 2030. We specifically seek to evaluate the impact of selected indicators on the GDP growth rate, such as education and training, gender equity/female empowerment, decent employment, industrialization, poverty, hunger, and health. We also included gas emissions as an environmental indicator due to the context of the study, as Saudi Arabia is a major oil exploration, production, and refining nation [39,40]. This study also examines the role of education and training in influencing the attainment of the SDGs in Saudi Arabia. Accordingly, this study aims to answer the following research questions:

RQ1: What is the impact of SDGs on the economic growth in Saudi Arabia?

RQ2: What is the role of education and training in influencing the SDGs attainment in Saudi Arabia?

The paper adopted multiple regression analysis to quantify the impact of each of the predictive variables on the GDP growth rate. The study reveals that education and training significantly impact the GDP growth rate in Saudi Arabia. This is followed by gender equity/female empowerment, gas emissions, and decent employment rate, respectively. In addition, the study reveals that education and training can play a significant role in promoting gender equality and female empowerment, raising awareness to reduce the environmental impact of greenhouse gas emissions, and creating employment opportunities. Education and training can promote social equality, employment opportunities, and economic growth without jeopardizing the environmental goals. Consequently, education and training play a crucial role in maximizing synergies and minimizing trade-offs among the SDGs.

The rest of this paper is presented in the following manner. Section 2 reviews the relevant literature related to the SDGs, education and training, and the GDP growth rate. Section 3 describes the research methods in addition to data collection, measurement, and the empirical model of the study. Section 4 presents the empirical results and discussion of the study. Section 5 gives the summary and conclusion of the study. Section 6 presents the limitations of our study and provides directions for further research. Finally, Section 7 provides the recommendations.

2. Literature Review

2.1. SDGs and Economic Growth

The SDGs is a significant policy document that identifies shared goals for tackling global challenges such as economic, social, and environmental issues. SDGs synergy is the key determinant of policy consistency for sustainable development. The SDGs are undividable and do not imply that one goal is more important than the others [3,20]. Therefore, progress toward one goal should not hinder efforts to advance other goals [20]. In reality, it is both a huge challenge and a necessary requirement to be able to create consistency between and within the extremely broad SDGs policy areas [41–43]. Despite the perceived objectives of the SDGs, their implementation and accomplishments have not been consistent across countries due to the unique requirements of each nation [44]. Strategies for

achieving the SDGs that are deemed feasible in developed nations may not be optimal in developing or least developed nations [45]. Each nation has its distinctive characteristics and particular needs; therefore, for SDGs to be sustainable, these special characteristics should be acknowledged [15]. Taking into consideration the unique characteristic and contextual realities in Saudi Arabia with respect to its Saudi Vision 2030, this study investigates the impact of SDGs and their respective indicators on the nation's GDP growth rate.

Previous empirical research findings have not been conclusive on the GDP and SDGs nexus, not only in developed countries, but also in developing economies [4,18,43]. These contradictory empirical findings may be attributable to the examined country or territorial practices, the size of time-series data, and the empirical models utilized [46,47]. Nonetheless, the UN SDGs are an important policy accomplishment in measuring environmental, social, and economic growth and directing future developments in the identification of shared goals for tackling global challenges [3,48].

Tampakoudis [4] examined the country-level relationships between the GDP growth and SDGs in the Eurozone. The study's findings revealed significant coefficient deviations that depicted each nation's unique strengths and weaknesses based on their distinct socio-economic frameworks. Their conclusion indicated that human needs necessitated a new concept capable of combining economic development and environmental concerns. For instance, several empirical studies reported that the GDP growth rate had a positive relationship with the industrialization (SDG 9) [49–54] (except a few studies such as Saba and Ngepah [55], who found a negative relationship) and decent employment (SDG 8) [56–58], but also resulted in increase in greenhouse gas emissions, which was detrimental to the environment (SDG 13) [4,18]. Studies also indicate that economic growth has a negative relationship with poverty (SDG 1) [59–63] and hunger (SDG 2) [64–66], but the literature is divided regarding the effect of the GDP on health (SDG 3). Some authors found a positive relationship between economic growth and health [67–71], while others found a negative relationship [72–74]. Yang's [33] study in 21 developing countries revealed that the health and economic development had a varying relationship depending on the degree of human capital development. At low, medium, and high human capital development, there were significant negative, insignificant positive, and significant positive relationships between the health and the economic development, respectively [33].

Studies generally suggest that the pursuit of economic SDGs (e.g., industrialization (SDG 9, decent employment (SDG 8)) may compromise the environment (e.g., climate change (SDG 13)) and social welfare SDGs (e.g., health (SDG 3)). During the peak of COVID-19, the SDGs progress reversed, particularly in developing countries (such as Saudi Arabia), as economic [75–78], socioeconomic [79–82], and health [83–85] goals deteriorated while environmental [86–88] goals improved. However, sustainable development requires that environmental protection, economic development, and social welfare should coexist [4]. Coscieme et al. [43] investigated the relationship between the GDP and the SDGs in European Union (EU) countries. They demonstrated that the risk of not achieving the SDGs' overall objective in line with the UN agenda was increased by the pursuit of unconditional GDP growth. They pointed out that in the European Union (EU), GDP growth is uncorrelated with indicators of environmental sustainability and well-being (such as employment rates) and was inversely correlated with the indicators of economic performance (such as GDP). Therefore, they suggested carefully selecting and implementing policies to ensure progress toward one goal without impeding headway toward others, thereby ensuring balanced synergies and trade-offs to achieve sustainable development. Ramos and Laurenti [20] examined the synergies and trade-offs among the SDGs in Spain to report that about four-fifths of SDGs had either positive or negative connections. The research findings indicate that a nation should work on SDGs as a whole as no single SDG can make a country achieve SDG agenda. Adrangi and Kerr [18] conducted a study in developing countries of Brazil, Russia, India, China and South Africa (BRICS). The study demonstrated that focusing on GDP-based growth reduced gender equality (SDG 5) and increased gas emissions (SDG 13) but reduced mortality rate (SDG 3). The results of the study indicated

that focusing on the GDP growth would not result in the achievement of the SDGs as it might lead to unsustainable prosperity.

