

# A Comparative Analysis of the Economic Growth Paths of South Africa and the United Kingdom

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**Abstract:** This study compares the economic growth paths of the United Kingdom and South Africa by exploring the determinants of economic growth and examining how those determinants affected the macroeconomic performances in the two countries in 1945 and 1961, which are two defining years for both countries, and thereafter. In order to ensure its validity, the majority of the data is taken from the database of the World Bank, one of the world's most authoritative statistical bureaus. The study also inquired into the political and social backgrounds of the two countries, which helps to reveal how and how rapidly they grew. Apart from that, the paper also utilized the Solow Growth Model—a neoclassical model for predicting future economic growth—to analyze the respective economic profiles of the two countries systematically, which can serve as a reference for decision makers to generate proper solutions for the slow growth in certain countries.

**Keywords:** Long-Run Economic Growth; the United Kingdom; South Africa; Policy

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## 1. Introduction

Economic growth is defined as a long-run process that occurs as an economy's potential output increases (Curtis and Irvine 2017, 384) <sup>[11]</sup>, and it is widely desired by all countries around the world. Since growth is understood to be so important, comprehending its determinants as well as how such factors influence economic growth help governments enact policies that maximize the economic growth rate. Meanwhile, studying the economic history of various countries enables us to identify their flaws in decision-making, thereby empowering governments to minimize the likelihood of repeating past failures. In light of these facts, the economic growth paths of different countries deserve in-depth research.

The countries that will be analyzed in this paper are the United Kingdom and South Africa. I chose these two countries because both of them have had marked booms and recessions in the history. The United Kingdom used to be the most powerful country in the world in terms of economic strength. However, its growth slowed down in past decades, and has even fallen behind many developing countries on the aspect of real GDP. South Africa, once a British colony, experienced long periods of steady and promising growth centuries ago due to its complete integration into the world's capitalist economy from 1770 to 1870 (Mabin et al 2021) <sup>[20]</sup>. Nonetheless, its economy started to falter from 1980 onward and did not prosper again even after a new liberal government took charge in 1994 (South African Government 2019) <sup>[35]</sup>. Since their histories are intermingled and also closely mirror each other, studying the two countries makes it possible to observe the results of different but correlated economic actions.

As for geographical features, South Africa is located at the southernmost point of the African plateau, with coastal lowlands in the south, east and west and mountains in the north. The country is bordered by Namibia, Botswana, Zimbabwe, Mozambique and Swaziland to the north, and encircles Lesotho in the middle, making it the largest “country within a country.” South Africa is surrounded by the Indian and Atlantic oceans on the east, south and west. The Cape of Good Hope route, at its southwest end, has always been one of the busiest sea routes in the world and is known as the “lifeline of the West Sea.” (Mabin et al 2021) <sup>[20]</sup>

South Africa is also characterized by its rich linguistic diversity, which stems from the variety of races in the country. According to the South African government, the country is multilingual, with eleven official languages all guaranteed

equal status. Nationally, over one quarter (25.3%) of individuals spoke isiZulu at home, while 14.8% of individuals spoke isiXhosa, and 12.2% spoke Afrikaans. English, a widely used language around the world, was only sixth among the most commonly spoken languages in South Africa (South African Government 2019) <sup>[25]</sup>.

Likewise, the United Kingdom is also a country with excellent geographic assets for development. It is surrounded by sea, but to a greater extent compared with South Africa. The North Sea is on its east and the country faces Belgium, the Netherlands, Germany, Denmark and Norway on the same direction. Iceland can also be reached in the Atlantic to the north, while France is 33 kilometers south across the English Channel (Chaney et al 2021) <sup>[7]</sup>.

Britain has a diverse culture and economic composition. Just take its capital London as an example. World Bank identifies London as the world's largest financial center, controlling 45% of total foreign exchange trading (2.7 trillion USD daily on average) and the pricing power of gold, silver, crude oil and other commodities (World Bank 2021) <sup>[1]</sup> (if not specifically noted, all data below is from World Bank 2021). It is also the world's largest banking, insurance, futures and shipping center, while it ranks second on the aspect of total wealth of residents.

In the following sections, we will first discuss the political and socio-economic history of the two countries over the past centuries. Second, their macroeconomic performances, including indicators such as life expectancy and the performances of various sectors, are going to be examined and compared. Third, this paper will also assess the countries' potential for future economic growth, including the current availability of natural resources, and multiple possibilities for their future growth paths. Fourth, the Solow Growth Model will be introduced to analyze the economy of the United Kingdom and South Africa systematically, which serves as a way of explaining why or how the booms and the recessions occurred. Lastly, based on the above analysis, some policies on growth enhancement are recommended and details on how such policies could benefit a developing economy are discussed.

## **II. The Countries**

### **2.1 Political Information**

The political histories of the two countries are both complicated and close-knit, with many interactions. In the course of dynastic changes, colonial movements, and numerous other events, they altered their style of the government and changed people's living standards.

#### **2.1.1 A Brief Political History of the Two Countries**

When Charles I was executed in 1649, England was proclaimed to be a republic (Cooper 2014) <sup>[10]</sup>. After several turbulent decades, in 1689, Parliament approved the Bill of Rights, establishing the Constitutional Monarchy which continues to be the United Kingdom's form of government (the British Government 1978) <sup>[3]</sup>.

About two centuries later, Britain's major contemporary political parties started to emerge, with the Conservative Party and the Liberal Party emerging from a 19th century realignment of the Whig and Tory parties. In 1945, right after the Second World War, British politics entered a new era when the newly dominant Labor Party began to devote major efforts to promoting social welfare rather than focusing on international politics, as the Conservative Party had done. From 1945 to the 1970s, the two parties continued to dominate British politics. However, in February 1974, the Liberals won 19% of the vote nationally, and after that point, many different political parties started to flourish (Lauderdale 2015) <sup>[17]</sup>. Regular transfers of power and hearing the voices of some minor parties helped to develop a multiparty political system in the United Kingdom which later made government decisions more efficient.

