

HOLY SPIRIT UNIVERSITY OF KASLIK (USEK)

Economic Growth, the Case of Developed and Developing Economies

by

Richard Hanna Beainy

Supervised by

Dr. Charbel Salloum

Submitted to the

Department of Doctoral Studies

at the USEK Business School

In partial fulfillment of the requirement

For the degree of Ph.D. of Business Administration - Finance

at the

Holy Spirit University of Kaslik (USEK)

Kaslik, Lebanon

March,2023

Copyright © 2023 Richard Hanna beainy

All Rights Reserved

ABSTRACT

The goal of this study is to analyze what can enhance Gross Domestic Product, one of the most important indicators of economic growth, the study analyzes what are the effects of education, technology, innovation and political stability on economic growth.

Keywords:- Gross Domestic Product, Economic growth, Education, Technology, Innovation, Political stability

TABLE OF CONTENTS

Abstract	2141
Introduction	2145
Literature Review	2147
Research Methodology	2152
Results and Discussion	2154
Conclusion	2160
REFERENCES	2161

LIST OF TABLES

Table 1: Sampling Method summarized	2152
Table 2: Research Methodology Summary	2153
Table 3: Argentina, Developing economy	2154
Table 4: Greece, developed economy lower bounds	2155
Table 5: United states, Developed economy upper bound	2155
Table 6: United kingdoms, developed economy upper bound	2156
Table 7: Germany, Developed economy upper bound	2157
Table 8: China, Developed economy upper bound	2158
Table 9: Results Summary	2158

LIST OF FIGURES

Figure 1: Technological advances in terms of computational capacity of computers	2149
Figure 2: GDP increase in the United States of America	2150

CHAPTER ONE

INTRODUCTION

A. Background and Statement of the Problem

Covid-19 ended, new economic challenges began. Painful but fast, was the economy's respond towards Covid-19, but as soon as international economies were recovering, with Covid-19 tamed not yet solved, a new crisis erupted caused by the Ukraine War (Prohorovs, A., 2022) with controllable negative impact on developed economies and uncontrollable impact on economies already in crisis, Gross Domestic Product "GDP" in many countries decreased but in some countries GDP kept increasing and from such countries we learn how to develop a better economy.

B. Purpose of the Study

Some argue that taking a passive approach; economies do fix themselves in the long run.

However, the quick adaptation to Covid-19 in the past proved that people, firms and countries do adapt quickly in the short run and it is the adaptation of individuals and entire economies to challenges, which encouraged us to hasten this study with the purpose of addressing the current risks on economies, more particularly taking into consideration what can be done to developing economies to increase their GDP.

Our analysis will contribute to a better comprehension of the current economic challenges that were, are and may continue in the future in the purpose of building an efficient and effective economy, with policies and solutions that may help policymakers to provide for individuals, not only the infrastructure necessary for the survivability of firms but the ability to meet and use global emerging challenges, that are to be seen as opportunities instead of threats to increase competitiveness.

C. Significance of the Study

Theoretically, developed and developing economies tend to converge on the long run.

Practically, the gap between developed and developing economies in most cases is being widened and differences have been increasing.

The first significance is simple, examining an economic theory's implication on a developed country would render the study purely theoretical as we will fall into the misleading assumption of "Ceteris paribus" as many variables would, in addition to the strategy, affect the county's already well developed economy, but as we compare successful countries to less successful ones, we would be able to, using statistics, understand the differences that are prohibiting developing economies from converging with others and maybe, be able to draw an equation that would help developing economies to get out of the hole and finally have their Gross Domestic Product GDP and more importantly the quality of living of their population increased.

The second significance is the possible use of the theory for developed countries as well, as they also need of the security and immunity provided by the arguments discussed to maketheir economiesimmune to national and international crises, natural challenges like Covid-19 and human caused challenges due to excessive risk-taking and insufficient regulations like the 2007 global financial crisis (Hjertaker, I., &Tranøy, B. S.,2022).

