

Article

# Applying an Evolutionary Growth Theory for Sustainable Economic Development: The Effect of International Students as Tourists

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**Abstract:** In this globalized era of strict competition, all actors in countries must focus on their strengths for continuous growth, which would presumably lead to sustainable economic development. Amongst the three components of sustainable development, this paper focuses on the economic and social aspects. Many countries are becoming service-oriented for economic growth. Education is a form of human capital investment which significantly contributes to countries' national income via students, particularly international cross-border students in higher education institutions. While endogenous growth models dismiss the importance of governments in the growth process, in this paper, the Keynesian and new growth theories are combined to form an evolutionary growth theory. This research aims to analyze the short and long-term relationships between macroeconomic variables, international students, and their impact on the gross domestic product (GDP) of a small island with the intention of policy implications for stakeholders to reach or maintain sustainable economic development. Using an evolutionary growth theory with 34 years of time-series data on quarterly base, the vector autocorrection (VAR) model helps reveal the short and long-run relationships as well as impacts on the economy for sustainable economic growth. The results confirmed a long-run relationship via cointegration. Moreover, they approved bidirectional causality between student numbers, general secondary school enrolment, and GDP. Findings suggest significant implications for all stakeholders, particularly for higher education institutions, the government, and local citizens due to the importance of micro and macro-economic variables' effect on GDP. The results prove that educated human capital contributes to economic growth. Governments should continue their existing strategy regarding secondary school enrolment rates as it is found to be the most effective variable in the long-run. As education, knowledge, and information transfer rises, it contributes to sustainable development through promoting social stability. Limitation of the unavailability of the total yearly population, GDP was opted instead of GDP per capita.

**Keywords:** economic growth; sustainable economic development; international students; human capital; higher education

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## 1. Introduction

Economic growth assumedly contributes to human development and social welfare through enhanced employment, purchasing power, and production. Sustainable development is a multifaceted concept which could be defined in numerous ways. According to Jackson, the root philosophy

and social base for sustainable economies differ vastly from the basis of the current conventional economies [1]. The former entail various meanings [2]. Amongst the different perceptions of sustainable development, some view it as a possible radical philosophy to reshape the growth process and as a new framing concept [3]. Contrarily, other perspectives believe it to be a key to achieve increased progress within collective societal fairness and also in environmental protection. Further debates claimed that it is a biased conservative project intended to protect the current economic model that causes most of the global natural and social issues [1]. Amongst the three components of sustainable development, environmental, economic, and social [3], this paper focuses on the direct economic and indirect social aspects.

One of the critical income generation sectors which contribute to sustainable economic growth is the services industry [4]. Nevertheless, the services industry interconnects with other sectors in economies, consisting of various activities, and it is difficult to measure its impact on sustainable economic growth. As one of the subsectors of the service industry [5], higher education plays a vital role in developing quality human capital for sustainable growth. Education is a form of human capital investment, which is significant for countries contributing to increased national income via students [6], in particular, international cross border students in higher education institutions. Therefore, there is a need to ensure public investment in sustainable development and invest in education to reach high-quality [7]. We suggest that increasing international student flows will support institutions, also the country's technological progress, and its research and development, therefore, international students contribute to sustainable development [2].

It could be observed that the inequality of income distribution in nations has been enormous in the past [8] and still remains a global issue as the gap between the rich and the poor is globally enlarging [9]. In regard to the economic problems of North Cyprus, agriculture and manufacturing sectors have been weakened, and the yearly trade deficit is continuously increasing. Besides limited natural resources, strict trade barriers, tariffs, devaluing exchange rate, increasing budget deficit, and limited production, North Cyprus is not able to export sufficient goods [10], therefore, it exports a large proportion of services through international students and tourists. Moreover, international students contribute to most sectors of the economy, while budget deficits also benefit from this income via tax revenues collected [10], as well as increased foreign exchange flow. One way or the other, international students strengthen the higher education sector, which promotes new universities to rise in numbers as well as create new employment opportunities for the increasing workforce. This could be also visible in North Cyprus.

Since ecological, economic, and social systems are interconnected, the problem of sustainable economic development is not only a regional but also a global issue, as stated in several international policy documents [3].

This research focuses on the economic and social aspects of sustainable development with the assumption of testing impacts along with the relationship between secondary school enrolment rates (as a measurement of human capital), labor force (representing the available workforce), technological progress (essential for economic growth), government expenditure (on infrastructure, health, and education), exchange rates (adopted Turkish Lira), rising international student numbers (for economic growth), and GDP will benefit the society socioeconomically. In instances when the economy of a country fails, this will create problems and cause social instability [1]. Presumably, when macroeconomic indicators and essential stakeholders in the economy play their roles efficiently, sustainable growth of the services sector will lead to sustainable economic development. The main contribution of this article is using only international students as a representative of international student tourism and higher education institutions' effect. Additionally, we have created a new multi-factor evolutionary theory derived from relevant literature and adapted it to the North Cyprus economy, which could be tested for other similar demographical countries. Finally, to the best of our knowledge, sustainable economic development policy implications have not yet been suggested for the region.

Our work shares some similarities with previous research by Katırcıoğlu on North Cyprus, who used quarterly data of a 20-year span with four variables, including real GDP and exchange rate [10] and 45 years in different research on Cyprus, including international tourists [11]. Differently, our research holds a sustainable approach and utilizes the most commonly used variables combined in a single growth theory. Furthermore, this paper expands to more years and recent data. Notably, local students have been excluded from the higher education student numbers to examine the net impact of international students on economic growth. The main difference and originality of our theory are the multiple factors combined to test growth, which, to the knowledge of the authors no other theory is alike. Including local students would combine human capital and disable the significant contribution of using international higher education students as tourists. Other authors examined government expenditure, technological progress, and secondary school enrolment rates [12,13]. Labor force has been previously mentioned by many authors [14] and numerous economic growth researchers use GDP as a measurement of economic growth.

North Cyprus, a small microstate island, declared its independence in 1983 and officially is only recognized by Turkey [15]. Considering that the population is estimated to have doubled since 1983 [16,17], the increase in GDP in a small island state is worth examining since microstates have generally been neglected in the literature. Although GDP per capita would be a better measurement to see whether the income distribution is fair for the lower class, due to lack of data on the population number for North Cyprus, GDP represents economic growth. Additionally, it is a services-dominated economy, therefore several actors play vital roles for sustainable economic development. Initially, the macro variables (international students, government expenditure, technological progress, labor force, human capital, and exchange rate) should be examined to shed light on recommendations for stakeholders and policy implications for the government. Previous relevant literature review mentions other researchers using similar variables for different countries. Hence, these variables together have not yet been used for North Cyprus.