According to Bush et al. [89], the risks of exceeding available resources, physical and technical limits, and economic growth in pursuit of GDP growth outweigh the benefits. This is because it typically leaves significant unresolved issues, such as persistent poverty and pollution. According to Fioramonti et al. [90], using GDP growth as a single measure fails to inform the inclusiveness and sustainability of the economy. Indicators that provide a more comprehensive accounting of economic growth's effects, both locally and globally, are needed to replace GDP growth measures to increase coherency with the overall agenda of the SDGs [90].

These contradictory findings, among others, lend credence to the commonly held belief that uniformly adopting the UN development agenda across countries may not produce similar results in all member countries. Each country's specific economic, social, environmental, and political needs must be considered before deciding which SDGs and their corresponding indicators to pursue [4,18]. Even though the SDGs aren't legally binding, governments can still take responsibility for enforcing them by minimizing tradeoffs and maximizing synergies among them [91,92].

Empirical and meta-analytic studies present a wide range of alternative sustainable development indicators. According to Tampakoudis et al. [4], using a defined conceptual framework of sustainability and determining the optimum indicators are necessary. Given our focus on Saudi Arabia, we adhere to the guidance and policy trust of the Saudi Vision 2030-based country's development agenda. According to Vision 2030, Saudi Arabia has made efforts to eradicate poverty (SDG 1: no poverty) by launching welfare programs to protect poor Saudi families from the direct and indirect effects of various economic reforms [93]. Saudi Arabia has devoted a larger share of its GDP to agriculture to promote economic growth and diversify its agricultural base to achieve food security (SDG 2: no hunger) [94]. Saudi Arabia has launched numerous programs to ensure the health and well-being of its citizens and residents (SDG 3: good health and welfare), including financing mother and childcare programs, vaccinations, children mortality reduction, and increasing life span [95,96]. Saudi Arabia devotes the largest portion of its budget to workforce education and training (SDG 4: educational quality) [97]. Saudi Arabia has made conscientious efforts to encourage women to work and reduce gender disparity (SDG 5: gender equality), such as *wusool* and *qurra* for working women. Saudi Arabia has launched a training program known as *darooob* to improve women's employability and facilitate their entry into the workforce [93]. In accordance with the SDG 8 (decent employment and economic growth), Saudi Arabia is working to create the conditions necessary for people to have decent jobs [93]. In accordance with the SDG 9 (industrialization and innovation), Saudi Arabia has launched multiple programs aimed at the maintenance and operation of major infrastructure projects in partnership with the private sector [98,99]. Saudi Arabia has developed a national environment strategy to achieve the SDG 9 (combat climate change). Under this strategy, Saudi Arabia encourages industries to reduce pollution and enhance green cover [100].

The choice of the SDGs and their respective indicators in the context of Saudi Arabia is based on the country's developmental agenda and policy trust. Saudi Arabia's vision for 2030 is to develop a knowledge-based economy and accelerate economic growth [11,101]. By 2030, Saudi Arabia aims to transform its economy into a knowledge-based economy [12]. Saudi Arabia has, therefore, identified human capital development as one of the major channels to achieve this purpose [9,14]. It is widely accepted that in this knowledge society model, knowledge creation and innovation are the driving forces behind economic and social progress [102,103]. Consequently, the policies that enable quality education and other life-long learning opportunities should be adopted to promote sustainable employment generation, economic growth, and technology-enabled social empowerment. Therefore, we investigate the role of education and training in achieving the SDGs and economic growth.

2.2. The Role of Education and Training in Achieving SDGs and Economic Growth

Previous studies [27–30] have argued that education and training played a vital role in the economic development process of many nations in building the needed human capital. Nations allocate a substantial portion of their annual budgets to educating their labor force due to the importance of education and training [104–107]. The study of Asia-Pacific countries by Maitra and Mukhopadhyay [34] revealed that public education expenditure positively influenced the GDP of nine of the twelve countries examined. Riihelaninen's [35] study on European Union revealed a statistically significant positive association between government education spending and economic growth during the economic crisis. Mercan and Sezer's [36] study showed that government education spending positively impacted economic growth in Turkey. Le and Tran's [37] study showed that government education expenditure and GDP positively impacted each other in Vietnam. Gheraia et al. [38] study revealed that a 1% increase in government education spending led to 0.89% increase in GDP growth in Saudi Arabia.

According to Bleaney and Nishiyama [108], a nation's economic progress is strongly connected to the labor force's productivity, entrepreneurial activity, job possibilities, and degree of education and training, among other economic and non-economic factors (such as capital buildup, governance, technical knowledge, etc.). Chakraborty and Maity [30] asserted that education and training was a crucial element of human capital development, and without substantial investment in human capital, no nation can achieve sustainable economic development. Therefore, promoting education and expanding employment options can improve economic growth, particularly during and after calamities, such as health impairment due to COVID-19 pandemic.

The UN SDGs placed a premium on educational quality as the major development pillar [3]. Individuals' self-perspectives and perceptions of those around them are broadened via education. Education and training enhance people's living standards and have various benefits for both individuals and society [109], which is in line with the SDG 1: no poverty. Extant research [56,110,111] related to economic growth shows that education and training form the basis for development, laying the structure for much of a nation's financial and social well-being. Education is critical for enhancing economic efficiency and social welfare. Education assists the poor people to escape poverty and hunger by improving their labor's worth and efficiency (SDG 1: no poverty and SDG 2: no hunger) [112].

Education and training are critical components in confirming economic and social advancement and redistributing income [110]. In the least-developed and developing economies, education is perceived as the only method by people to enhance people's economic and social welfare [113]. Education, especially female education, positively promotes female participation in the workforce and bridges gender disparity (SDG 5: gender equality) [111]. It also increases an individual's productivity and ingenuity and supports free enterprise and technical developments (SDG 9: industrialization and innovation) [114]. Education boosts the efficiency and logical suppleness of the workforce [115,116]. It assists a nation in maintaining its competitiveness in rapidly changing global markets and manufacturing practices. Human capital has been widely recognized as fundamental to sustained economic growth and development. Education and training promotes economic development by eliminating social inequality through social and physical capital developments (SDG 10: reduced inequalities) [117].