D. Nature of the Study and Research Question

This study taking a fundamental approach does not aim to recreate alphabet for alphabet is already created, instead it aims to increase understanding on how existing theories combined may enhance economies in distress and renders successful economies resistant to adverse events through the use of reliable secondary data mainly from the world bank and the international monetary fund “IMF” while focusing on amplification and contraction effect of multiple variables together.

This effect is well known in the economy as correlation, synergy and compound system (Hu et al., 2022) to answer a research question: how can countries realize a sustainable growth of GDP while considering the scarcity of resources?

CHAPTER TWO

LITERATURE REVIEW

A. Mainstream Literature Review

Many argue that gross domestic product or GDP that is defined as the sum of the total value of all goods and services produced in an economy is one of the best indicators for national economic well-being (Aitken, 2019). But increasing GDP is still as general as an objective as enhancing an economy, so to render the theory more tangible and scientific we examine how GDP is calculated

$$GDP = C + I + G + (X - M) \text{ (Stewart and Budnikova, 2022)}$$

With C as consumer and household spending on goods and services, I as investment spending on productive physical capital, G represents government spending on infrastructure, goods and services, X as export and selling to other countries and M as imports and purchases of goods and services from other countries.

Taking into consideration the paradox that increasing salaries increase consumer spending and investments and thus increase GDP while simultaneously the increase in salaries increases the cost of goods produced, decreases exports and increases imports thus decreases GDP we realize that even though the objective of increasing GDP is clear and simple, the practical implementation is not as simple as the study's objective.

Another road leading to the same destination is economic growth which modern economists argue that can be caused by two specific possibilities, an increase in factors of production and better technology, the former includes land, labor, physical and human capital and the latter includes proper use of technology to produce more outputs using less inputs (Ray and Anderson, 2015)

A third approach is the unemployment rate approach, which measures the health of an economy by the percentage of people that can and want to work but could not find jobs (Hall and Kudlyak, 2022) and although this definition is accurate but analyzing this definition from a macro-economical point of view the definition of an unemployed becomes someone who wants to increase consumer spending, who wants to pay additional taxes for the government and thus enabling the government to spend more and who wants to participate in the economic growth by being productive yet due to an unknown inefficiency he could not find a job. The direct cost of unemployment even though seems negligible or as little as the government unemployment compensation is, as economists we have learned to always look unto the opportunity cost as well, which is immense on both the individual, the society, the government and the economy.

B. Theoretical Framework

In this section, we present prior theories related to methods of calculating and increasing Gross Domestic Product and economic growth while decreasing unemployment rate.

Robert Solow, Nobel prize winner 1987 provided the Solow growth model, which is one of the most significant theories ever written to calculate economic growth. According to the Solow growth model simplified:

$$\text{Economic growth or output or } Y = A \times \sqrt{(E \times L + K)}$$

A represents productivity, ideas and innovation, it's about combining Human capital and physical capital to produce an output

E for education or efficiency

L for labor power

Together E and L represent human capital

K represents physical capital, K is all our factories and tools

The reason why Solow growth model is so important and is good news for stressed economies as in our study, is the simple law of diminishing returns according to which adding more and more capital eventually adds less and less output, which means that countries with already small amount of physical capital can very quickly increase their output even by adding a small amount of physical capital.

But if this is the case, then why some economies like china grew fast to catch up while other economies like Nigeria did not grow this fast and in fact, in some years their economies actually shrank.

Here another theory coexists with the Solow growth model that includes proper institutions like political stability, property rights, honest government, competitive and open markets and a dependable legal system (Zalle, 2019)

In theory this has been proven as countries in Africa have had almost no growth due to political instability, but the translation of the theory into a quantifiable formula is necessary for a scientific study.

Assuming political stability, property rights, honest government, competitive and open markets and a proper legal system are designed by a letter P, P as stability cannot influence directly the level of output and therefore cannot be higher than one, yet it can eliminate growth and due to the logical arguments above P is measured between 0 and 1.