The objective of this paper is to test long-term effects, discover significant variables, and suggest implications for stakeholders to increase knowledge which is suggested to increase the welfare of the country as a whole. We argue that international students alone are unable to be sustainable, but need to be supported by strengthening human capital, labor force, increased technological process, and government support. International students contribute to sustainable development as they have effects on economic growth. Moreover, quality human capital and labor force are needed to supply this rising demand. Technological progress could contribute to research and development facilities. Finally, like most countries, the government plays a crucial role in maintaining economic and social stability through infrastructural investments, as well as contributing to research and development, and support related institutions. We suggest that if all the above-mentioned variables are processed in an interconnected, efficient manner, then, sustainable economic development could be reached.

Along with the above viewpoint, this research aims to use Solow's neoclassical growth theory as a base [18], and reaugment it to create an evolutionary new growth theory. Many island countries around the world have common characteristics. However, small island economies are somewhat dissimilar from larger countries regarding the structure and framework of their economic development. Besides the abandonment of small island state's development [19], also, their economic issues have been neglected in the literature.

The tested variables show a contribution to the short- and long-run growth of the GDP of a small island state, North Cyprus. They should contribute to the economy via strengthened human capital, continuous technological progress with the help of labor force, increased government expenditure, and rising international students. Sustainable economic development is concerned with economic growth as economic failure causes social instability.

## 2. Review of Relevant Research

Sustainable development is a multifaceted concept which could be defined in numerous ways. According to Jackson, the root philosophy and social base for sustainable economies differ vastly from the basis of the current conventional economies [1]. This could be true in certain aspects since the inequality levels continue to rise, and the international economic system, when once thought to be safe, is continuing to create a disaster of a near collapse. However, the general goal of sustainable development addresses the significance of human needs, the necessity of social fairness, the importance of unselfish care towards forthcoming generations, and the importance of environmental dependency. Its goal is to increase the wellbeing of people in order to form strong, healthy, and fair social systems as a whole, which, in turn, would be sustainable for future generations. Therefore, social change and progress are essential for sustainable development [2]. In parallel, it should be noted that robust resilient economies are a precondition in this process since the failure of an economy will bring vital problems, such as social instability. Keynes stressed that the fundamental aim of economics is to provide societal stability [1].

Economies can be sustainable only when they simultaneously respond to people's needs as well as address the obliged limits to preserve the environment's capability in response to the current and future needs. This means that if the needs of people are not satisfied, there is apparent social instability. The foundations of the philosophy beneath a sustainable economy is the view of natural resources, excluding manufactured resources, as a mutual inheritance of humans, which necessitates equal distribution and availability to the current and future generations [20].

The conventional growth-led paradigm assumes tackling this issue lies within the growth itself. This view assumes that if the global economies grow collectively, the poorest will inescapably improve its welfare and could possibly reduce inequality. Simon Kuznets (cited in Jackson, 2011) [1] once asserted when countries develop, initially the inequality levels rise, hence when the highest levels of inequality are reached, afterwards, it starts to reduce to stable levels. However, a few, if not any evidence from countries prove this hypothesis [1] (p. 156).

One method of achieving long-term sustainable economic growth is to enable regulations to increase the level of production and exports. However, as a result of limited resources [10] and because of global competition, many island economies tend to shift towards services-dominated economies [12]. Tourism as an invisible export industry [21,22] contributes to a nation's economy because of different destination features and touristic activities demanded by travelers. Export-oriented services, specifically tourism, seem to provide a foundation for a probable comparative advantage in small islands or microstates [17]. Other authors consider international higher education students as tourists [20–22] and regarded as international student tourism [11]. Amongst many divisions or sub-divisions, international and domestic students enrolled in universities are a market segment of educational tourism [23] (p. 18). In a broader sense, tertiary education is related to economic expansion along with the increase in student populations around the world after World War 2 (p. 181). More information could be found in this source regarding how international students previously neglected in the literature, benefit the services industry because they consume intangible tourism products as well as tangible goods [23]. Regardless of their developmental levels, services play a crucial role in the contribution to GDP, are also a significant source of employment opportunities, and have a positive impact on the production processes of host countries [24].

Higher education institutions are vital actors in social change and development. Not only they produce skilled labor to meet economic needs, they also create research output to supply economic demands. Furthermore, universities form a platform for training and socializing people of possible new social elites as well as promoting new cross-border cultural morals [25] (p. 7). For these social reasons, they serve a great purpose towards sustainable development. Public research and innovation institutions continue to be critical contributors to valuable scientific production. Universities, in particular, are the backbone of knowledge-driven economies [25]. Scholars [5] mentioned that education is a vital subsystem under the socio-economic system of any nation. During their tertiary

education journey, presumably, cross-border international students directly contribute to the economy through the services industry (e.g., real estate, communications, entertainment, and recreation) in the host country. Within this context, this fact needs to be evaluated concerning its economic, and therefore, social contribution to the host country.

Barbier asserts that international students should contribute to sustainable development in numerous ways, and one of them is economic aspects. They increase capital flow in the economy, local consumption, and supplement for young workforce. Moreover, they contribute in societal ways as they help acculturation and, along this, aid knowledge transfer. The author also points out that as knowledge increases, communities seem to be more environmentally friendly, which indirectly contributes to sustainable development [2]. Furthermore, literature also suggested that higher education institutions differentiate within education systems of countries, but ultimately plays a crucial role in accumulating skilled human capital [6,26]. In this regard, a highly educated human capital will benefit employment opportunities, enhance competitiveness, and could be a catalyst for sustainable economic growth.

Moreover, low-income countries will attract higher international arrivals if the public expenditure is distributed amongst education as well as increased secondary school participation, which leads to higher-skilled human capital [27]. Accordingly, governments support their citizens to study abroad in terms of benefiting from the know-how of other countries [28].

After the 1960s, many small island economies declared their independence. Therefore, more focus has been put towards analyzing them [29–31]. The significant worry back then was whether small states could be economically sustainable in the long run [32]. However, being a sustainable economy in historical views was continuous economic growth. The new concept of sustainable economic development considers not only economic growth but growth which would contribute to social stability and preserving the environment. Although Romer [33] assumed that large countries may always grow faster compared to small countries, contrarily, Luxemburg is an example of a healthy economy showing continuous development with a population of around 600 thousand [34]. There are several microstates in the top 10 wealthiest countries with populations less than one million. Relatedly, literature is not specific whether being a small island is economically advantageous. Hence, they are generally economically vulnerable [30]. Contrarily, some authors [35] criticized general literature, stating that small size and being an island is less significant regarding economic issues.