More precisely, the influence of education and training, and employment prospects on economic development can be quantified in various ways. At the outset, there is a correlation between the education and the productivity. Educational facilities within a country are a significant prognosticator of the structure and growth of its exports, outputs, and employment opportunities (SDG 8: decent jobs and economic growth) [56–58]. They are a vital element of a system's capability to use overseas technology successfully. For instance, evidence suggests that education improves the output of farmers who employ contemporary agricultural techniques [118]. Liu and Bi [119] asserted that the better educated the labor force, the greater total capital productivity. This is because educated employees

are more inclined to innovate, hence raising everybody's productivity. Second, the relationship between education and income shows that improved education results in more income equality, which supports better growth rates (SDG 10: reduced inequalities) [120]. Low-income people are better positioned to pursue economic possibilities as education becomes more inclusive. Education may indirectly affect income growth per capita by checking the population increase [121]. Third, there is a correlation between education and family. Men and women with a superior education level are likely to invest in their family's health and well-being. Education could be the most prominent factor influencing an individual's health and life expectancy. Education benefits the poor by increasing their wages and food spending and motivating them to choose better, healthier food choices (SDG 3: good health and welfare) [122].

Education can play a vital role in raising social awareness of protecting and conserving watersheds and encouraging integrated water resource management. Education can promote a positive behavior change in people and encourage them to adopt sanitation and hygiene practices to safeguard their health (SDG 6: safe drinking water and sanitation) [123]. Education plays a vital role in promoting awareness of inclusive and safe human settlements and sustainable development (SDG 11: sustainable development) [124,125]. Education can play a prominent role in conserving the environment. Education makes people aware of the adverse effect of human activities on climate and discourages them (SDG 13: combat climate change) [126]. Education plays a crucial role in creating awareness about the ecosystem, combating deforestation, and halting the loss of biodiversity (SDG 15: forestation and biodiversity) [127,128].

The education and training variable is reported to have synergies with other SDGs [57,58,109,111,112,114,117,120,122–129]. A well-coordinated educational system nurtures economic growth and productivity while also increasing the income level of the people [130]. It influences family at the micro-level and an entire nation at the macro-level [108]. Education and training are critical components of reviving an economy stalled due to sociopolitical issues such as COVID-19 [131,132]. A functional education and training system can enhance the socio-economic empowerment process and ensure SDG achievement [133,134]. Given this reality and the critical role education and training plays in human capital development [106], Saudi Arabia, as an emerging economy, devotes significant resources to building a robust education and training system [97] in line with its Vision 2030 for achieving knowledge centered and diversified economy. We, therefore, empirically investigate the relationship among the selected UN SDGs and the GDP growth rate as a proxy for economic development in Saudi Arabia.

2.3. Hypotheses Development

Extant literature suggests that the education and training have a positive impact on the GDP growth [34–38]. The literature supports the assertion that gender equity/female empowerment contributes to the economic growth [111,113]. GDP growth has a positive relationship with industrialization [49–54] and decent employment opportunities [56–58], but also leads to higher greenhouse gas emissions and environmental pollution [4,18]. GDP growth has a negative relationship with poverty [59–63] and hunger [64–66]. Based on Saudi Arabia's relatively low human capital development ranking of 73 out of 157 countries [135], Yang's [33] study suggests a negative relationship between health and GDP in Saudi Arabia. Based on our review of the relevant literature, we formulate the following hypotheses for this study:

H1: *There is a positive relationship between the education and training and the GDP growth rate in Saudi Arabia.*

H2: *There is a positive relationship between the gender equity/female empowerment and the GDP growth rate in Saudi Arabia.*

H3: *There is a positive relationship between the gas emissions and the GDP growth rate in Saudi Arabia.*

H4: *There is a positive relationship between the decent employment and the GDP growth rate in Saudi Arabia.*

H5: *There is a positive relationship between the industrialization and the GDP growth rate in Saudi Arabia.*

H6: *There is a negative relationship between the poverty and the GDP growth rate in Saudi Arabia.*

H7: *There is a negative relationship between the hunger and the GDP growth rate in Saudi Arabia.*

H8: *There is a negative relationship between the health and the GDP growth rate in Saudi Arabia.*

3. Methodology

In this section, we outline and explain the data sources and the method adopted in our analysis. Data from 1990 to 2020 were collected from multiple reputed sources to maximize the size of the data and, consequently, the power of the tests. In line with previous studies [18,20], multiple regression was employed to explore the association between GDP and SDGs variables.

3.1. Data and Measurement

Our study aims to examine the relationship between SDGs and Saudi Arabia's economic growth represented by the GDP. Based on Saudi Arabia's Vision 2030, a dependable and representative set of sustainable development indicators were selected and their impact on the country's economic growth was evaluated. The study focused on selected SDGs and their respective indicators to evaluate their impact on Saudi Arabia's GDP growth. We also incorporated gas emissions as an environmental indicator, given Saudi Arabia's status as a major player in the oil industry (in all its forms of exploration, production, and refining) [39,40]. The main dependent variable is the GDP growth rate for Saudi Arabia, taken from the World Bank data [136]. Though the use of GDP has its own limitations, it has historically been used as a measure of a nation's economic growth [18]. Therefore, we used GDP as a proxy for economic growth in this study.

The independent variables consist of quantifiable and accessible time series data related to 8 selected SDGs targets for Saudi Arabia. As earlier stated, the choice of these targets and their respective indicators is based on their significance to Saudi Arabia's Vision 2030—pursuit of a knowledge economy. Data from 1990 to 2020 were sourced from the United Nations Conference on Trade and Development [137], UNESCO Institute for Statistics [138], Saudi Arabia General Authority for Statistics [139], Lozano et al. [140], International Labor Organization [141], Food and Agriculture Organization [142], UN Sustainable Development Report [143], World Health Organization [144], World Bank [10,136,145,146], and United Nations [147]. Previous studies evaluating the SDGs used these data and deemed them persuasive and satisfactory [45,148–150]. Therefore, we utilized the aforementioned sources to collect Saudi Arabia specific SDGs related data. Table 1 shows the independent variables, their description, source, measurement, and relevant SDG.