Combining political stability with the Solow growth simplified equation and the below formula which will be called: Richard of Mary's Model for economic growth:

$$Y = [A \times \sqrt{(E \times L + K)}]^P$$

C. Research Context

A theoretical framework without a practical actual context of our times is either history or prophecy but not a scientific research in anyway, therefore we have to consider our current times to properly analyze the theoretical framework.

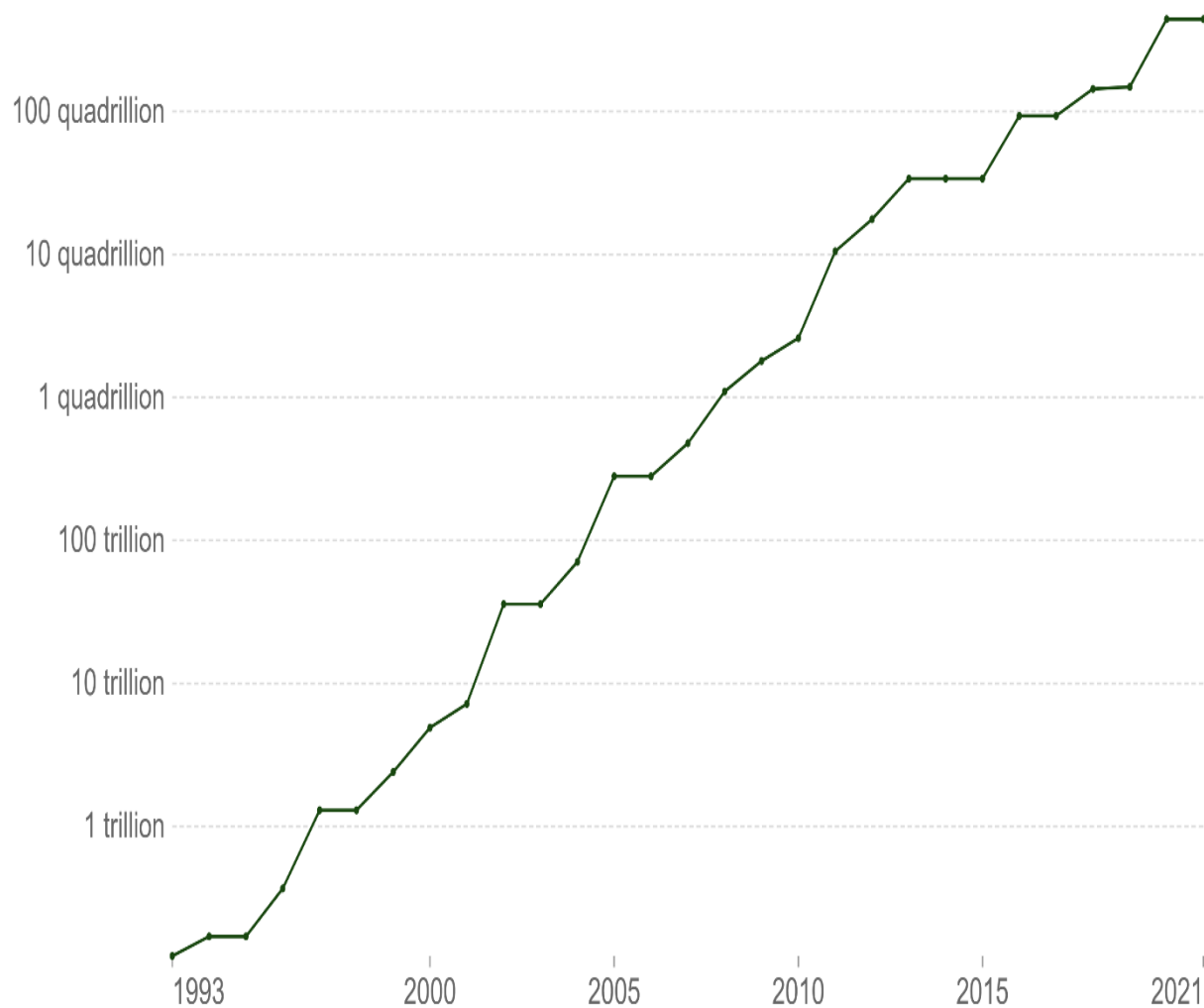
A co-founder of Intel in 1965 Gordon E. Moore scientifically presented a law related to technology that was in the best scenario thought of as it would last a decade, today after more than half a century Moore's law, according to which the number of transistors on integrated circuits will double every two years enabling massive technological advances, still holds (Edward, 2023)