Unlike the United Kingdom, South Africa began its political history in the form of a colony. In the 1600s, the first European settlers, the Dutch East India Company, established a colony in Table Bay, Cape Town today (South African Government 2019) <sup>[24]</sup>. During early colonizing activities, they imported a huge number of slaves from East Africa, while dislodging the aboriginal people, the San people (Bushmen), from South Africa. Since the Netherlanders, known as "the Boers," occupied the whole area, they started to recognize themselves as the real locals. When the British arrived in the

1800s, clashes with the Boers led to the Boer Wars, which resulted in the British establishing a coalition government with the Boers called the Union of South Africa in 1910 (Pretorius 2011) <sup>[30]</sup>.

The coalition involved only white people, leaving out the colonized races, who began to unite in opposition to its rulers. In 1948, apartheid was established as a major national policy, and discriminatory practices increased over the next two decades, inspiring the black protestant organization, the African National Congress (ANC), to abandon its long-standing commitment to non-violent resistance and turned to armed struggle. In the 1980s, the South African Government reformed some of its segregationist policies under great pressure both domestically and internationally. In April 1994, South Africa held its first democratic election, when Nelson Rolihlahla Mandela, along with some other leaders of the ANC, became the first colored presidium in South Africa's history (Blakemore 2021) <sup>[4]</sup>. Today, South Africa is a parliamentary republic with a three-tier government, a multiparty political system, and a fixed-term presidency (South African Government 2019) <sup>[35]</sup>.

## 2.1.2 Current Political Systems and Corruption Measures

The current political system of the United Kingdom is a classic constitutional monarchy. While Elizabeth II holds the title of monarch, it is the central Parliament that actually enacts nation-wide policies, with national assemblies in Scotland, Wales, and Northern Ireland. Likewise, to the form of parliament, the UK government system contains devolved institutions. Though they have to strictly follow the instructions of the UK Government, these regional ones still have the authority to impose taxes which fund a range of community services (Chaney et al 2021) <sup>[7]</sup>.

As a former colony of the United Kingdom, South Africa's first constitution was based on a parliamentary system with the British monarch as head of state. On the contrary, the present constitution defines the country as a sovereign democratic state founded on the principles of human dignity, non-racialism and non-sexism, seeking the achievement of equality and the advancement of human rights and freedoms. The government is also meant to be a "cooperative," with national, provincial and local levels cooperating with and supervising one another (Mabin et al 2021) <sup>[20]</sup>. In reality, many chiefs of rural counties, who are regarded as supporters of tradition, still wield enormous administrative power. In more suburban areas, the provincial governments exercise authority (Mabin et al 2021) <sup>[20]</sup>. Since governments all have flaws, the only Worldwide Governance Indicator to be considered here is the control of corruption (aggregate and individual governance indicators evaluate six dimensions of governance: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law and control of corruption). The Worldwide Governance Indicator measures corruption in two ways: (1) in the indicator's standard normal unit, ranging from approximately -2.5 to 2.5, and (2) in percentile rank terms from 0 to 100, with higher values corresponding to better outcomes (World Bank: WGI Interactive 2020) <sup>[39]</sup>. For South Africa, its estimates for the control of corruption vary from -0.1 to 0.1 in the past decade, rather moderate performances. However, its performances in the nineties make it obvious that the South African Government has been becoming increasingly corrupt, since the figure was only 0.7 in 1996. Compared to other countries worldwide, the country's percentile rank was about 62.4 in 2010; however, in 2019, it declined to 59.6, a slight drop. The United Kingdom had a much better as well as a more organized government than South Africa did. In 1996, the figure was 2.0. Though decreasing, it was still 1.8 in 2019, with a percentile rank of 93.8.

Both this data and their political histories suggest that the United Kingdom possesses a much more developed system of government than South Africa does, indicating that the policies enacted by the UK Government are likely to be more sensible, thereby enabling the country's economy to develop more smoothly in the long run.

## 2.2 Socio-economic Information

In the 1860s, the Industrial Revolution led Britain's socio-economic situation to skyrocket along with its production level. The English population tripled and real income rose, making Britain one of the wealthiest countries in the world. Industries such as cotton, potteries, foundries and steel were transformed. The application of new technologies lessened the number of people working in the primary sector (the agricultural sector), from 70% to 80% of its citizens to

about 21%, while the other two sectors dominated the outstanding 79% (Clark 2007, 193-94) <sup>[9]</sup>. Seventy years after the end of the Industrial Revolution, in 1900, over half of the labor force was working in the secondary sector (the manufacturing sector), along with a marked rise in employment in the tertiary sector (the service sector).

As productivity grew, life expectancy rose. Before the industrial revolution, the average life expectancy of British people was around thirty-five years. By the end of the eighteenth century, the figure increased to about forty (Lambert 2021) <sup>[16]</sup>, a rise which continued until a setback due to the COVID-19 epidemic. The reduced mortality rate corresponded to an increase in healthcare spending by the government from 3.5% to over 7% of real GDP in the twentieth century (Stoye and Zaranko 2019) <sup>[36]</sup>.

Another indicator that assesses a nation's socio-economic development is the Human Development Index (HDI), which was created by the United Nations (UN) to emphasize that people and their capabilities, not economic growth alone, should be the ultimate criteria for assessing a country's general development. The HDI is a summary measure of the average achievement in key dimensions of human development: a long and healthy life, a good education, and a decent standard of living (United Nations Development Program, n.d.)<sup>[12]</sup>.