3.2. Empirical Model

We set out to assess the following empirical model in Equation (1) to determine which sustainable development goals variables significantly affect the GDP growth rate in Saudi Arabia.

$$GDP_t = \beta_0 + \beta_1 EDT_t + \beta_2 GEFE_t + \beta_3 GASE_t + \beta_4 DEMP_t + \beta_5 IND_t + \beta_6 POV_t + \beta_7 HGR_t + \beta_8 HTH_t + \varepsilon_t \quad (1)$$

The variables are defined as follows:

GDP_t —GDP growth rate for Saudi Arabia in year t

EDT_t —Education and Training attained as a percentage of the population of Saudi Arabia in year t

$GEFE_t$ —Gender Equity/Female empowerment index for Saudi Arabia in year t

GASE_t—Carbon dioxide emissions as a percentage of GDP for Saudi Arabia in year t
 DEMP_t—Decent employment as a percentage of total employment for Saudi Arabia in year t
 IND_t—Industrialization as a percentage of GDP for Saudi Arabia in year t
 POV_t—The poverty rate for Saudi Arabia in year t
 HGR_t—Hunger rate as a percentage of the population of Saudi Arabia in year t
 HTH_t—Universal health coverage index for Saudi Arabia in year t
 ε_t—Error term.

Table 1. Variables Description and Measurement.

| Explanatory Variable | Variable Description | Source | Measurement | Relevant SDG |
|---|---|--|--|--------------|
| Education and Training (EDT) | Population over 25 with a bachelor's degree or its equivalent | UNESCO Institute for Statistics [138], United Nations [147], and Saudi Arabia General Authority for Statistics [139] | Percentage of adults aged 25 and older with a Bachelor's degree or higher by the total adults of the identical age group | 4 |
| Gender Equity/Female Empowerment (GEFE) | Gender parity index (GPI) | UNESCO Institute for Statistics [138], Saudi Arabia General Authority for Statistics [139], and United Nations [147] | GPI is the proportion of girls to boys enrolled at the tertiary level in government and private schools | 5 |
| Gas Emission (GASE) | Carbon dioxide (CO ₂) emissions | World Bank [146], United Nations [147], and Climate Watch [151] | CO ₂ emissions as a percentage of GDP | 13 |
| Decent employment (DEMP) | Decent employment for all males and females | UNESCO Institute for Statistics [138], Saudi Arabia General Authority for Statistics [139], International Labor Organization (ILO) [141], World Bank [146], United Nations [147] and World Development Indicators [10] | Decent employment as a percentage of total employment. It is determined as per ILO guidelines by subtracting vulnerable (own-account and contributing family), part-time, temporary, and child employment from non-agricultural wage and salaried employment covered by work injuries and social security benefits [152–154] | 8 |
| Industrialization (IND) | Industry capabilities | UNESCO Institute for Statistics [138], World Bank [146], World Development Indicators [10] | Value added from industrialization (including construction) as a percentage of GDP | 9 |
| Poverty (POV) | Poor population | World Development Indicators [10], United Nations [147], and Saudi Arabia General Authority for Statistics [139] | Percentage of households receiving poverty benefits. | 1 |
| Hunger (HGR) | Prevalence of malnutrition | Food and Agriculture Organization [142], UN Sustainable Development Report [143], and United Nations [147] | Percentage of the population below the minimum dietary energy intake. | 2 |
| Health (HTH) | Good health for everyone at every age | World Development Indicators [10], World Health Organization [144], United Nations [147], Saudi Arabia General Authority for Statistics [139], and Lozano et al. [140] | Universal health coverage index (includes safety net for medical treatment, access to quality health services (such as reproductive, pediatric care, maternal, diseases treatment etc.), and affordability of vital medicines and vaccines) [155] | 3 |

3.3. Method

This study employed the Ordinary Least Square (OLS) regression model in line with previous research [18,20] as a statistical technique to analyze the relationship between the

SDGs and the GDP growth in Saudi Arabia. OLS offers consistent theory and methods for regression, analysis of variance, and analysis of covariance, as well as the generation of results for other analyses [156]. This method also minimizes the prediction error between the predicted and real values [157]. Finally, the OLS method reveals information about variable structures and distinguishes the roles of various variables in influencing the outcome variable [158]. This method is consistent with the purpose of this paper, which is to examine the roles of various SDGs in impacting Saudi Arabia's GDP growth rate as the country strives to achieve a knowledge-based economy in line with its Vision 2030.

4. Empirical Results and Discussion

4.1. Descriptive Statistics and Correlation Analysis

Table 2 displays the descriptive statistics for the variables utilized in the analysis during the time frame of our investigation. It shows the average of GDP rate at 3.297, education and training at 18.092, gender equity/female empowerment at 0.835, gas emission at 0.309, decent employment at 34.732, industrialization at 52.952, poverty at 5.908, hunger at 4.721, and health at 63.625. The coefficient of variation (CV) quantifies a sample's degree of data variability relative to the mean. The gas emission variable appears to be the least volatile, with the lowest coefficient of variation (0.074). In contrast, the GDP appears to be the most volatile variable with the highest coefficient of variation (1.469). In 2020, the COVID-19 pandemic caused a 4.138 percent decline in Saudi Arabia's GDP growth rate [136].

Next, the Pearson correlation between the explanatory variables was examined to evaluate multicollinearity issues (Table 3). Multicollinearity issues may arise in the regression model if there is a high degree of bilateral correlation among independent variables [159,160]. If there is multicollinearity among independent variables, coefficients will be less accurate, and *p*-values cannot be relied upon to precisely estimate the significance of independent variables. The correlation analysis results in Table 3 indicated a mixture of negative and positive weak correlations. There is no strong correlation, but there are a few moderate correlations [161] such as between hunger and poverty (0.414) and hunger and health (−0.418) [162–164]. To further assess multicollinearity issues, variance inflation factors (VIFs) between variables were analyzed. All VIF values were less than 5 (refer Table 2) [165,166], so it is assumed that there is no multicollinearity problem.

Table 2. Summary Statistics of All Variables.

| Variable | Mean | Minimum | Maximum | Standard Deviation | Coefficient of Variation | VIF |
|----------------------------------|--------|---------|---------|--------------------|--------------------------|-------|
| GDP | 3.297 | −4.138 | 15.193 | 4.842 | 1.469 | 3.665 |
| Education and Training | 18.092 | 10.253 | 25.949 | 4.873 | 0.269 | 2.042 |
| Gender Equity/Female Empowerment | 0.835 | 0.136 | 1.772 | 0.382 | 0.457 | 2.768 |
| Gas Emission | 0.309 | 0.281 | 0.38 | 0.023 | 0.074 | 3.512 |
| Decent employment | 34.732 | 26.821 | 43.156 | 4.587 | 0.132 | 3.879 |
| Industrialization | 52.952 | 40.1 | 66.8 | 6.927 | 0.131 | 3.425 |
| Poverty | 5.908 | 4.483 | 7.541 | 0.954 | 0.161 | 3.432 |
| Hunger | 4.721 | 3.7 | 5.9 | 0.711 | 0.151 | 2.657 |
| Health | 63.625 | 45.2966 | 79 | 11.21 | 0.176 | 2.785 |

Table 3. Correlation Coefficients between Model Variables.