The vulnerability of sustainable economic development may be a feasible concern within mini economies and therefore, most small islands as, generally, they have limited natural resources, reduced size of the domestic market, and benefiting from economies of scale is more difficult [35]. In contrast, other scholars argued against these assumptions, as several small states flourish and grow in the modern global system [36]. Sustainable economic development includes several bodies in societies acting towards a common goal to benefit the health and welfare of the society, create employment opportunities, being cautious about environmental matters and achieving continuous long-term growth [24], which will benefit future generations too.

Although North Cyprus is traditionally an agrarian economy [37], the share of agriculture showed a continual decline in previous decades [38]. Accordingly, it is highly difficult to benefit from exports and imports [37] attributable to the fact that production is limited mostly due to apparent strict trade barriers, insufficient resources, and vulnerable exchange rates. The economy has proven to benefit more from tourism and higher education services [39], which are combined as interconnected industries. Therefore, North Cyprus is currently a service-oriented economy. This small island state exports to over 50 countries [17] and hosts international students from more than 135 countries [40].

This is no surprise as the number of students studying abroad in OECD (Organization for Economic Co-operation and Development) countries has more than doubled between 2000 and 2011, rising from 1.3 million to approximately 4.3 million [41] reaching 4.6 million in 2017 [42]. All of the 20 countries hosting most inbound students have increased numbers from 2016 to 2017, hence a significant 58.9% for Mexico, 34.4% rise of New Zealand, and thirdly Spain with a 24.9% change. North Cyprus would be the eighth highest increase for the same period with 12% growth just after Australia. These numbers

are projected to double for Japan and Australia approximately, and also increase for Germany, France, among others by the year 2020 [43].

With eighteen higher education institutions, North Cyprus hosted over 87,000 cross-border international university students from more than 130 countries in the academic year of 2017–2018. This number accounts for just below thirty percent of the estimated population, which is an incredible ratio considering only about thirteen percent of the total 100,913 students are domestic students [17] (p. 33).

The literature stresses the importance of social capital, which should be incorporated into development theories along with policy implications that encompass the micro and macro actors' effect on economic growth [44] (p. 154). As human capital correlates with human development, both significantly affect the economic growth of a country [45], and it has been a critical variable in developmental economics [31,46–49]. Human capital, achieved using education, has also been highlighted as a crucial factor of economic development by several authors who assert the importance of human capital within the growth concept [47]. Furthermore, the key to economic growth lies within accumulating quality skills and knowledge for productive human capital. Assumedly, one reason for the differences within wealth and prosperity amongst countries is the disparity in the structure of human capital [50].

Barro [47] asserted that the growth rate per capita GDP is inversely associated with the initial level of per capita GDP when holding fixed measures for several variables. In addition, he found that growth is positively linked to the initial level of average years of schooling. The importance of education to development is immense through accumulating quality human capital and technical improvement through research and development.

A higher level of educational achievement creates stronger skills which result in higher levels of output of products and services. A high quantity of well-educated human resources promotes the transfer of advanced technology from developed nations [51]. Previously, it has been assumed that the combination of technological improvement and a better-educated labor force will lead to developing quality human capital [52]. In addition, proof from literature commonly reveals the statistical significance of human capital on the growth rate of per capita income [53]. Along with human capital, labor force also has been used to measure growth [53], and the Solow growth model also applies human capital, technological progress, and labor force [18].

In general, modern theories suggest that a country can improve its economy by adopting export-led growth policies that are appropriate for open market-oriented countries. Admittedly, a more open economy would grow at a faster pace, which in return will improve human development [53]. As mentioned earlier, due to limited production, North Cyprus is not able to export sufficient goods. However, exports a large proportion of services through international students. In addition, international students contribute to most sectors of the economy, while budget deficits also benefit from this income via tax revenues collected [12], as well as increased foreign exchange flow.

The connection between the exchange rate and economic growth, inflation, and purchasing power parity has been studied and much debated in the literature [54,55]. North Cyprus's currency uses Turkish Lira (TRY) as a local currency. Factually, the TRY is devaluing with time against the US Dollar and most other currencies [17,56], which negatively affect the purchasing power of the public. However, it could boost economic growth in the long-run [57,58]. This undervaluation may also cause income inequality. Nonetheless, it is suggested to have positive effects on technological improvement [59]. Previous theoretical research in regard to the impact of exchange rate volatility on the economic growth of countries continues to be a debatable topic [60]. Along with the exchange rate, the government's effect on growth is worth examining since they are presumed to have a relationship with economic development [8].

Primarily, amongst the stakeholders, the government plays a key role in sustainable development. Government spending is also taken into consideration as it can have a beneficial effect on sectoral growth through public infrastructure development. Temple [53] notes that government spending on infrastructures such as telephone networks and electricity has a significant effect on economic growth.

On the other hand, Easterly and Rebelo (as cited in Gani and Clemes, 2010) [12] found the share of public investment in transport and communication being robustly correlated with growth. Other authors examining different regions around the globe also used government spending as a variable. In the Caribbean Small Islands, Thacker et al. [61] used government spending along with many other variables to test the role of tourism and size on growth. Presumably, investing in infrastructure, education, health, technology, research, and development will be beneficial both in the short and long-run.

This article utilizes empirical analysis, therefore, research in previous empirical studies for different countries using varying variables and measurements will lead to choosing appropriate variables to make short and long-run analyses along with bilateral testing.

### *2.1. Review of Relevant Empirical Research*

De Meulemeester and Rochat's [62], research and the results show a significant casualty from national higher education effort to economic development for four countries: Sweden, UK, Japan, and France. However, such a causality link has not been found for Italy or Australia.

Later research by Gyimah-Brempong et al. [63] used GDP, technology, physical and human capital also adding a civil war as a regressor with various levels of school enrolments, total population increase percentage, technical progress, and initial income. They found all levels of human capital, but notably higher education rates having a statistically significant impact on the growth of per capita income. Fadaee Khorasgani [64] also discovered that the higher education variable has a positive effect on the economic development for Iran in both the short and long run, adapting the model to relevant national variables. Although both of these studies applied different models and proxies, their findings reveal similarities by suggesting that higher education institutions have a mechanistic effect on the economic expansion of countries. Gani and Clemes [12] adopted a new growth theory as a base to analyze the relationship between the services industry and growth using 15 years of data in five Pacific Island countries. Results approve the positive and statistically significant correlation of the expansion of the services sector.