After growing for centuries, Britain's HDI already looked strong when the measurement was first established in 1990. The index improved from 0.78 in 1990 to 0.93 in 2019 with a percentage rise of approximately 19.2% (United Nations Development Program 2021) <sup>[13]</sup>. The HDI of a country is closely related to its school enrollment rate, which also reflects the literacy rate. The net school enrollment rate (primary) in Britain remained above 90%, falling to below 95% only in 1984 and 1985. In recent years, school enrollment has been over 99.5%, indicating the vast majority of the population receiving at least a primary education.

However, there are fewer hopeful aspects of Britain's short-run economic growth. One is the widening income gap between the rich and the poor, which is measured by the Gini Coefficient: a statistical measure of income or wealth distribution. The Gini Coefficient ranges from 0 (0%) to 1 (100%), with 0 representing perfect equality and 1 representing perfect inequality (US Census 2016) <sup>[5]</sup>. Britain's Gini Coefficient was below 34% before 1990, but later rose by nearly 11% to a peak of over 38% around 2000. The figure then zigzagged with a downward trend, suggesting the possibility that government measures were implemented to address the problem of income distribution. In the recent ten years, Britain's figure returned back to its initial level of the seventies and eighties, then climbed upward with fluctuations to as high as 35% by the end of 2015.

Due to its colonial background, South Africa developed in much the same route compared to the UK, though later. Like mentioned in section 2.1., the Dutch East India Company was the first group of Europeans to arrive on the South African land and found it to be a mostly self-sufficient agricultural society. After that, Britain seized the Cape Colony during the Napoleonic Wars in 1806, and later developed the country as a strategic base for it to conquer India. As the mission was fulfilled, the colonists began regarding the Cape Colony as a resource base for Britain's domestic developments, omitting the comprehensive developments of South Africa as an individual economy. During the early years of the Commonwealth, government interventions and policies of segregation continued to foster stable economic growth that benefited the white minority. However, the black majority was restricted to manual labor, causing great income inequality (Mabin et al 2021) <sup>[20]</sup>. The Gini Coefficient figures of this period were all over 57, increasing at points to above 65.

Even after South Africa left the Commonwealth in 1961, white dominance didn't end until the first democratic election in 1994. Though still under the rule of the white minority, during this period, socio-economic indicators and average living standards actually improved on an overall account. The average death rate dropped continuously from 17.4 people per thousand in 1960 to a low of about 8 people per thousand; in addition, life expectancy rose to nearly 64 years in 1993.

In terms of the Human Development Index (HDI), South Africa improved much more slowly than Great Britain. The HDI started at 0.62 in 1990, grew consistently for ten years at a rate of 6.55%, declined briefly from 2012 to 2013, then rose at an unprecedented speed (United Nations Development Program 2021) <sup>[12]</sup>. This trend reflects the

government's greater care for its citizens; however, the literacy rate did not match the HDI. It grew steadily and rapidly during the period of white dominance and the early days of the new liberal government to a rate of over 90% in 2008, improved more slowly to 95% in 2015, and suddenly fell to less than 87%. Nonetheless, it is still possible that this is an ordinary fluctuation, and the literacy rate will increase and begin to grow again in the near future.

## 2.3 Summary

In the previous section, we have viewed a survey of the political and socio-economic history of both South Africa and the United Kingdom. After looking at the big picture, it becomes obvious that by all means, South Africa has a much less developed social structure and distribution of resources compared to Britain. Among all gaps, the two most conspicuous problems of South Africa at present are life expectancy at birth and income inequality: South Africa ranked 167 out of 193 countries worldwide while Britain ranked 29 for life expectancy (United Nations World meter 2020)<sup>[18]</sup>; South Africa ranked last among 159 countries while the United Kingdom ranked 44<sup>th</sup> in terms of income inequality. Such discrepancies were attributed by the UN to the existing discrimination in society as well as corruption inside the administrative system.

## III. Economic Profile

### 3.1 The Purpose of an Economic Analysis

An economic analysis is a study of the economic variables and the ways they affect the functioning of a country, an organization, or any other group, for the purpose of more sensible decision-making. Since every country in the world is affected by internal or external factors when it comes to economic growth, doing an economic analysis helps to examine the possible opportunities or threats to a country's future development. At the same time, it also helps the administrator of the government to evaluate their decisions and policy enactments in terms of financial feasibility, which can later enhance growth.

### 3.2 Country Performance Indicators

In this section, various macroeconomic indicators will be examined and compared for the two countries. For Britain, its economic activities starting from the post-war (World War II) period will be scrutinized, in which we are able to observe their onerous paths of growth. For South Africa, the starting point should be 1961, when the Republic was then established.

After viewing different indicators such as the real GDP, we are able to grasp a basic understanding of the economic states of the two countries and learn more about what types of foundations they laid for their respective developments today. Moreover, it will also be easier for us to discover the ways Britain influenced the growth patterns of South Africa, as well as the reasons behind their fast or slow growth.

#### 3.2.1 Macro Performance

After the Second World War, the United Kingdom accumulated a considerable amount of national debt due to running a budget deficit during the war. The national debt of Britain reached as high as 230% of its annual GDP in the late 1940s (Office for Budget Responsibility 2017) <sup>[29]</sup>. Meanwhile, the United States launched the Lend- Lease policy, retracting funds needed for the UK to pay off its debt (Cairn cross 2013, 3-4) <sup>[6]</sup>. In response, Britain enacted a rationing system, along with a new welfare system by the Labor government. Therefore, its unemployment rate was exceptionally low, showing a rather encouraging trend of growth in general living standards.