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| GDP (1) | 1.000 | | | | | | | | |
| Education and Training (2) | 0.227 | 1.000 | | | | | | | |
| Gender Equity/Female Empowerment (3) | 0.367 | 0.342 | 1.000 | | | | | | |
| Gas Emission (4) | 0.365 | 0.112 | −0.374 | 1.000 | | | | | |
| Decent employment | 0.377 | 0.385 | −0.083 | 0.365 | 1.000 | | | | |
| Industrialization | 0.389 | 0.354 | 0.338 | 0.364 | −0.076 | 1.000 | | | |
| Poverty | −0.354 | −0.303 | −0.243 | 0.309 | 0.373 | −0.206 | 1.000 | | |
| Hunger (8) | −0.323 | −0.067 | −0.342 | 0.201 | −0.125 | −0.087 | 0.414 | 1.000 | |
| Health (9) | 0.368 | 0.343 | 0.349 | −0.284 | 0.356 | −0.325 | −0.388 | −0.418 | 1.000 |

4.2. Unit Root Test

Due to the characteristics of our data, we conducted a unit root test before conducting the multiple regression analysis to determine the impact of various SDGs on the GDP growth rate. Testing for unit roots is essential for determining if and how frequently time series data should be differentiated [167]. The unit-roots test is essential for determining the stationarity of the data in time series analysis [168–170].

If the test statistic < critical value and the p -value < 0.05, then the null hypothesis should be rejected. This demonstrates that the data do not have a time-dependent structure. It indicates that the time series data are stationary as there is no unit root [74].

Table 4 portrays the unit root test results. The DF-GLS test indicates the non-presence of a unit root in the selected variables [171]. Thus, the null hypothesis is rejected. The series is $I(0)$ and, therefore, stationary. Therefore, our models do not contradict the underlying assumption of independence. This result further confirms the low volatility of our target indicators.

Table 4. DF-GLS Unit Root Test Statistic Results.

| Series (Variables) | DF-Statistic | Probability | Unit Root |
|----------------------------------|--------------|-------------|-----------|
| GDP | −2.38 | 0.03 | No |
| Education and Training | −1.41 | 0.00 | No |
| Gender Equity/Female Empowerment | −1.29 | 0.00 | No |
| Gas Emission | −2.52 | 0.02 | No |
| Decent employment | −2.12 | 0.01 | No |
| Industrialization | −1.95 | 0.00 | No |
| Poverty | −1.93 | 0.01 | No |
| Hunger | −1.44 | 0.00 | No |
| Health | −2.12 | 0.03 | No |

4.3. Heteroscedasticity Test

OLS regression estimates are accurate when disturbances have zero mean, constant variance, and no correlation [172]. In problems involving time series, correlations between disturbances are frequently observed. This study also utilized the Breusch–Pagan and Koenker tests to determine the presence of heteroscedasticity (unequal scatter of residuals or error terms) [173]. According to Table 5, the p -value of the test is less than the significance level (i.e., $\alpha=0.05$). Therefore, we can conclude that heteroscedasticity is not a concern in our regression model.

Table 5. Heteroscedasticity Test Results.

| Variables | Heteroscedasticity |
|----------------------------------|--------------------|
| GDP | 0.021 |
| Education and Training | 0.002 |
| Gender Equity/Female Empowerment | 0.007 |
| Gas Emission | 0.015 |
| Decent employment | 0.027 |
| Industrialization | 0.005 |
| Poverty | 0.029 |
| Hunger | 0.014 |
| Health | 0.035 |

4.4. Multiple Regression Analysis

Table 6 shows the results of the multiple regression analysis of the identified UN SDG variables on Saudi Arabia's GDP, which was used as a proxy for economic well-being. Table 6 displays the results of our analysis employing Equation (1). Particularly, we demonstrate the most important indicators contributing to Saudi Arabia's GDP growth in line with the ideals of Saudi Vision 2030.

Table 6. Multiple Regression Results of SDG Variables on GDP Growth Rate.

| | Coefficient | Standard Error | T-Statistic |
|----------------------------------|-------------|----------------|-------------|
| Constant | 7.637 | 4.784 | 1.596 |
| Education and Training | 4.476 ** | 1.659 | 2.698 |
| Gender Equity/Female Empowerment | 2.875 ** | 1.077 | 2.669 |
| Gas Emission | 2.276 *** | 0.776 | 2.933 |
| Decent employment | 1.868 * | 0.955 | 1.956 |
| Industrialization | 1.592 | 0.943 | 1.688 |
| Poverty | −0.954 | 0.601 | −1.503 |
| Hunger | −0.741 | 0.493 | −1.587 |
| Health | −1.167 | 0.715 | −1.632 |
| R ² | 0.705 | | |
| F | 78.165 | | |

Note: The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

4.5. Results and Discussion on Specific Variables

The overall results in Table 6 show that the model has satisfactorily high explanatory power with $R^2 = 0.705$. Specifically, our identified independent variables explained 70.50% of the variation in the GDP growth rate in Saudi Arabia compared to 62.80% in a study in the Five BRIC countries by Adrangi and Kerr [18]. The difference may be attributable to the larger number of SDG indicators included in our model and the longer time frame utilized in this analysis. All the variables in the model are associated with the GDP growth rate, though some relationships are moderate and insignificant.