Furthermore, as the higher education industry grows, people studying in universities increase, global student mobility and tertiary education become more popular, attracting researchers to shed light on the effects. The first study using GDP, the total number of students studying in universities of North Cyprus, and the real exchange rate to analyze the impact of these service-oriented industries was conducted a decade ago [65]. Data from the period between 1979 and 2007 were used to reveal the long-run equilibrium relationship and also unidirectional causality from higher education to the growth of the Turkish Cypriot economy. Since then, international student numbers have more than doubled for North Cyprus [17]. This continuous increase could be because of the devaluing Turkish Lira against the Dollar and other currencies since this was observable in Malaysia [66] (p. 39), and in the Korean University of Korea (p. 42).

Eugenio-Martín et al. [27] discovered that the exchange rate and purchasing power parity are not statistically significant for all economies. In contrast, Lee and Chang [67] found that real effective exchange rate has significant effects on economic development from their panel cointegration technique for OECD and non-OECD countries. Results reflect varying results for OECD, non-OECD and Asian countries.

Nourudeen and Usman [68] also examined the growth and analyzed government expenditure effect on economic expansion in Nigeria. They found surprising results such as the government's total capital expenditure, recurrent, and educational expenditures had a negative effect on growth, whereas spending on transport, health alongside communication lead to economic growth. Furthermore, Katircioglu et al. [10] examined the connection between international tourism, higher education, and economic growth in Northern Cyprus and found a long-run equilibrium relationship for both with GDP growth. Later, Katircioglu [65] carried out an analysis utilizing different variables and found a positive effect of higher education, which was considered as student tourism.

We argue the reliability of proxies opted in these papers since the total number of university students is used as a measurement of student tourism, thus combining human capital with tourists in a single variable. Since international students are considered as educational tourists, local students must be subtracted from the total number of higher education students to reflect the effect of university student tourism most reliably. Similar research was carried out testing the higher education led growth with a new form of Solow growth model [10]. They tested the role of the stock of physical along with human capital, raw labor, technology, and university students, effecting real output. Granger causality tests revealed unidirectional causality from university students to real income growth in the Turkish Cypriot Economy between the years of 1980 and 2010.

Recently, other authors focused on the technological progress and scientific measurements on an extensive 160 countries. They considered per capita real GDP, human capital, government spending, and trade openness for the period of 1960–2009 [13]. Higher education institutions contribute to development through research, transfer of know-how, and may help accumulate quality human capital. Human capital alone has been examined to test its effect on economic growth for Mauritius [31]. To summarize, labor and human capital seem to be relevant determinants, significantly contributing to economic growth for the region.

Conversely, Bhorat et al. [14] found that degree cohort positively affects growth. However, universities and higher colleges do not productively contribute to economic growth in South Africa after examining the relationship between higher education, employment, and economic growth. In contrast, Obradovic and Lojanica [69] discovered a unidirectional causality among higher education and real GDP per capita for Sweden. Published in the same year, Ngware [70] criticizes new growth theories to have limitations. Including knowledge and technology, growth may also be influenced by infrastructural investment, institutional, and social frameworks. Consequently, government consumptions should be another internal variable to reflect the effect of the investments on infrastructure generally distributed between health, education, and communication, which, in turn, increases the profitability of firms as well as reducing production expenses and fostering productivity [35].

A different perspective was presented in a very recent research which focused on (Nomenclature of Territorial Units for Statistics, secondary level) NUTS-II Level European countries to see how the higher education institutions contributed to growth in the region between 1998 and 2008 [71] focusing on tertiary students. This empirical study showed a robust statistical significance relation among knowledge-intensive employment and research and development expenditures. Arguably, due to the need of students graduating first before they positively contribute to society, a time lag was apparent between the effect of human capital and economic growth.

Although empirical studies regarding economic growth and its determinants have generally been tested with few variables, Ridderstaat et al. [72] cited various authors who examined tourism development's effect on economic growth. In their empiric notes until 2011, out of the 17 cited authors, only five used over four variables. Until now, generally, theorists, including Solow [18], also utilized few variables, reflecting the gap in the literature for an evolutionary new growth theory abandoning single or two-factor analyses and shifting towards multifactor models suitable for the characteristics of the economy examined. To the best of the author's knowledge, the only research by Eugenio-Martin et al. [27] utilizes a multifactor theory of various variables for Latin American countries which do not include international students.

## 2.2. Growth Theories

Economic growth continues to remain the most relevant and significant sub-area in the world of economics. Regardless of which country is analyzed, the issue of economic growth still remains as vital as it used to be for modern humanity in general [28].

For numerous decades, a vast number of scholars attempted to determine the mechanisms to describe growth. Many of these new growth theories examined large states, whereas small states could

require alternative approaches depending on their structure and strengths [35]. Therefore, the need for evolutionary growth theories arise [73].

Perhaps, the main issue of economic growth is the enlarging gap between the rich and poor, causing inequalities within countries and also between countries around the world. Back in history, when Adam Smith first laid the foundation to theorize economics, the gap amongst the rich and the poor between countries used to be narrower. Since then, particularly after the industrial revolution [74], the disparity enlarged as some nations economically developed at a faster pace whereas some experienced the opposite. A few countries such as Japan, South Korea, and Singapore managed to economically develop at a more rapid pace compared to others, similar to developed regions [28].

First mentioned by Adam Smith, classical economy authors were mainly interested in the long-term patterns of growth of countries. Along with this viewpoint, new growth theories, also referred to as endogenous, modern or neoclassical, have been initiated by Roy Harrod in 1939 inspired by J. K. Keynes's *General Theory* (as cited in Hagemann, 2009) [75]. Neoclassical theories derived by Cobb-Douglas, then Solow et al., who suggested the level of growth in economies depend on the initial income levels. After Mankiw et al. [76] acknowledged the technological progress differences amongst countries, growth theories began to evolve. This has been referred to as "conditional convergence", and Eugenio-Martin et al. [27] mention example variables such as human/physical capital, technological change, financial factors, income allocation, openness to global trade and exchange rate amongst several more. There have also been studies carried out to see whether the Solow growth model is valid within the international across border differentiation of living standards. Furthermore, Mankiw et al. [76] discovered that, when population growth and capital accumulation were constant, countries seemed to converge at approximately the rate of the augmented Solow growth model predicts. They also state people with weaker human capital, in terms of educational levels, received a low wage while others higher qualified or skilled, received better wages.