Therefore, technology is growing exponentially, economically speaking this means that economic growth can grow exponentially if the latter efficiently uses the former.

Computational capacity of the fastest supercomputers



Number of floating-point operations¹ carried out per second by the fastest supercomputer in any given year.



Source: TOP500 Supercomputer Database

OurWorldInData.org/technological-change • CC BY

Note: Floating-point operations are needed for very large or very small real numbers, or computations that require a large dynamic range. Floating-point operations per second are therefore a more accurate measure than instructions per second.

1. **Floating-point operation:** A floating-point operation (FLOP) is a type of computer operation. One FLOP is equivalent to one addition, subtraction, multiplication, or division of two decimal numbers.

Fig. 1: Technological advances in terms of computational capacity of computers

Note. According to the above, computer speed multiplier from 1993 to 2021 was one hundred thousand (University of Oxford, 2022)

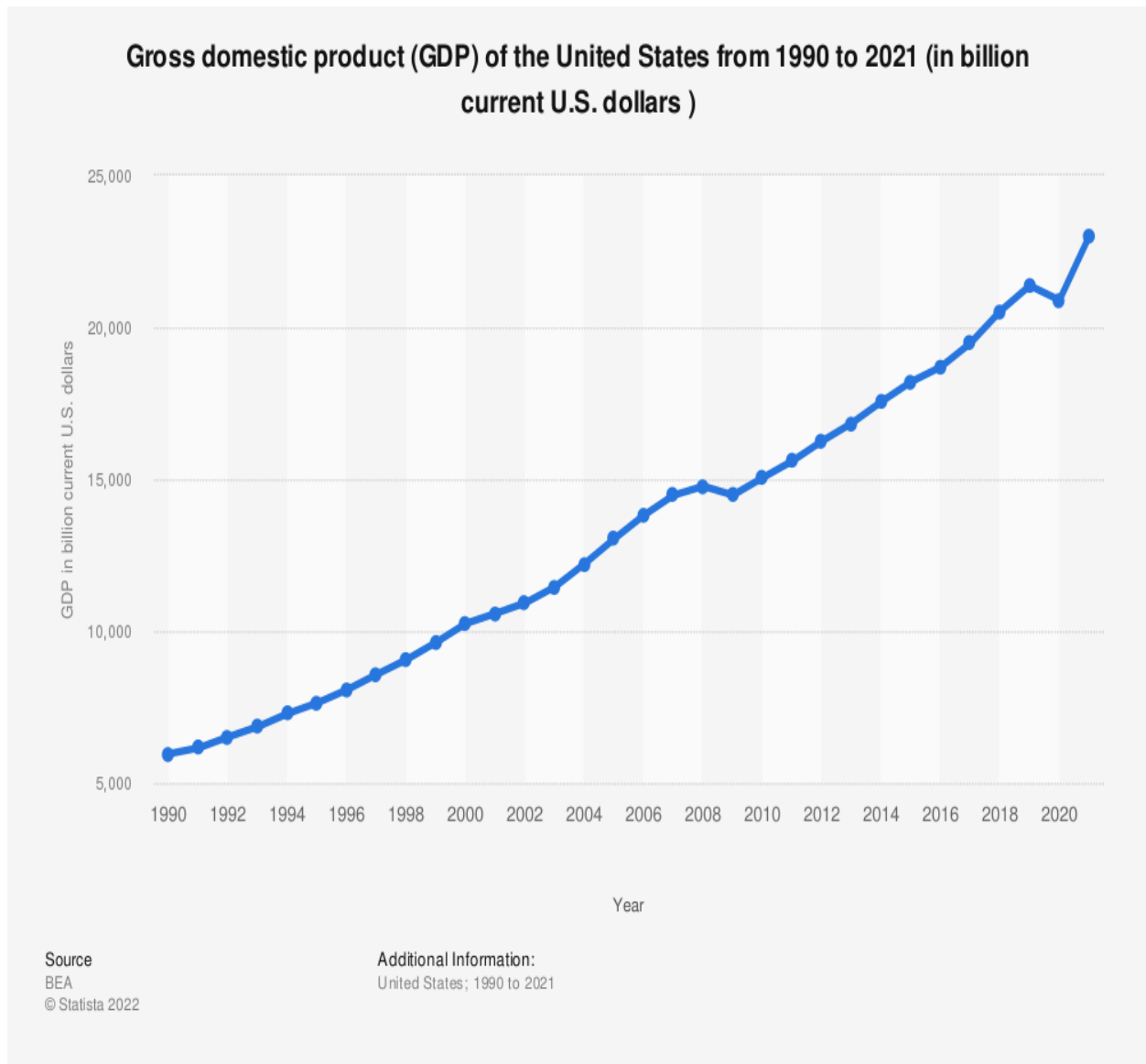


Fig. 2: GDP increase in the United States of America

Note. According to the above, GDP multiplier from 1990 to 2010 was only five while the increase in technology multiplier was over one hundred thousand, there must be another variable significantly influencing economic growth beyond technology (O’Connel, 2022)

D. Hypothesis Development

As the research question how can we build an invincible economy while considering the scarcity of resources is not an easy one, but it sure is an important one due to its potential impact on the life of billions, we therefore draw an objective research hypothesis that is more like a quantifiable mathematical equation rather than a statement.

$$GDP = C + I + G + X - M$$

$$Economic\ growth\ Y = [A \times \sqrt{(L \times E + K)}]^P$$

If C is consumer spending, I is investment spending, G is government spending, X is export and M is import while A is productivity and innovation, L is labor and E is education and k is physical capital while P is political stability we should now to formulate a hypothesis analyze the above two equations for variables that may affect both

- Hypothesis 1 H_1 would be: if consumer spending shifts towards Education the impact on GDP and economic growth would be Significantly positive
- Hypothesis 2 H_2 would be: if investment spending focuses on capital the impact on GDP and economic growth would be significantly positive