The education and training variable has the highest coefficient and reveals a positive and statistically significant relationship with the GDP growth rate in Saudi Arabia, which is of interest in this study. Therefore, our hypothesis H1 is accepted. This result is in accordance with prior studies [27,35,37], which confirm the role of education and training in attaining the UN SDGs not only in developed economies, but especially in emerging countries where resources are grossly inadequate. Prior research confirms that education

and training are essential for a country's economic development and the growth of its human capital [34–36,38] even during crisis time such as COVID-19 [27–30]. Education and training (SDG 4: educational quality and lifelong learning) also positively influences most of the UN SDGs by reducing trade-offs and maximizing their synergies (e.g., SDG 1: no poverty [109,112], SDG 2: no hunger [112], SDG 3: good health and welfare [122], SDG 5: gender equality [111], SDG 6: safe drinking water and sanitation [123], SDG 8: decent jobs and economic growth [56–58], SDG 9: industrialization and innovation [114], SDG 10: reduced inequalities [117,120], SDG 11: sustainable development [124,125], SDG 13: combat climate change [126], and SDG 15: forestation, and biodiversity [127,128]). As a result, SDG 4 (education and training) is regarded as a foundational SDG because it influences the achievement of most of the other SDGs [129]. Under its Vision 2030, Saudi Arabia has encouraged investments in education and training to enhance its human capital and promote economic growth [26]. Saudi Arabia prioritizes education and training, allocating the largest portion of the Kingdom's budget to these areas [97]. Therefore, this result renders apparent the need for the Saudi Arabian authorities to continue investing in education and training to attain the goals of Saudi Vision 2030. To broaden access to the advantages of education and training, the government should encourage educational institutions to combine traditional systems with a personalized and adaptable system enabled by digital technology [174].

The gender equity/female empowerment variable has the second highest coefficient, which is positive and statistically significant. Therefore, our second hypothesis, H2, is also accepted. This result is important for Saudi Arabia as it has launched several programs to achieve gender equality and female empowerment (SDG 5: gender equality) as part of its Vision 2030, including *wusool* and *qurra* for working women and *darooob* to improve women's employability [93]. This result is in accordance with Gebre [111], who stated that giving women opportunities and promoting female participation in the workforce bridges gender disparity and contributes to the overall economic development. According to Singh and Alhulail [113], in the least-developed and developing economies, education is perceived as the effective way to attain gender equity through which people can enhance their economic and social welfare. Therefore, this result underpins the need for Saudi Arabia to encourage gender equity through education and training in line with its Vision 2030, as gender equity encourages women's participation in the workforce and contributes to economic activities and the GDP growth.

As expected, the gas emission variable is positive and significantly related to GDP growth in Saudi Arabia. Our H3 hypothesis is thus also accepted. This result is also in accordance with prior research [4,18]. This relationship illustrates the complexity of economic development, as efforts to increase GDP growth to improve the standard of living result in a rise in greenhouse gas emissions and environmental pollution. According to Adrangi and Kerr [18], the inconsistency between sustainable growth and rising living standards reveals the difficulty many developing nations face. Consequently, achieving SDG 8 (decent employment and economic growth) via GDP growth hinders the achievement of environmental goals. Since the GDP does not consider the harms caused by economic growth to other economic progresses and social welfare measures, many have suggested looking beyond consumption-based macroeconomic indicators such as the GDP [43,90,175]. Education and training can play a vital role in raising awareness about environmental protection and sustainable development (SDG 13: combat climate change) [124–128]. Therefore, countries must invest in education and training to maximize synergies and minimize trade-offs among SDGs. This is particularly important for Saudi Arabia as a major oil-producing and exporting country [39,40], as it is investing considerable resources to reduce pollution and enhance green cover under its national environment strategy [100].

The decent employment rate is positive and significantly related to the GDP growth rate. Our hypothesis H4 is, therefore, also accepted. This is consistent with prior research [56–58], indicating that economic activities generate employment opportunities, thereby promoting employment and vice versa. The highly technical nature of Saudi

Arabia's oil industry, which along with the public sector is one of the country's largest employer, necessitates that the country's citizens receive specialized training to work there. Saudi citizens could also obtain decent employment in the oil industry in accordance with government endeavors to create a healthy working environment [93]. However, Saudi Arabia employs a sizeable number of expatriate workers in the highly technical oil industry [176]. In accordance with Vision 2030, the Saudi government should prepare the local labor force for absorption into oil and gas industries via targeted education and training programs to increase decent employment opportunities (SDG 8: decent employment and economic growth) [56–58]. This action will increase economic activity, promote decent employment, increase GDP growth, and enhance the overall well-being of citizens.

The industrialization variable is positively associated with the GDP growth rate; however, the effect is not statistically significant. Nevertheless, this result is consistent with previous research in demonstrating a positive relationship between industrialization and the GDP growth rate [49–54]. The insignificant relationship may be due to a lack of robust institutional support and the need to strengthen human capital development in developing countries [55] such as Saudi Arabia. The effects of industrialization on the GDP growth may take some time to materialize [4]; however, they are crucial to the long-term development of the economy, particularly in developing countries such as Saudi Arabia. This result is not unexpected, given that Saudi Arabia is a capital-intensive exporter that relies heavily on the highly technical oil industry. In addition, Saudi Arabia needs expatriate workers for its technology-intensive oil industry. Saudi Arabia's current industrialization efforts are focused on developing infrastructure in partnership with the private sector [98,99]; however, it needs to improve its human capital development [135] to reap the economic benefits of industrialization fully. Education and training play a crucial role in generating the knowledge necessary to develop human capital, which is crucial for maximizing the economic benefits of industrialization (SDG 9: industrialization and innovation) [114]. Therefore, once the necessary infrastructure and human capital for industrialization have been developed via targeted education and training programs, it is anticipated that industrialization will significantly contribute to economic growth in Saudi Arabia.

The empirical results of our model demonstrate that poverty is negatively related to the GDP growth rate; however, the effect is not statistically significant. Nevertheless, this result is aligned with the prior research [59–63]. Moreover, this result is pertinent for Saudi Arabia as it has launched several direct and indirect measures to protect poor Saudi families [93]. The insignificant relationship indicates that although economic growth in Saudi Arabia is related to reducing poverty, the poorest citizens may not have been able to reap the benefits due to a lack of access to socio-economic opportunities [177]. Education and training can help the poorest sections of society and improve their access to socio-economic opportunities to attain SDG 1 (no poverty) [112].

The research results depict a negative relationship between hunger and the GDP growth rate; however, the effect is not statistically significant. Nevertheless, this result is consistent with previous studies [64–66]. This result is relevant for Saudi Arabia as the country has made efforts in the agriculture sector to achieve food security [94]. Due to these efforts, Saudi Arabia has a low hunger problem [178]. The insignificant relationship suggests that despite the relationship between economic growth and low hunger in Saudi Arabia, issues such as food waste prevent the benefits from reaching the poorest citizens [178]. The government of Saudi Arabia should educate and train the populace to prevent food waste so that the poorest segments may benefit from social welfare programs and the country can attain SDG 2 (no hunger).