In the sixties, the British economy maintained steady growth. The economic growth rate each year varied between 0.25% and nearly 5% while GDP per capita improved from \$13,934 (constant 2010 USD) in 1960 to \$17,341 (constant

2010 USD) in 1969, a total increase of 24.5%. This steady growth was believed to be the result of multiple reasons, such as booms in private car industry, pop music industry (Pettinger 2010) <sup>[26]</sup>, etc. However, hidden problems existed. Along with the problem of lacking innovation was the aggravated labor-employment relationship: although there were not too many working days lost due to strikes during the sixties, the lost working days did suggest an upward trend, which later led to three major strikes in the seventies and eighties. The lost working days did not return to a normal level until 1990—thirty years later (Office for National Statistics 2015) <sup>[37]</sup>. Other problems include lacking a self-contained infrastructure.

With a more independent white-ruled government, South Africa in the sixties injected a greater government intervention in the economy, considered to be an adoption of the British Keynesian methods. The apartheid government restricted outflows of currencies as well as international trade. Consequently, government spending increased, due to an inevitably increasing economic sophistication of the country's public sectors, and later on, an increase in aggregate demand. As reflected in data, government expenditure (%GDP) increased from 12% in 1960 to 35% in 1993 when apartheid fell. The country also devoted part of that increased expenditure to national defense, which was meant to stabilize the country through covert military operations (Koch and Schoeman 2005, 193-94) <sup>[15]</sup>, stimulating a 30% increase in real GDP within the decade. The South African economy did not stop expanding until 1971; if we count in 1960, that was an eleven-year period of steady and high-speed growth.

The seventies and eighties were difficult for the British Empire. In the early seventies, Britain experienced a period of rapid growth, namely the Barber Boom, due to the government running expansionary policies. However, such policies were not accompanied by the same growth in productive potential, causing inflation later on. The inflation rate in the United Kingdom remained above five percent in the seventies and the early eighties, reaching up to as high as 24% in 1975. Contemporarily, three large-scale strikes took place respectively in 1972, 1979 and 1984 (Office for National Statistics 2015) <sup>[37]</sup>. Under such circumstances, the high rate of inflation, together with an increase in unemployment, led to "stagflation," meaning both inflation and high unemployment (Nelson and Nikolov 2004, 294) <sup>[23]</sup>. Growth rate of GDP per capita once dropped to -2.54% in 1974 and -1.47% in 1975, and it later fell below -2% at the beginning of 1980s.

In response to this severe situation, the UK Government planned to firstly adjust inflation using contractionary policies. Though it did achieve its first objective, the recession deepened, causing massive unemployment. The unemployment rate increased from 5.4% in October 1979 to 11.9% in May 1984, which implies a total of three million people being unemployed. Trying to recover from the recession, the British Government not only focused on raising aggregate demand, but more on increasing the potential growth of the economy through supply-side policies, including deregulation, privatization, and reforming the labor market (Pettinger 2017) <sup>[28]</sup>. As a result, inflation did not rise much in the late eighties, averaging approximately 5%. Following this recovery, the British economy entered the Lawson Boom, in which the annual growth of GDP per capita was consistently above 2%.

Similarly, to the UK but in contrast to its previous growth, the growth pattern of South Africa in the seventies and eighties was rather tortuous. GDP per capita growth was volatile: though per capita GDP once went up during the seventies, by the end of the decade, the figure returned to \$6,470 (constant 2010 USD), close to the level in the sixties. Recessions occurred intermittently throughout the 1980s, but the most severe one took place in 1989, and continued itself until the early 1990s. The main reason was the deficiencies in the apartheid system.

The unfair treatment of black people in the apartheid system triggered international criticisms, leading to sanctions on South Africa's foreign trade. Other flaws include the country's education policies: there were separate education systems created for black and white students, in which black students were taught only to do low-skilled manual work while white students received high-level education. In the 1970s, the increase in derived demand for skilled labor demonstrated the shortages in its supply, which stagnated the growth in real GDP (Lowenberg 1997, 64) <sup>[19]</sup>. Additionally, due to the rebellions of the African National Congress (ANC), riots were taking place across the country, disrupting economic production. To be more direct, apartheid not only stagnated the productivity growth of black South Africans,



but the productivity growth of the country's entire population.

For the United Kingdom, the nineties were a period of returning to a state of steadier growth. Following the Lawson Boom, the British economy entered a recession again. As expected, the boom led to high inflation and current account deficit. To control both, the UK Government launched a series of contractionary policies, leading to the recession mentioned above, but the economy started to recover in 1992 with a rise in GDP per capita growth rate to 0.13%, then to over 2%, and kept itself at that standard throughout the nineties.

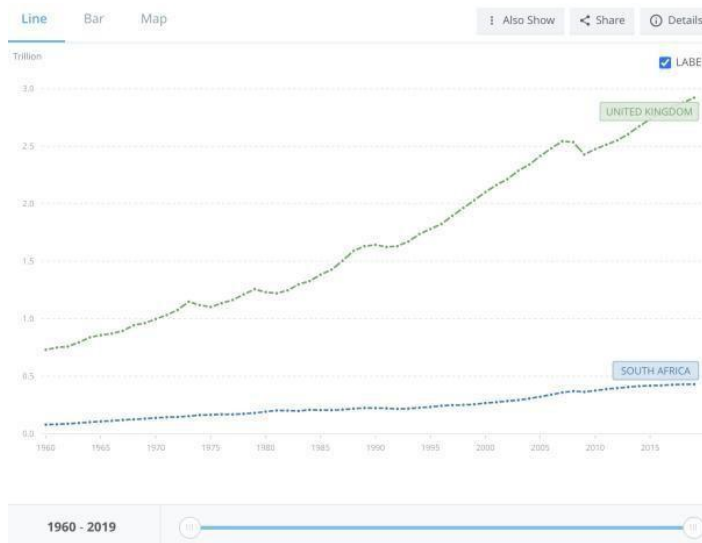
From 1993 to 2007, Britain experienced 63 consecutive quarters of economic growth. This period, the Great Moderation (Pettinger 2013) <sup>[27]</sup>, saw economic growth rates between 1.5% and 4% annually. GDP per capita was around \$28,328 (constant 2010 USD) in 1992; it rose to \$41,466 at the end of the Great Moderation in 2007 (constant 2010 USD). However, banks became lax on permitting mortgages gradually during that period, resulting in high levels of defaults, eventually causing the 2008 Financial Crisis (Bianco 2008, 3-6) <sup>[2]</sup>. During the crisis, unemployment rose from 5.62% to over 7.5% within a year; the growth rate of GDP per capita also fell to -5% in the middle of 2008, with the actual figure dropping from \$41,025 to \$38,986 (constant 2010 USD).