In a different future study, Cohen and Soto [77] assert human capital could create long-term sustainable growth, which has been one of the critical attributes of the new growth literature initially commenced by Lucas [8] and later contributed to by Romer [78]. This significance has received further attention within time [79–81]. Debates regarding the reasons behind the disagreement between such authors are assumed to be because of the conceptual and empiric measurement of human capital and the form it should take to be a good representation. The number of years of being enrolled in school has been utilized as a measurement of human capital in various growth-related researches [77,82].

These new growth theories or endogenous growth theories suggest technological progress is created internally by the production of market forces, which leads to knowledge accumulation. Besides, if countries generate new knowledge, this will cause a spillover effect leading to sustainable development [70]. Consequently, education, technological progress, and growth are most probably interrelated [52]. However, recently, scholars have been debating against linkages within technical change and expansion through both social and technical innovations. Accordingly, this contradicts the new growth theory as scholars stress the importance of not only investing in technology but the technical improvement of all levels of firms being crucial for growth. Since science and technology are related, information transfer among universities and other research firms are necessary for technical progress. Both the former and the latter need to be given importance as new information develops necessary skills within all divisions of organizations [73]. Compatibly, the international student number flowing to North Cyprus has been increasing, as well as the rising number of higher education institutions from only 10 in 2000 to 18 in 2018 [17].

Generally, economic theories assume small countries experience intense challenges in the growth process compared to larger regions due to their small size. Therefore, this restricts attaining necessary economies of scale, hindering basic economic activities. As a result, instead of traditional growth theories, alternative approaches must be adopted for small state economic growth analyses [35].

The proposed model to investigate the relationship of international students, human capital, technical progress, labor force and exchange rate to GDP, adopting the new growth theory as a

base [18,78,83] is to reaugment the Solow growth theory into an evolutionary new growth theory adapted to a services-driven small island de-facto state's economy, North Cyprus. Although their significance in describing the contribution of higher education to economic expansion, new growth theories have been criticized for their limitations [70]. We propose the model to be mechanistic, reliable, and applicable for demographically similar countries.

While endogenous growth models dismiss the importance of governments in the growth process, in this research, the Keynesian and new growth theories are combined [68] to form an evolutionary growth theory.

### 3. Methodology and Data Analysis

The data series used in this research were extracted from the Northern Cyprus's official government website State Planning Organization (SPO), and exchange rates from the Republic of Turkey's Central Bank (TCMB) all on an annual basis. The time-series data were converted to a quarterly basis using E views software (quadratic match average). The analysis spans on a 34-year quarterly basis from 1983 to 2017. In order to maintain consistency and avoid outliers, log of independent variable GDP (LGDP) in US dollars accompanied by log of variables, such as number of tertiary students studying in higher education institutions (LSTNO), gross secondary school enrolment rate (LGSS), government expenditure in US dollars (LGOVEXP), exchange rates against the US dollar (EXCH) and labor (LLAB) have altogether been utilized. Labor force was calculated by adding employment and unemployment numbers. The combination of these variables is invented as a result of the aforementioned previous research.

Technological change (TECH) is considered as mentioned before. It was calculated using Solow's [18] production theory:

$$A = \Delta \ln Y - \alpha \Delta \ln K - \beta \Delta \ln L$$

Here,  $A$  signifies technology,  $K$  representing fixed capital,  $L$  for labor and  $Y$  reflects the GDP of the Turkish Cypriot economy. Therefore, the production function Cobb–Douglas is evolved to be compatible with other additional variables to test each variables effect on and relationship with GDP.

Due to times series data, we initially checked whether the data were stationary, i.e., unit root test was applied in order to avoid superiority and increase reliability [84–86]. The augmented Dickey–Fuller (ADF), Phillip–Perron (P&P), and Ng–Perron tests were adopted.

Inspired by Phillips and Perron, it is necessary to test if the data are stationary, and they also improved the Dickey–Fuller method into the augmented Dickey–Fuller (ADF) [87]. This procedure enables fairly mild assumptions regarding the allocation of the error term. Generally, the presumption of stationary economic variables could be assumed to hold following the series [86]. Therefore, analysis of the stationary data is a requirement to test long-term relationships.

Next, the VAR representation is tested as:

$$y_1 = A_1 y_{t-1} + \dots + A_p y_{t-p} + B_t + \varepsilon_t$$

After, the long-run cointegration vector is set as:

$$\text{LGDP} = 0.053458\text{LSTNO} + 0.934866\text{LLAB} + 1.455271\text{TECH} + \\ 0.566071\text{LGSS} - 07\text{EXCH} + 0.122350\text{LGOVEXP} - 4.18\text{E}$$

Further, the corresponding VEC model is:

$$\Delta y_{1,t} = \alpha_1 (y_{2,t-1} - \beta y_{1,t-1}) + \varepsilon_{1,t}$$

$$\Delta y_{2,t} = \alpha_2 (y_{2,t-1} - \beta y_{1,t-1}) + \varepsilon_{1,t}$$

The VEC model is followed by impulse response tests for shock effects, and finally, Granger causality tests were carried out for bidirectional and unidirectional relationships.

The results could be found in the following section.

Table 1 presents the choice of the variables based on the aforementioned literature review, as well as the source and acronyms used in the above model.

**Table 1.** Variables, acronyms, and sources.

Variable	Acronym	Reference
Real Gross Domestic Product	D(LGDP)	Gyimah-Brempong et al. (2006)
Number of International Student Number in Universities	D(LSTNO)	Katircioglu et al. (2012) (University Students)
Labor Force	LLAB	Bhorat et al. (2016)
Technological Progress	TECH	Barro and Lee (2000)
Number of Secondary School Enrolment Rate	LGSS	Eugenio-Martin et al. (2004)
Exchange Rate	EXCH	Rodrik (2007)
Government Expenditure	LGOVEXP	Nourudeen and Usman (2010)

#### 4. Results and Discussion

The results of these tests with and without trend is illustrated in Table 2 which reflects the unit root test indicating the time series data being stationary at first difference.