Finally, the study results reveal a negative, but insignificant, relationship between health and the GDP growth rate. This result contradicts some prior studies [67–71], while supporting others [72–74]. This result could be partly explained by Yang's [33] study, which reported a significant negative relationship between health and GDP growth rate at low levels of human capital development. Human capital development in Saudi Arabia is

ranked 73 out of 157 countries [135], which is low but close to moderate. This suggests that if Saudi Arabia improves its human capital development through education and training, it will realize greater economic benefits from its healthcare programs [95,96] in the long term. The relationship between healthcare spending and economic growth may be negative in the short term [68]; still, government healthcare initiatives, especially in developing nations such as Saudi Arabia, are essential for long-term development. Furthermore, government healthcare initiatives (such as educating and training medical professionals, developing healthcare facilities, administering vaccinations, etc.) are essential to prepare the country to overcome crises such as COVID-19 [30], which are detrimental to SDG 3 (good health and welfare). This is because human health is essential for long-term economic growth [179], which crises such as COVID-19 endanger particularly in developing nations [180–182] such as Saudi Arabia. Moreover, a healthy and safe workplace is vital for employee satisfaction and long-term business profitability [183,184], which crises such as COVID-19 threaten. Therefore, health and safety measures adopted by developing nations such as Saudi Arabia (especially during crises such as COVID-19) are vital for safeguarding public welfare and ensuring long-term economic growth. This is evident from rebound of Saudi Arabia GDP growth rate in 2021 to 3.241% from contraction of 4.138% in 2020 [136].

This study determined which of the identified UN SDGs directly impact the GDP growth rate in Saudi Arabia. The results show that all the variables included in this study impacted the GDP growth rate of Saudi Arabia either positively or negatively depending on their value of the regression coefficient (RQ1). Based on significance, direction, and the regression coefficient value, the education and training indicators are most important in influencing the GDP growth and therefore require more specific attention to ensure better economic and social well-being in Saudi Arabia. This pursuit of education and training is also in accordance with the country's Vision 2030 agenda and its emphasis on the knowledge economy. Education and training variables, though not a direct measure for most of the other SDGs, do influence the attainment of many of the UN SDGs in Saudi Arabia (RQ2) [56–58,109,111,112,114,117,120,122–128].

Education and training can play a crucial role in promoting gender equity/female empowerment [64], the second most important variable in our study. Education and training can raise awareness about preserving the environment and conserving biodiversity [124–128] to reduce the environmental impact of greenhouse gas emissions, the third most significant variable in our study. Education and training can also play a prominent role in promoting decent employment opportunities [56–58], the fourth most important variable in this study. Education and training can also positively influence industrialization [114], the fifth most important variable in this study. Education and training can help to address poverty [109,112] and hunger [112] issues and promote good health and welfare [122], even during crises such as COVID-19 [30]. Therefore, education and training can contribute to social welfare, employment opportunities, and economic growth without compromising environmental objectives. Hence, education and training can significantly maximize synergies among the SDGs and minimize their tradeoffs.

5. Summary and Conclusions

This paper empirically investigated the linkage between the GDP growth as a proxy for economic well-being and selected UN SDGs and their respective indicators, which are based on Saudi Arabia's Vision 2030 agenda and its emphasis on the knowledge economy. Multiple reputable sources were used to collect data from 1990 to 2020 to maximize the size of the data and, consequently, the power of the tests. We conducted a unit roots test to check the stationarity of the time-series data used in the analysis. We checked multicollinearity concerns in the variables using Pearson correlation and VIF values. We also tested for heteroscedasticity to ensure the validity of our test results. Lastly, we adopted multiple regression analysis to quantify the impact of each of the identified predictive variables on the outcome variable, i.e., GDP growth rate.

The overall result shows that the model has a satisfactorily high explanatory power, as our identified variables explain 70.50% of the variation in the GDP growth rate in Saudi Arabia. Education and training has the highest impact and reveals a positive and statistically significant relationship with the GDP growth rate in Saudi Arabia. In accordance with the prior research [34–36,38], the study supports the assertion that education and training plays a vital role in developing a country's human capital and boosting economic growth.

The gender equity/female empowerment variable is also positive and significant, with the second highest impact on the GDP growth rate in Saudi Arabia. This supports the claim that providing women with employment opportunities reduces gender inequality and promotes economic growth [111]. In developing economies such as Saudi Arabia, education and training is perceived as an effective means of achieving gender equity and promoting the social and economic welfare of the populace [113].

The gas emission variable is positive and significantly related to the GDP growth rate in Saudi Arabia, as expected, and it is also in line with the previous studies [4,18]. This indicates that the GDP growth measure may not consider the negative environmental effects of economic growth [43,90]. Education and training can play a crucial role in promoting environmental protection and sustainable development awareness [124–128]. Therefore, countries (such as Saudi Arabia) should focus on education and training to maximize synergies and minimize tradeoffs among the SDGs.

Consistent with the prior research [56–58], the decent employment rate variable is positive and significantly related to the GDP growth rate in Saudi Arabia. Through targeted education and training programs, the Saudi government should boost decent employment opportunities for the local workforce by encouraging a healthy working environment [93] and enhancing their technical skills to work in the oil and gas industry.

The industrialization variable is positively related with GDP growth rate, as expected for Saudi Arabia as a developing country [49–54]. The insignificant relationship may be due to the lack of robust institutional support and the need to strengthen the human capital development in Saudi Arabia [55]. Industrialization may significantly contribute to overall economic growth [4] in Saudi Arabia once the necessary infrastructure and human capital have been developed through specialized education and training programs.

The relationship between poverty and the GDP growth rate is negative in Saudi Arabia, which is consistent with previous research [59–63]. The insignificance of the relationship may be attributable to the lack of socioeconomic opportunities [177] for the poorest Saudis, which education and training can help to remedy. Similarly, the relationship between hunger and the GDP growth rate is negative in Saudi Arabia, and it is also in line with prior research [64–66]. The insignificance of the relationship may be attributable to problems such as food waste, which can be addressed by educating and training the population. Furthermore, the relationship between the health and the GDP growth rate is negative and statistically insignificant. This may be due to the low but approaching a moderate level of human capital development in Saudi Arabia [33,135]. Education and training can improve Saudi Arabia's human capital development resulting in greater long-term socio-economic returns from its healthcare programs [95,96,183,184] and a greater capacity to withstand crises such as COVID-19 [30].