The real nineties began in 1994 for South Africa when the new regime was settled, saving the South African economy from continuously declining economic growth as a result of social unrest. Between 1994 and 2012, the South African economy, in the absence of apartheid, recorded an average annual real GDP growth rate of 3.28%; specifically, 73 of the 76 quarters in the period had positive economic growth. However, that successful growth was interrupted by the 2008-2009 global financial crisis. Though affected, South Africa wasn't the center of the crisis. Real GDP per capita merely experienced a decline in growth rate of 2.90% in 2008; as for real GDP in total, the decline was 1.54%, suggesting an increase in effective labor.

Britain enacted fiscal austerity when recovering from the crisis. The British Government reduced expenditure, using mixtures of contractionary and expansionary methods to promote recovery. Such measures caused a lengthy recovery as it took more than five years to reach the pre-crisis level of real GDP. After that, all annual growth rates were below 2% up to the present. Though acted rather cautiously in gaining recovery, the government still achieved much, including a lower unemployment rate: the figure kept dropping from 8% in February 2013 to 3.8% in July 2019.

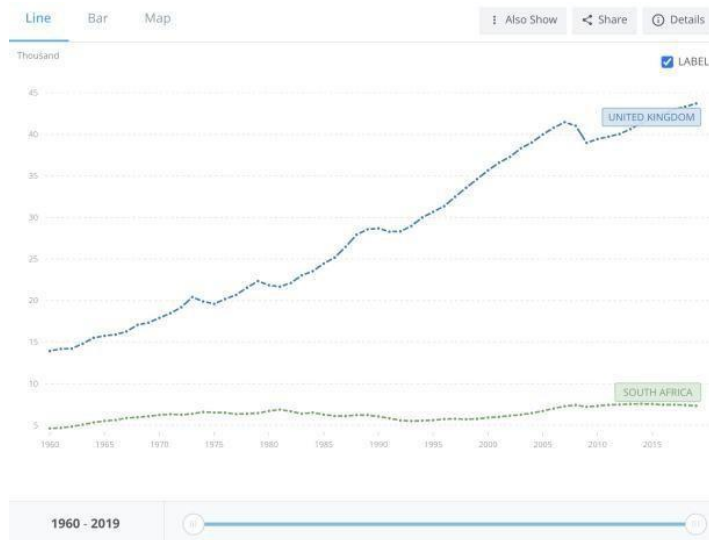
South Africa had a much faster rate of recovery than the United Kingdom. Within two years, GDP per capita caught up with the pre-crisis level by reaching \$7,455 (constant 2010 USD). The economy continued growing since then, but has shown some downturns in the past five years: per capita GDP went down from \$7,583 in 2014 to \$7,346 in 2019 (constant 2010 US dollars), a 3.13% decline.

**Fig. 1. Real GDP of the United Kingdom and South Africa**



*Source: Open Data, World Bank Databank, 2021*

**Fig. 2. Real GDP per capita of the United Kingdom and South Africa**



**Source: Open Data, World Bank Databank, 2021**

Figure 1 provides a look at the broad trend of growth in the two countries from 1960 to 2019. If we use the initial and final values of real GDP of both countries, the increase in percentages turn out to be nearly 300.1% for the UK and



444.03% for South Africa. By the same method, figure 2 suggests the respective growth rates of real GDP per capita to be approximately 214% and 58.9%. Although the UK had a higher level of per capita real GDP growth, South Africa's overall economic growth rate exceeded Britain's, suggesting that the growth in South Africa was heavily dependent upon its fast-growing population while Britain focused more on labor productivity enhancement.

In summation, a higher real GDP does not necessarily mean a higher real GDP per capita, indicating that countries with very high population growth face a disadvantage when trying to raise average living standards. Because of that, we should focus more on per capita GDP while conducting macroeconomic analysis rather than solely examining the total output.

### 3.2.2 Sector Performance

The percentage of GDP contributed by each sector—including primary (agricultural), secondary (manufacturing) and tertiary (service)—also reflects the states of economic growth in the two countries.

Britain started its economic growth with few natural resources. Before the industrial revolution, many people still worked in the primary sector to ensure food supply, which was primarily due to the country's relatively low productivity and lack of suitable technologies. After the industrial revolution, the percentage of the workforce employed in the primary sector shifted from over 70% to 21% (Clark 2007, 193-94) <sup>[9]</sup>. As technology became more advanced, the contribution (%GDP) from agriculture decreased: reaching the end of the twentieth century, the contribution from the primary sector to real GDP dropped to 1.4%, and in the twenty-first century, the figure was never above 1%. To conclude, though decreasing, agricultural contributions generally leveled off along with social developments.

The signature products of the agricultural sector in Britain include cereal crops, broad-leaved hardwood trees and copper. Among the three, the first one took half of the arable land nationwide while the successful growth of the second one relied on Britain's suitable weather conditions; copper mining, on the contrary to cereal crops, only took place at a few mine fields in Wales (Sawe 2019) <sup>[31]</sup>.