- Hypothesis 3 H_3 would be: if the government provided political stability and social security the impact on GDP and economic growth would be significantly positive
- Hypothesis 4 H_4 would be: if investment spending focuses on technology the impact on GDP and economic growth would be significantly positive

CHAPTER THREE

RESEARCH METHODOLOGY

A. Data Collection

The goal of the chapter below is to present the research method that is used to properly verify the validity of the hypothesis stated above

B. Sampling Method

One of the best method to confirm or to refute an argument is using historical data, which will allow us to test if the variables of Education, Politics, Technology and Physical capital have a positive impact on economic growth.

The aim itself is beyond studying a simple significance in influence between the four variables, the goal is to determine which of the four is the most significant and have the most importance and especially in the case of developing economies.

Variables	Impact on A	Impact on B
Technology	Developing economies	Developed economies
Education	Developing economies	Developed economies
Political and Financial system stability	Developing economies	Developed economies
Physical Capital	Developing economies	Developed economies

Table 1: Sampling Method summarized

Note. the goal is to examine the impact of each of the variables according to the economic status, in addition to analyzing the significance of each variable, the correlation and the importance of different variables according to the development of the economy is calculated.

C. Empirical framework and Data Treatment

The statistical method involves quantification of the development of variables into percentages, in this part and the next the study includes designing the data in a way that could be collected and analyzed to draw meaningful interpretation. In other words, the goal of the statistical method is to be able to collect and process data in a way that could provide significant patterns to report the research findings, to analyze the usefulness of each of the variables, whether through a direct significant effect on the economy or through a direct effect on other variables that would indirectly influence economic growth

The research type is empirical, which needs to draw conclusions and equations from historical statistics to be able to achieve a qualitative strategic objective of increasing the quality of living for humans through the use of quantitative data, technology and sciences.