These empirical findings have some implications for policy makers in Saudi Arabia, not only as an oil exporting nation that generates a substantial proportion of its revenues (GDP) that has an impact on the environment but also as a developing economy. However, high GDP growth levels though create synergies among some SDGs, may have significant trade-offs among other developmental goals [5]. This negates the UN agenda of all-around sustainable development. Saudi Arabia has developmental agenda, which the country has implemented through its Vision 2030 to build a knowledge economy. This study's empirical findings have identified education and training as the most significant and positively associated variable with the GDP growth in Saudi Arabia. The current study suggests that education and training can positively influence most of the UN SDGs by maximizing their synergies and minimizing tradeoffs. Therefore, Saudi Arabia should invest further in

education and training in accordance with its Vision 2030 to build a knowledge economy and attain the SDGs.

Our study extends the literature on the SDGs and the GDP growth relationship by attempting to link the suggested SDG indicators based on Saudi Arabia's developmental agenda (Vision 2030) with the GDP growth rates via empirical analysis. Second, this study differs from the prior research in its emphasis and context. While the current research does look at the social, environmental, and economic aspects of sustainable development, it emphasizes the role of education and training in influencing the SDGs and the economic growth in Saudi Arabia. Third, this study shows that a few variables significantly impact the GDP growth rate in Saudi Arabia, while others are insignificant. This could be due to a lack of robust institutional support and human capital development in developing countries such as Saudi Arabia. This study contributes to the literature by offering empirical evidence that developing countries such as Saudi Arabia may not be able to achieve the successful implementation of all the SDGs unless they address their shortcomings through targeted education and training programs. Lastly, this paper's findings may extend current evidence on Saudi Arabia to other Gulf Cooperation Council (GCC) nations, as they share similar cultural, social, and economic characteristics.

6. Limitations and Future Research

This study has a few limitations that may have an effect on the findings. First is the limited data availability for various SDG indicators for Saudi Arabia. For example, SDG 8 (decent work) can be measured by the degree of national compliance with labor rights according to ILO textual sources and national legislation. However, no data are available for Saudi Arabia for this measure. Consequently, we determined this measure in accordance with ILO-suggested indicators of decent work [152–154]. ILO states decent work should be secure, dignified, and fair and provide employee freedom [185]. Even though our measure encompasses most of the ILO-suggested indicators (such as regular and stable employment, social security, work safety, respect for eliminated jobs, etc. [123,124]), it could still be improved by including data on overtime employment, labor rights, etc. For SDG 9 (industrialization and innovation), we could only measure industrialization but not innovation. The innovation can be measured using data from the global innovation index [186]. However, the global innovation index was introduced in 2007, so data for the entire study period (1990 to 2020) were unavailable. Further, SDG 1 (no poverty) could be better measured using data on the population living below the poverty line (BPL). However, the BPL data are not available for Saudi Arabia. Therefore, the percentage of households receiving poverty benefits was utilized.

The second limitation is the measurement problem of the SDG indicators or variables used in this study, as different measures adopted by different authors result in inconsistencies in empirical results. Third, this study used nine variables. Explanatory power could be improved by including more determinants and a longer time period. Finally, the presence of an endogeneity problem associated with time series data may not be fully statistically controlled in the present study.

Future research may consider using multiple measures for the variables, different methods, and even more SDG determinants to increase statistical power and obtain even better results. Empirical results have not been consistent in SDGs studies principally due to several indicators for each SDG. The use of a limited or unified set of indicators for each SDG may bring some level of consensus and the possibility of comparing results among studies. The GDP may not be an appropriate measure to gauge the sustainable development of a nation as progress towards economic and social SDGs may compromise the environmental SDGs. Consequently, future research may employ a sustainable wellness index [175] as a unified measurement system that considers the value created by the natural capital, environment, social capital, and net economic endowments.

Given the similarities between GCC countries' economies, societies, and cultures, future research may want to consider a larger cross-country study to examine the impact of

additional SDG indicators on the GDP growth. This comparison with other GCC countries may further illuminate the relative standing of Saudi Arabia. Finally, this study's findings highlight the need for additional theoretical and empirical research into the behavioral and cultural moderating factors impacting GDP growth.

7. Recommendations

The interrelated nature of the SDGs highlights the interlinking between the economic (e.g., industrialization), social (e.g., health), and environmental (e.g., climate change) sectors. SDG 4 (education and training) is considered a foundational SDG because it affects the accomplishment of most of the other SDGs. Further, it maximizes synergy and minimizes tradeoffs among SDGs. Therefore, the current study suggests that developing nations such as Saudi Arabia should continuously enhance their human capital through targeted education and training programs to achieve the SDGs. Saudi Arabia's Vision 2030 provides a broad framework for developing a knowledge-based economy; however, education and training programs should be tailored to advance the SDGs that have the greatest impact on the economic growth. Therefore, education and training policies should promote gender equality and the empowerment of women, environment protection, decent employment opportunities, and human capital development. The government should encourage educational institutions to combine traditional and digital systems to increase access to education and training. Additionally, the Saudi government should ensure the equitable distribution of socioeconomic opportunities and educate the populace on how to address socioeconomic issues such as food waste. The government of Saudi Arabia should promote laws and regulations that encourage an equitable, healthy, and safe work environment in the current technological workspace. The Saudi government should provide robust institutional support to the private sector to provide decent and safe employment opportunities, expedite the development of essential infrastructure, and the adoption of emerging technologies. Consequently, Saudi Arabian policymakers should continue to initiate and implement policies that promote education and training, as well as other lifelong learning opportunities, sustainable employment generation, human capital development, economic growth, and technology-enabled socioeconomic empowerment. In addition, the Saudi government should continue to promote prudent education and training policies to expedite economic recovery throughout and after the COVID-19 pandemic. This is because education and training (SDG 4) as a foundational SDG will positively influence Saudi Arabia's economic, socioeconomic, health, and environmental sectors (throughout and after the COVID-19 pandemic).

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