Income from the secondary sector was a lot more prominent than that from the primary sector after the Industrial Revolution. With the improvements in technology, manufacturing became more efficient, leading to the mass production of manufactured goods. However, in the past thirty years, its contribution to real GDP lessened from 16.7% in 1990 to 9.6% in 2010. Similar to the primary sector, the rate of decrease in its contribution gradually leveled out, and has reached a steady state around 8% at present.

By contrast, the tertiary sector is the only one showing an upward trend in the past decades. Though not being demanded very much hundreds of years ago, its demand grew as people's basic living standards grew. Though the contribution (%GDP) from this sector once declined by over five percent in 1995, the general trend displayed is positive. Beginning at 64.5% in 1995, it rose to a peak in 2009 of 71.6%; due to the austerity in 2010s, it dropped back to 69.8% in 2013, but later increased steadily.

Nowadays, South Africa and the United Kingdom are alike in terms of the distribution of contributions from each sector to real GDP; however, primary and secondary sectors seem to possess greater importance in South Africa than in the United Kingdom. The contribution from agriculture (%GDP) was over ten percent, it went down continuously, with temporary variations. In 2019, the figure was 1.89%, still higher than Britain's 0.61%.

South Africa possesses a vaster national domain than Britain, indicating a better storage of natural resources. Among the major crops are maize, wheat, sugarcane, sorghum, peanuts (groundnuts), citrus and other fruits, and tobacco. For the fishing industry, there are mainly pilchard and maasbanker, while offshore trawling brings in kingklip, Agulhas sole, Cape hake, and kabeljou, among others (Mabin et al 2021) <sup>[20]</sup>.

Apart from that, South Africa is also rich in certain mining industries. Precious minerals such as gold and diamonds were originally discovered in Kimberley, acting as the source of raw materials for the modern jewelry industry. The tertiary sector, like Britain's, had an increasing contribution (%GDP) to South Africa's real GDP: except for 1980, there emerged an upward trend of growth. In 2019, the output from the service sector accounted for 61.2% of the real GDP,

but that was lower than Britain's figure of 71.3%.

### 3.2.3 Trade Performance

Trade is the market transaction of goods and services, which is another important factor in measuring a country's overall macro performance.

After the Second World War, the Bretton Woods Monetary System—an international monetary and financial system centered on the US dollar—was formed. In the words of the renowned economist John Maynard Keynes, the establishment of it was intended to seek “a common measure, a common standard, a common rule applicable to each and not irksome to any.” (Igwe 2018, 105)<sup>[14]</sup> Though the United Kingdom failed at attaining a dominant status for its currency in the system, it did profit from such an institution, as it later led to the greatest expansion of world trade in history in the 1960s: between 1948 and 1968, the total volume of merchandise exports from non- communist countries grew by a remarkable 290%. The achievement was prominent, but this scenario did not last.

In 1976, the value of US dollar was officially decoupled from gold, indicating the end of the Bretton Woods Monetary System. From then on, British exports did not show a very strong correlation with the development of its economy. The UK exports of goods and services (%GDP) expanded to nearly 30% by the end of the seventies and dropped in the late eighties. After that, the figure kept increasing, along with temporary fluctuations. Accompanied by exports, imports by Britain showed a similar trend, with a sharp rise in the late seventies, it did not stop fluctuating randomly until the 1990s. A positive trend grew, ending the figure at 32.7% in 2019, the highest in history.

As for current account balance of payment, the United Kingdom has been stuck in a huge deficit. The country had a nearly balanced situation only during the seventies and eighties; on later occasions, the current account deficit indicated a worsening trend, though it zigzagged on the way. Even the situation was improved in recent years, the latest update in 2019 still presented a deficit of \$87.5 billion (current USD).

Principal British exports include machinery, automobiles and other transport equipment, electrical and electronic equipment (including computers), chemicals, and oil. Services, particularly financial services, are another major export and contribute positively to Britain's trade balance. As for imports, the United Kingdom had to import a third of its machinery due to large-scale productions domestically (Chaney et al 2021) <sup>[17]</sup>. On the agricultural side, though the country has devoted 25% of the land to farming, the sum of crops generated is merely capable of satisfying 60% of its own needs, indicating a huge import on such products (Sawe 2019) <sup>[32]</sup>.

Britain's top trading partners in history have long been Germany and America, which produce high-quality machinery as well as transport equipment. However, in 2020, China exceeded Germany with an import value of \$75.41 billion USD, accounting for over 12% of Britain's total imports. Countries ranking below China are Germany, the United States, Netherlands, France and Belgium. For exports, the United States took the most, over \$57 billion USD (Trading Economics 2021) <sup>[38]</sup>.

Similarly, to the UK, South Africa also followed the Bretton Woods Monetary System, but didn't seem to benefit much from it. Though the broad environment of world trade improved between 1948 and 1968, the South African exports (%GDP) dropped from nearly 30% in 1960 to 21% in 1970. The figure rose afterwards throughout the seventies, but kept varying violently for the next decades; the average level of exports (%GDP), even nowadays, is still not markedly higher than the figure seventy years ago.

Imports of goods and services did not possess much difference compared to the country's exports. Starting from 24.6% of real GDP in 1960, it undulated until the early eighties. The number went down afterwards due to sanctions imposed by its trading partners in response to the atrocities of apartheid. After the liberal government formed, imports (%GDP) initially had a positive trend of growth, but went down sharply during the period of the global financial crisis. Following that, the figure fluctuated randomly and did not show a prominently higher figure compared to seventy years ago.

As for South Africa's signature exports, they include mainly its rich natural resources. Exports that ranked 1, 2, 4, 6,

and 8 in 2020 all involved the country's mining industry; its top export was gems and precious metals, meriting a total of \$20 billion USD (Trading Economics 2021) <sup>[34]</sup>. As for imports, since the country's technology is not so advanced as to compete with those developed countries, its main imports have historically included chemicals, chemical products, and motor vehicles; its major trading partners include China, the United States, Germany, and Japan, followed by India, Netherlands and Botswana (Mabin et al 2021)<sup>[20]</sup>.