D. Variable Characteristics and Measurement Scale

Research Type	Empirical
Hypothesis 1	Effect of Labor skills and education on economic growth
Hypothesis 2	Effect of Capital and manufacturing on economic growth
Hypothesis 3	Effect of Political stability and proper financial system and regulations on economic growth
Hypothesis 4	Effect of technology and innovation on economic growth
Approach	Quantitative
Branch of Science	Statistics – Regression Analysis
Data Collection method	Governmental Secondary Data
Time Scale	Up to 63 years

Table 2: Research Methodology Summary

Note. It has been known in finance that whenever a giant need to be compared to a mouse, common size analysis which involves transferring numbers into percentages is used and this is exactly what needs to be done to be able to properly compare huge economies to small economies

CHAPTER FOUR

RESULTS AND DISCUSSION

Information presented in this chapter have a maximum input of 63 years and a minimum input of 8 years, this decrease in input is a result of a reliability study, for years where the data were unreliable according to the world bank where not used in the below tables.

The Null Hypothesis H_0 , is that education, innovation and technological advance, political stability and investments in Capital assets have no significant impact on GDP

A. Results

<i>Regression Statistics</i>		
Multiple R	0.892	
R Square	0.795	
Adjusted R Square	0.678	
Standard Error	0.079	
Observations	12.000	

<i>Significance F</i>
0.015

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4.000	0.172	0.043	6.796
Residual	7.000	0.044	0.006	
Total	11.000	0.216		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-0.668	1.189	-0.562	0.59
Education Exp % GDP	-0.044	0.098	-0.450	0.67
R&D Innovation exp % GDP	-0.913	1.221	-0.748	0.48
Government Effectiveness/world bank	0.024	0.015	1.583	0.16
Capital Assets and manufacturing output	0.000	0.000	1.356	0.22

Table 3: Argentina, Developing economy

*Note.*With a significance level of below 0.05 yet with P-values above 0.05 we fail to reject the null hypothesis H_0 , and even though the model provides a better fit than the intercept-model only, yet we cannot significantly deduct that any of the independent variables alone has the significant impact on GDP, it is therefore deducted that all independent variables need to move together to impact GDP significantly in the case of the developing country of Argentina.

<i>Regression Statistics</i>	
Multiple R	0.950985569
R Square	0.904373552
Adjusted R Square	0.776871622
Standard Error	0.07181438
Observations	8

<i>Significance F</i>
0.069686009

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4	0.146323443	0.036580861	7.09301853
Residual	3	0.015471915	0.005157305	
Total	7	0.161795358		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.181	1.922	0.094	0.931
Education Exp % GDP	-0.220	0.252	-0.872	0.447
R&D Innovation exp % GDP	0.229	0.606	0.378	0.731
Government Effectiveness/world bank	0.016	0.018	0.865	0.451
Capital Assets and manufacturing output	0.000	0.000	-1.010	0.387

Table 4: Greece, developed economy lower bounds

Note. With a significance level and p-value of above 0.05 we fail to reject the null hypothesis H₀, according to which the independent variables of education, technology, political stability and Capital investments have no significant impact on GDP in the case of Greece.

<i>Regression Statistics</i>	
Multiple R	0.921887261
R Square	0.849876122
Adjusted R Square	0.793579668
Standard Error	0.010553369
Observations	12

<i>Significance F</i>
0.001172398

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3	0.005044035	0.001681345	15.09644141
Residual	8	0.000890989	0.000111374	
Total	11	0.005935023		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.353	0.265	1.335	0.219
R&D Innovation exp % GDP	-0.232	0.035	-6.686	0.000
Government Effectiveness/world bank	0.002	0.003	0.723	0.490
Capital Assets and manufacturing output	0.000	0.000	2.702	0.027

Table 5: United states, Developed economy upper bound

Note. With a significance level and p-value of below 0.05 we successfully reject the null hypothesis H_0 , according to which the independent variables of education, technology, political stability and Capital investments have no significant impact on GDP in the case of the united states, the most important variables according to P-value are R&D and technology, as well as investments in Capital and manufacturing assets.