**Table 2.** With/without trend test results of ADF, P&P, and Ng–Perron.

Variable	K	ADF		P and P		NG–Perron	
		A	B	A	B	A	B
Set A at level I(0)							
D(LGDP)	2	−1.261818	−2.363084	−0.940997	−1.259582	0.2392	−2.9677
D(LSTNO)	2	−2.049176	−3.2905807	−11.54244 ***	−18.12298 ***	1.5760	1.5680
D(LLAB)	2	−0.471789	−3.566731 **	−0.439200	−2.445870	1.4250	−3.6098 ***
D(TECH)	3	−2.582262	−3.717490 **	−2.421430	−3.128320	−18.8829 ***	−42.1000 ***
D(LGSS)	2	−1.543462	−0.515649	8.766623	12.35826	2.62119	−2.0165
D(EXCH)	2	−2.580783	−2.550647	−1.652164	−1.600315	0.8082	−3.0675 **
D(LGOVEXP)	3	−2.238339	−0.098132	−4.667546 ***	2.266267	−2.6915	−3.3988
Set B at 1st difference I(1)							
D(LGDP)	2	−4.427714 ***	−4.482890 ***	−5.464894 **	−5498033 **	−5.04429 ***	−5.20322 ***
D(LSTNO)	2	−7.948663 ***	−7.697663 ***	−9.182523 ***	−8.245235 ***	−1.9910 **	3.8t692 **
D(LLAB)	2	−5.447051 ***	−5.426520 ***	−6.509779 ***	−6.486389 ***	−4.9075 ***	−4.9167 ***
D(TECH)	3	−10.34515 ***	−10.28798 ***	−7.073837 ***	−7.052630 ***	−36.9471 ***	−7.7992 ***
D(LGSS)	2	2.862886 **	2.593586 **	3.652851 **	3.064460 **	3.1868 **	−3.7642 **
D(EXCH)	2	−4.768472 ***	−4.765390	−5.921449 ***	−5.913990 ***	−2.9157 ***	−33537 **
D(LGOVEXP)	3	−1.748866	−2.721514 ***	−1.804180	−3.300919	−4.7839 ***	−4.9743 ***

\*, \*\*, and \*\*\* significant at level 1%, 5%, and 10%, respectively, based on the test critical values. K: Lag length, A: Intercept, and B: Intercept and trend.

Analyses regarding the vector autoregressive (VAR) modeling initiated to attract attention in the econometrics world since the end of the 1980s, including the decomposition of the forecast error variances [88]. Constructing variance decomposition connections entails several steps. In instances where endogenous variables are large, firstly, the VAR model must be estimated by utilizing regularization methods. Secondly, estimates derived from the VAR coefficients help to generate the generalized forecast error variance decomposition. Thirdly, this serves to determine the total significance of the dependent variables [89].

The representation of a VAR is as follows [90]:

$$y_1 = A_1 y_{t-1} + \dots + A_p y_{t-p} + B_t + \varepsilon_t$$

Visible in the above representation, the  $A_1$ 's are (nxn) coefficient matrices, whereas  $\varepsilon_t$  is an unobservable i. i. d. mean error.

Subsequently, as the variables were entirely stationary at first difference, next the cointegration was tested using the Johansen cointegration test [72]. Within this framework, a reduced form of VAR was estimated, and at first, the lag order of VAR was determined through the data specifications (information criteria). The order of the vector autoregressive model was firstly determined by information criteria (Schwarz–Bayes criterion, Akaike information criterion, and Hannan–Quinn criterion) and the results of information criteria were conflicting. Due to conflicting results, we opted for a different criterion in order to determine the lag length based on VAR specification residuals until all the residuals of holograms were uncorrelated (white noise) [91]. In continuation of this technique, the optimal lag length was determined within the framework of the LM test, which was three lag length.

The results of the data in Table 3 mirror t-statistics accompanied by critical values for both eigenvalues and trace. The statistical trace and eigenvalues indicated that at least two variables are cointegrated in the long-run. Granger [92] asserted that in cases where two variables are cointegrated, then there should be a unidirectional causality.

**Table 3.** Johansen cointegration test results.

Hypothesis	R = 0	R = 1	R = 2	R = 3	R = 4	R = 5	R = 6
Trace	175.5907 *	103.1224 *	55.51559	31.46344	16.41066	6.435869	0.139068
Critical value	125.6154	95.75366	69.81889	47.85613	29.79707	15.49471	3.841466
Eigen, max	72.46828 *	47.60681 *	24.05215	15.05278	9.974792	6.296801	0.139068
Critical value	46.23142	40.07757	33.87687	27.58434	21.13162	14.26460	3.8411466

\*, reject the null hypothesis of no cointegration at level 5%.

As stated earlier, the long-run cointegration vector was therefore set as follows:

$$\text{LGDP} = 0.053458\text{LSTNO} + 0.934866\text{LLAB} + 1.455271\text{TECH} \\ + 0.566071\text{LGSS} - 07\text{EXCH} + 0.122350\text{LGOVEXP} - 4.18\text{E}$$

The negative relation between exchange rates and economic growth is in line with Eugenio-Martín et al. [27] yet contradicts Lee and Chang’s [67] extensive research. Presumably, one reason behind this negative relation could be due to the misalignment of the Turkish Lira, as discussed by Civcir [93].

From another perspective, instead of paying attention to exchange rate levels, the exchange rate volatility could be the reason for the negative effect for North Cyprus economy in the long-run. Literature suggests this volatility dampens trade, as well as investment, and unexpected falls in the exchange rate may have harsh economic outcomes. Eichengreen points out that this could then lead to currency crises, which, in return, affect growth negatively. Authorities must focus on minimizing exchange rate volatility for sustainable growth [94]. Consequently, this could be the reason for the negative sign result of the exchange rate for North Cyprus. Controversially, as North Cyprus authorities cannot have an effect on the adopted Turkish Lira, it could be assumed that this negative effect will remain a problem for the economy unless Turkish officials discover a method to reduce the volatility and form a competitive real exchange rate.

Moreover, the number of students reveals a positive impact on economic growth which signifies that international students do contribute to the GDP of North Cyprus. All other variables tested revealed similar results showing positive long-term effects on the economic growth of the country. For this reason, if all the stakeholders collectively focus on improving the efficiency of the variables, sustainable economic growth could be reached.

Once the data were stationary at first difference and in apparent cointegration with at least two variables cointegrated in the long run, it was appropriate to analyze the causation between student numbers, labor, technological change, human capital, exchange rate, government expenditure and GDP in the short-run through the vector error correction model (VECM) [95,96]. In line with the suggestion of Granger [92] we performed variance decomposition impulse response and causality tests.

As it can be seen in Table 4, in the short-run equilibrium, the leading independent variable happens to be human capital, followed by technology. The next most important is labor, followed by international student numbers, government expenditure, and the exchange rate is the least effective. The significance of quality human capital has been addressed in several previous studies [31,61], and our analysis also confirms the worthiness.