### 3.2.4 Investment

Investment is the amount of money spent on capital goods, which to some extent represents the future economic growth of a country. There are several different types of investments; the two to be considered in this section are Gross Fixed Capital Formation (GFCF), and Foreign Direct Investment (FDI).

Gross Fixed Capital Formation (GFCF) is defined as the acquisition of produced assets (including purchases of second-hand assets), including the production of such assets by producers for their own use, minus disposals (OECD Data 2021). After the Second World War, the UK government faced huge national debt, leading to reduction in fixed capital investment. However, in the sixties and seventies, the aim of the UK government shifted slowly back to structuring its own economy, driving GFCF up.

GFCF has increased markedly since 1970. However, as recessions occurred, GFCF fell. Among them were the recessions in the early eighties and early nineties, but after these was the Great Moderation, during which investment grew at a stable, high rate. A sharp decline took place during the global financial crisis with a rate of 24.7% decrease within the year of 2008. Recovering from the crisis, GFCF rose slowly again, reaching \$482.4 billion (current USD) in 2019, has not reached the pre-crisis level, though.

South Africa turned out to be nowhere similar to the United Kingdom. Because of the severe conflicts between the "white elite" and the "black majority," South Africa could not focus on promoting investment in the eighties. In this case, GFCF randomly fluctuated in the eighties though it was five times higher than the initial figure in 1970. GFCF progressed well from 2002 until the financial crisis retrograded its development. It fell slightly during 2008, then crawled upward until 2011, and undulated around a certain level. As interplayed with Gross Domestic Product, GFCF in South Africa showed instabilities in the 2010s largely due to the unstable economic growth, which was believed by the economist Mike Schussler to be the result of South Africa's load-shedding policies, corruption and mismanagement of the government (Mathe 2019) <sup>[22]</sup>.

By combining the previous data with population growth, we get the real GDP on a per capita basis. The populations in both countries were generally increasing in the past decades, just that Britain has a greater one whereas South Africa's growth rate is higher. For actual figures, Britain's present GFCF per capita is calculated as approximately \$7,217 current USD per capita while that of South Africa should be about \$585 (current USD). Therefore, the respective average growth rates of GFCF of South Africa and Britain are deducted as about 23.1% and 19.2%. In comparison, we observe that the United Kingdom has a higher per capita GFCF as well as a higher overall growth rate of GFCF compared to South Africa, which explains the better economic profile of Britain.

Foreign direct investment (FDI) is an investment made by a firm or individual in one country into business interests located in another country. It includes mergers, acquisitions, retail, services, logistics, and manufacturing (Chen 2021) <sup>[8]</sup>. Like GFCF, FDI is also tightly linked to a country's economic performance. The United Kingdom had relatively slow growth in FDI in the seventies and it dropped by approximately 50% in the early-eighties recession; similarly, it dropped by another 50% in the early- nineties recession. After recovery, FDI varied fiercely between 1995 and 2007, declined during the 2008 financial crisis by nearly 95%, and returned to stable growth afterward. In 2016, the greatest plummet arose: after the country proclaimed to leave the European Union, many European companies withdrew their capital from the UK due to rising production costs. As a result, FDI significantly dropped to \$2.24 billion (current USD) in 2019.

In the case of South Africa, political stability was one of the most important factors affecting the country's FDI. It had a constantly varying FDI around the zero line before government reconstruction due to investors' concerns about the

political instability nationwide that could result in losses of their investments. After a liberal government had formed, FDI attained an increasing trend in general: from zero in the eighties to \$4.63 billion (current USD) in 2019.

### 3.3 Summary

In this section, we directly observed the differences between the levels of growth in the two countries. For the United Kingdom, its economy is already highly developed, showing very strong performance in GDP per capita. Although it experienced a number of recessions in the history, the overall trend of growth is positive and ranks highly worldwide.

Besides, the country is also participating more in international trade as its exports and imports (%GDP) both display a positive trend. However, with the country leaving the European Union in recent years, FDI has declined sharply, which may lead to problems for future growth. In a nutshell, the country is still gradually acting as a part of globalization and international specialization, suggesting a promising economic profile.

On the contrary, due to apartheid, the South African economy once stagnated. Even though it gained a new government in 1994, discrimination still existed, and corruption in the administrative system largely resisted economic growth. In terms of international trade, apartheid was also the hindrance since it resulted in numerous sanctions from the country's trading partners; these led to the random variations in exports and imports throughout the twentieth century. As a result, the country's development in international trade lagged far behind Britain and other developed countries, though its exports (%GDP) grew in the twenty-first century. For investments, including FDI, South Africa performed somewhat better than Britain especially after the Brexit, but with a lower historic level.

In brief, South Africa's economy has not developed as systematically as Britain's; in the next section, we will apply the differences between the two countries identified in this section to the Solow Growth Model, and moreover, we will find out how these differences relate to differences in their long-run economic growth.

## IV. The Solow Growth Model

After analyzing the various macroeconomic indicators of South Africa and the United Kingdom, it is now possible for us to determine the root causes of their distinct growth patterns. We will use a more systematic approach to investigate their respective fast or slow growth, or, in essence, why the United Kingdom attains a stable economic growth in general, whereas South Africa has a relatively volatile growth pattern. The Solow Growth Model (also known as the Solow-Swan Model), a neoclassical long-run growth model, will be used in this section to help us to solve the question mentioned above. When using data to analyze different factors affecting economic growth, the time period that we will focus on is from 1970 to 2019, covering important historic events for both countries.