<i>Regression Statistics</i>	
Multiple R	0.626119475
R Square	0.392025597
Adjusted R Square	0.044611653
Standard Error	0.093862095
Observations	12

<i>Significance F</i>
0.415651756

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4	0.039765611	0.009941403	1.128410656
Residual	7	0.06167065	0.008810093	
Total	11	0.101436261		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	1.914	4.052	0.472	0.651
Education Exp % GDP	0.035	0.090	0.382	0.714
R&D Innovation exp % GDP	-1.273	1.049	-1.214	0.264
Government Effectiveness/world bank	-0.004	0.032	-0.128	0.902
Capital Assets and manufacturing output	0.000	0.000	1.096	0.309

Table 6: United kingdoms, developed economy upper bound

Note. With a significance level and p-value of above 0.05 we fail to reject the null hypothesis H_0 , according to which the independent variables of education, technology, political stability and Capital investments have no significant impact on GDP in the case of the United Kingdoms.

<i>Regression Statistics</i>	
Multiple R	0.941854773
R Square	0.887090413
Adjusted R Square	0.774180825
Standard Error	0.036211658
Observations	9

<i>Significance F</i>
0.035366852

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4	0.041209172	0.010302293	7.856643824
Residual	4	0.005245137	0.001311284	
Total	8	0.046454309		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.486	0.936	0.519	0.631
Education Exp % GDP	0.077	0.162	0.476	0.659
R&D Innovation exp % GDP	-0.531	0.303	-1.755	0.154
Government Effectiveness/world bank	-0.002	0.010	-0.200	0.851
Capital Assets and manufacturing output	0.000	0.000	3.796	0.019

Table 7: Germany, Developed economy upper bound

Note. With a significance level and p-value of below 0.05 we successfully reject the null hypothesis H_0 , according to which the independent variables of education, technology, political stability and Capital investments have no significant impact on GDP in the case of Germany, the most important variables according to P-value are investments in Capital and manufacturing assets, followed insignificantly by R&D and technological advances.

<i>Regression Statistics</i>	
Multiple R	0.891053353
R Square	0.793976077
Adjusted R Square	0.629156939
Standard Error	0.044226305
Observations	10

<i>Significance F</i>
0.057508199

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4	0.037689561	0.00942239	4.817256579
Residual	5	0.00977983	0.001955966	
Total	9	0.047469391		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	1.363	0.441	3.093	0.027
Education Exp % GDP	0.053	0.042	1.264	0.262
R&D Innovation exp % GDP	-1.065	0.307	-3.469	0.018
Government Effectiveness/world bank	-0.001	0.004	-0.301	0.775
Capital Assets and manufacturing output	0.000	0.000	2.684	0.044

Table 8: China, Developed economy upper bound

Note: With a significance level of 0.057 just above 0.05 we fail to reject the Null hypothesis H_0 even though the p-values are below 0.05 in both technological advances and innovation as well as Capital assets investments, if we had been using a confidence level of 94% we would have successfully rejected the Null hypothesis.

B. Discussions

	H1 – Significant impact of Education	H2 – Significant impact of Capital investments	H3 – Significant impact of Political stability	H4 – Significant impact of technology and innovation
Argentina, Developing economy	○	○	○	○
Greece, Developed economy lower bound	○	○	○	○
United States, Developed economy upper bound	○	YES	○	YES
United Kingdom, Developed economy upper bound	○	○	○	○
Germany, Developed economy upper bound	○	YES	○	○
China, Developed economy upper bound	○	YES	○	YES

Table 9: Results Summary

Note. In the developing economy of Argentina, no single variable had a Power of below 0.05 to be able to solely and significantly impact GDP, yet the sum of variables together had a significance of below 0.05 which means that in developing economies, many conditions need to be achieved simultaneously to impact GDP.