**Table 4.** Testing the variance decomposition.

Period	S.E.	D(LGDP)	D(LSTNO)	D(LLAB)	D(TECH)	D(LGSS)	D(EXCH)	D(LGOVEXP)
1	0.035897	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
6	0.050916	80.51703	0.307620	1.257565	1.470090	13.93191	1.768738	0.747054
12	0.070257	43.08652	0.475575	2.754348	5.884468	44.85188	1.382633	1.564576
18	0.126107	14.60030	0.485115	3.842866	8.611329	71.05748	0.455503	0.947407
24	0.327684	3.073113	0.332386	4.028395	9.750170	82.38251	0.087737	0.345684
30	0.873575	1.553078	0.374172	4.287077	9.779582	83.73504	0.032929	0.238118
36	1.957557	1.817170	0.499770	4.387639	9.692457	83.20663	0.025958	0.370371
42	4.958357	1.363212	0.381168	4.114403	9.930739	83.85831	0.024250	0.327914
48	14.15501	1.139086	0.327806	4.206277	9.915520	84.17954	0.024322	0.207448
54	33.65901	1.607799	0.456375	4.410382	9.726644	83.47755	0.024525	0.296723
60	77.67912	1.627308	0.454164	4.220275	9.831368	83.46052	0.024108	0.382252

The corresponding VEC model [87] is:

$$\Delta y_{1,t} = \alpha_1(y_{2,t-1} - \beta y_{1,t-1}) + \varepsilon_{1,t}$$

$$\Delta y_{2,t} = \alpha_2(y_{2,t-1} - \beta y_{1,t-1}) + \varepsilon_{1,t}$$

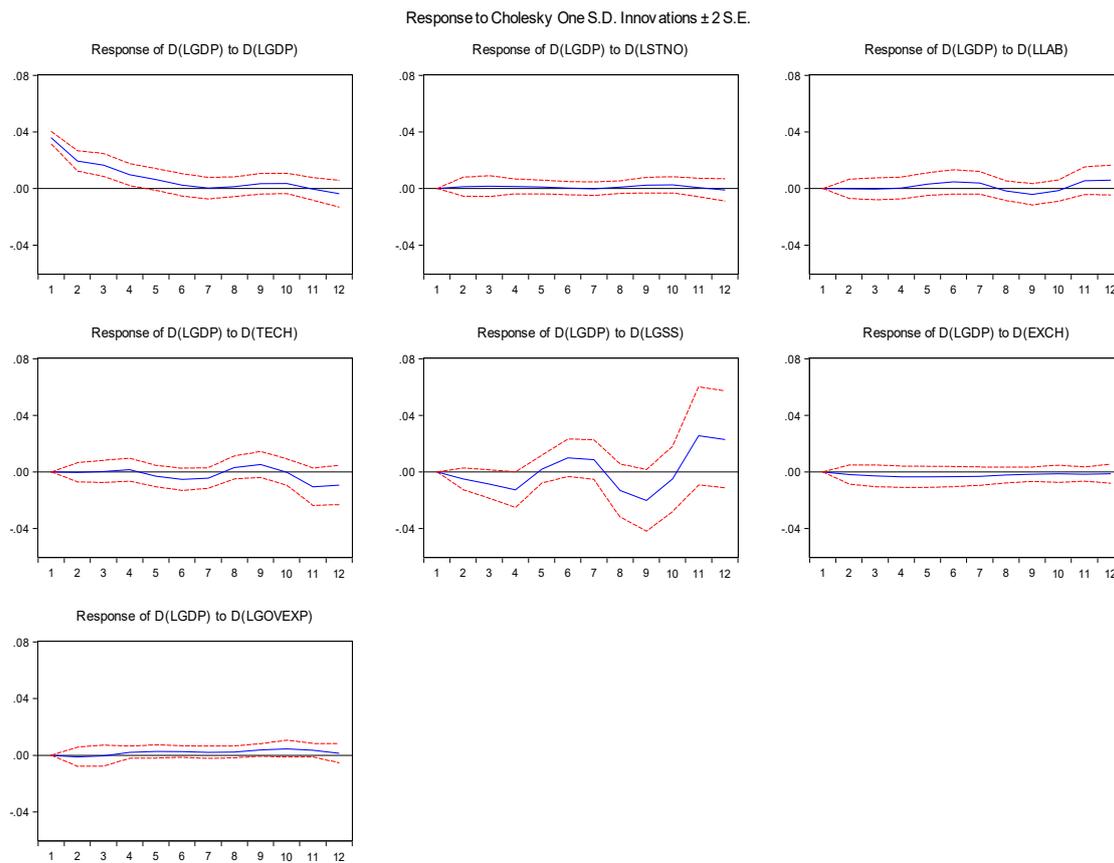
Furthermore, impulse response in the bivariate vector autoregressive modeling may reveal additional confirmation regarding the short-run connection, which could not be tested through the Granger causality test. A particular strength of this is determining whether the shocks are temporary or permanent. As illustrated in Figure 1, the logarithmic response of GDP to GDP as a mirror implies both significant and negative in the fourth period, and positively significant in the seventh period. Similarly, the response logarithm of GDP to a shock from the secondary school enrolment rate is significant and negative in the fourth period.

Illustrated below (Table 5), a bidirectional relationship is apparent between both government expenditure, international student numbers, and GDP.

**Table 5.** Pairwise Granger causality test.

Null Hypothesis:	F-Statistic	Prob.
LSTNO does not Granger Cause LGDP	4.30361	0.0400 **
LGDP does not Granger Cause LSTNO	159.663	0.0000 ***
LLAB does not Granger Cause LGDP	1.86854	0.1740
LGDP does not Granger Cause LLAB	0.12585	0.7233
TECH does not Granger Cause LGDP	1.25176	0.2652
LGDP does not Granger Cause TECH	0.27580	0.6004
LGSS does not Granger Cause LGDP	7.91393	0.0057 **
LGDP does not Granger Cause LGSS	4.00893	0.0473
EXCH does not Granger Cause LGDP	7.93944	0.0056 *
LGDP does not Granger Cause EXCH	0.95776	0.3295
LGOVEXP does not Granger Cause LGDP	4.96038	0.0276 *
LGDP does not Granger Cause LGOVEXP	55.2645	0.0000 ***

\*, \*\* and \*\*\* reject null hypothesis at 1%, 5% and 10%, respectively.