Technology and innovation was the most important factor influencing GDP of China and the United states in terms of power of significance, followed by the degree of Capital investments in the latter, also the GDP of Germany, a developed country was significantly influenced.

C. Limitation and Further Research

How rare is it that the economy of Argentina, was significantly influenced by the sum of independent variables, yet influenced to a lesser extent by each of the variables alone, three times was the analysis repeated and providing the same results which implied that further research is needed to understand the paradox of GDP in developing economies.

In the case of developed economies, results were much more straightforward and obvious as research and development are the major important variables in the two largest economies in the world, the United States and China.

CHAPTER FIVE

CONCLUSION

In terms of major findings, it became apparent that for economies to increase their GDP, the first and shortest method is to increase investment in Capital assets and manufacturing equipment, only after due to the law of diminishing value the impact of the latter becomes low, a country ought to increase investments in innovation and research and development.

Theoretically speaking, the Solow growth Model to measure economic performance proved to be useful and important even though incomplete, as it does need to weight the variables according to their importance and to add some more variables as political stability.

In terms of practical implementations, developing economies ought to launch a carefully weighted campaign to increase simultaneously, the quality of education, political stability, investments in capital assets and innovation, it is to conclude that the collective impact of the variables mentioned together would be enough to increase GDP and thus the quality of living in developing economies.

REFERENCES

- [1.] Prohorovs, A. (2022). Russia's War in Ukraine: Consequences for European Countries' Businesses and Economies. *Journal of Risk and Financial Management*, 15(7), 295.
- [2.] Hjertaker, I., & Tranøy, B. S. (2022). The dollar as a mutual problem: New transatlantic interdependence in finance. *Politics and Governance*, 10(2), 198-207.
- [3.] Mu, X., Kong, L., Tu, C., Chen, J., & Hu, G. (2022). Correlation and synergy analysis of urban economy–energy–environment system—A case study of Beijing. *Natural Resource Modeling*, 35(1), e12329.
- [4.] Aitken, A. (2019). Measuring Welfare Beyond GDP. *National Institute Economic Review*, 249, R3-R16. doi:10.1177/002795011924900110
- [5.] STEWART, E. T., & BUDNIKOVA, A. S. (2022). Methods of calculating GDP. In *ПРОБЛЕМЫ РАЗВИТИЯ СОВРЕМЕННОГО ОБЩЕСТВА* (pp. 20-22).
- [6.] Ray, M., & Anderson, D. (2015). *Krugman's economics for AP®*, (adapted from *Economics*, by Paul Krugman and Robin Wells). Worth Publisher.
- [7.] Hall, R. E., & Kudlyak, M. (2022). The unemployed with jobs and without jobs. *Labour Economics*, 79, 102244.
- [8.] Zallé, O. (2019). Natural resources and economic growth in Africa: The role of institutional quality and human capital. *Resources Policy*, 62, 616-624.
- [9.] Edwards, C. (2023). Scaling at 3nm and Beyond.
- [10.] Connie O. C. (2022). GDP by country, metro and other areas. Bureau of economic analysis (BEA) (Washington, DC: BEA [2022]) URL:
- [11.] <https://www.bea.gov/data/gdp/gdp-county-metro-and-other-areas>
- [12.] International Financial Statistics. (2023). *World Indicators: 1960-2021* [Data set]. World bank.
- [13.] <https://data.worldbank.org/indicator>
- [14.] International Financial Statistics. (2023). *World Governance Indicators: 1996-2021* [Data set]. World bank.
- [15.] <https://info.worldbank.org/governance/wgi/>
- [16.] World indicators of skills for employment (2023). *World Governance Indicators: 1996-2021* [Data set]. Organization for economic Co-operation and development
- [17.] <https://stats.oecd.org/Index.aspx?DataSetCode=WSDB>