**Figure 1.** Impulse response.

It is visible that student numbers cause an increase in GDP levels. They reflect a bidirectional relationship. Therefore, this signifies an increase in student numbers will be leading to economic growth as well as increasing GDP leading to rising student numbers. Katircioglu et al. found [10] a unidirectional relationship, however, different from this study, they included domestic higher education student numbers in their time-series data. Contrarily, the available labor force, and technology have no causality relationship with GDP. Growing numbers of general high school enrolment rates (human capital) will lead to an increase in GDP for North Cyprus. This could be due to the economy being dominated by the services sector, in which employees require a certain level of education. Reversely, higher GDP will lead to more enrolment rates.

Furthermore, the results point to a unidirectional relationship between the exchange rate and GDP as exchange rate fluctuations will lead to an increase in GDP. Arguably, the devaluation of local currency leads to increased spending levels of most international students because their rising home currency strengthens their purchasing power parity in the host country. Increased spending levels should lead to more tax revenue for the government, which, in turn, leads to higher government expenditure. Furthermore, the results show that government expenditure causes GDP with a bidirectional relationship. Sensibly, spending on infrastructure, education, and health will lead to accumulating quality human capital forming a cycle flow of benefits.

As seen in Table 5, we aimed to discover the causal relationships between all variables of interest in the short-run. Results indicate a shock from technology and labor force does not contribute to GDP. Contrarily, a shock from secondary school and exchange rate causes growth in GDP in the short-run. Moreover, a bidirectional relationship is visible between international students, government expenditure, and GDP.

Presumably, government spending on infrastructure, education, and health helps stakeholders attract more international student tourists. Most significantly, human capital, labor force and

technological progress strongly appear important, which are yet again interrelated. The more educated the workforce is, the higher the chance they would be ready for work and perform more efficiently [52]. The results prove that educated human capital contributes to economic growth.

Our results confirm Gyimah-Brempong et al.'s research since human capital and technological process has been found to have a significant impact on GDP. They tested their effects on GDP per capita [63]. After our results, we agree with Fadaee Khorasgani's analysis since higher education is essential for development [64]. Gani and Clemes's investigation regarding the effect of the services industry on development [12] has also been approved for North Cyprus since higher education sector and tourism are the two primary services sector in North Cyprus. Lee and Chang's results of the exchange rate [67] have not been found to apply for North Cyprus since we found a negative relation to GDP. However, this could be because of the adopted currency. Our results are in line with Eugenio-Martin et al.'s findings regarding the exchange rate since they discovered the exchange rate is not statistically significant for all economies.

Malta is another small Mediterranean island with similar demographic features and also has around 87,000 international students [97] just like North Cyprus. Differently, Malta specializes in English Language schools, yet, until now, the effects of international students on economic growth or sustainable development have not been researched, reflecting a gap in the literature. We propose our model could be applied for Malta to help a strategic plan for longer-term sustainable development.

## 5. Conclusions and Policy Implications

Overall, the results of this research suggest significant implications for all stakeholders, particularly for higher education institutions, governments, and the local citizens due to the importance of the micro and macro-economic variables' effect on the GDP of North Cyprus. It is recommended that stakeholders must sustain enhanced value towards international students for sustainable development of the economy and the services sector. Debatably, high numbers of international students also reflect the openness of an economy since foreign exchange flow increases along with knowledge, know-how, and technology between institutions, locals, and educational tourists. They also aid diversity, acculturation, and shared cultural values contributing to societal means. International higher education students' account for approximately one-third of the general population in North Cyprus, therefore, interconnected bodies should be aware of the short- and long-term effects they have on the local economy.

The tested variables show a contribution to short- and long-run growth of the GDP of a small island state, North Cyprus. They should contribute to improved knowledge via strengthened human capital, continuous technological progress with the help of labor force, increased government expenditure and rising numbers of international students. These would promote research and development that contribute to social stability, therefore, promoting sustainable economic development. The results prove that educated human capital contributes to economic growth. Governments should continue their existing strategy regarding secondary school enrolment rates as it is found to be the most effective variable in the long-run. Consequently, the number of local citizens enrolled in higher education institutions could be used as a measurement of human capital in future research as increased skills would promote quality human capital and labor force. Moreover, since the labor force, technological progress, and government spending also contribute to GDP, government bodies should reform policies and increase spending on infrastructure and education, as well as focusing on educational events for all the actors dealing with students. Additionally, policies must be reformed towards becoming a knowledge economy focusing on research and development, sustainability, and faster sustainable technological progress.

Our results show a negative long-term connection with GDP and the exchange rate. For this reason, the government should form more policies to be less affected by the devaluation of the local currency against foreign currencies. Sensibly, vulnerability against exchange rate volatility must be dealt with for sustainable development.

There are numerous conclusions the authors believe could be drawn from this study. Observably, as the economic conditions of countries vary, classical growth theories do not apply to every country, at least not without augmentation. Consequently, they must be formed after discovering the driving factors and economic conditions of the country studied. The conventional mindset must be replaced with sustainable development perspective. For North Cyprus, this evolutionary growth theory proves internal variables and external tourists' namely international students, play vital roles in economic enhancement. Sustainable economic development is concerned with economic growth as economic failure causes social instability. Noticeably, parallel to the increasing international student numbers, the number of higher education institutions also increases. As a result, extra job opportunities, foreign exchange flow, and an increase in consumption levels also benefit GDP and presumably reduce social instability.

In-depth research of both theoretical and empirical literature revealed conflicting results for different countries as well as changing models and methods chosen by various authors across the globe. We, therefore, preferred to create an evolutionary growth theory and initially tested for causality between numerous variables through secondary data gathered from 1983 to 2017. The evidence discovered of Granger-causality running from international students, secondary school enrolment rates, technological progress, labor, and government expenditure to GDP confirms significant relationships. The exchange rate proved to be different.

Sustainability must involve positive impacts on the economy and society. Literature also asserts the validity of increasing economic growth, technical progress and knowledge should indirectly decrease social instability. Governments must aim to reach both economic growth and sustainable development. This could be difficult as sustainable economic development entails social welfare, environmental protection, and care towards future generations. Economists and decision-makers should aim to balance this growth with harmony. Educating the public and governmental bodies to be more aware of the concept of sustainable economic development could aid sustainability in order for future generations to live in welfare. All humans must collectively search for a mutual path which values the goal of global sustainable development.

We prove short- and long-run positive economic effects of international students, human capital, labor force, government expenditure, and technological progress. Accordingly, this should increase awareness for the government and higher education institutions, which could shed light on further research to investigate the awareness of international students regarding sustainability and perceptions on social and environmental factors.

Our research focused on the economic aspect of sustainable economic development. Future research could examine the environmental awareness of international student tourists, also their direct and indirect effect on the environmental and social aspects of sustainability.

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