### 4. Description of the Solow Growth Model

The Solow Growth Model, developed by the Nobel Prize-winning economist Robert Solow, was the first neoclassical long-run growth model and was built upon the Keynesian Harrod-Domar Model. For Keynes's model, Prof. Solow assumed that it was based on some unrealistic assumptions like fixed factor proportions, constant capital output ratio, etc (Solow 1956, 65-66) <sup>[33]</sup>. The Solow Model acts as the basis for the modern theory of economic growth as it ensures steady growth in the long run. As the famous economist N. Greg Mankiw puts it, "The Solow Growth Model shows how saving, population growth, and technological progress affect the level of an economy's output and its growth over time." (Mankiw 2007, 186-187) <sup>[21]</sup> What he has mentioned are some of the most important variables controlled in the Solow Model which we will discuss one by one below.

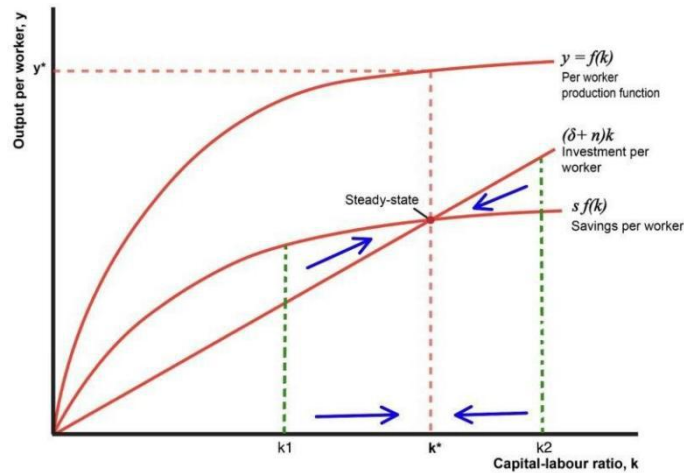
1. The whole model is based on the aggregate production function  $Y=AF(K, L)$ . With its linear homogenous feature, we assume constant returns to scale, meaning that with the proportionate change in all factors of production, the output also increases in the same proportion; for example, if all the input factors are doubled, the output also gets doubled. The production function specifies that, for a given level of technology, defined by  $(A)$ , only so much

output ( $Y$ ) can be produced for given levels of inputs capital ( $K$ ) and labor ( $L$ ). In addition, the constant returns to scale are shown by the original version of the aggregate production function, the Cobb- Douglas production function:  $Y=K^aL^{1-a}$ . In order to achieve constant returns to scale, we stipulate that  $0 < a < 1$ , which makes both  $a$  and  $1-a$  positive real numbers.

2. For the sake of simplicity, the Solow Growth Model is designed to be in a closed system without government interventions. Therefore, with  $GDP=Y=C+I+G+NX$ , the income in the Solow Model reduces to  $Y=C+I$ . Rearranging terms we have  $C=Y-I$ , meaning that consumption equals income minus investment.
3. Since it is more accurate to consider people's living standards by measuring GDP on a per capita basis, we may convert all variables in the Solow Model from their aggregate forms to per-worker forms, and  $C=Y-I$  is transformed as  $c=y-i$ , where  $c=C/L$ ,  $y=Y/L$  and  $i=I/L$ .
4. When we substitute the per-worker variables into the aggregate production function, we observe that  $y=f(k)$ . Notice that output or income per-worker is dependent on the amount of capital each worker has access to.
5. We assume people either spend their money or save it. In this case,  $Y=C+S$ , and on a per-worker basis,  $y=c+s$ . Therefore, since  $c=y-i$ ,  $y=(y-i)+s$ . After simplifying the equation, we have the equivalent relationship of  $s=i$ , suggesting that the per-worker saving is equal to the per-worker investment. Mathematically  $i=sf(k)$ , where  $s$  represents savings rate rather than the real savings per capita, and this goes along in following reasoning.
6. After working through the basics of the aggregate production function, we now add new variables to the relationship between savings and investment. One important factor affecting per capita investment is population growth while another one is depreciation rate. We respectively identify the two factors by the symbols of  $n$  and  $\delta$ .
7. The change in capital stock per capita is equal to investment minus depreciation:  $\Delta k=i-\delta k$ . Therefore, by substituting  $i$  with the former mathematical form, we find  $\Delta k=sf(k)-\delta k$ .
8. Population growth will negatively affect the capital accumulation per capita because per capita growth in capital equals the total amount of capital over population. Therefore, as the denominator increases, the result decreases. In other words, higher population growth either requires a higher savings rate, or it leads to a lower level of capital accumulation; higher population growth rates always require a trade-off of a higher savings rate to offset. In this case, if we put  $n$  as the population growth rate into the equation in (7), we have  $\Delta k=sf(k)-(\delta+n)k$ .
9. In the Solow Model, there is one equilibrium, namely the steady-state. The steady-state is achieved when the capital accumulation per capita equals zero, meaning that the investment, or the savings, is just capable of offsetting the negative effect on it by the increase in population and the capital depreciation. In mathematical form,  $\Delta k^*=sf(k^*)-(\delta+n)k^*=0$ , and the level of investment in the steady state is also called the break-even investment, with the annotation noted by \* implying the steady-state values.
10. In a steady-state, consumption can be maximized, and it is expressed in the form of  $c^*=f(k^*)-(\delta+n)k^*$ , where the Marginal Product of Capital (MPK) acts as the gradient of the depreciation and population growth's effect on the per capita capital accumulation,  $MPK=\delta+n$ . Rearranging, we have  $MPK-\delta=n$ , meaning that the capital increase, due to the increase in one more unit of input, net of depreciation rate is the same as population growth rate.
11. Now we extend the Solow Model to a more dynamic application and at the same time pair the process of achieving the steady states with the Cobb- Douglas production function. As we stipulate that  $0 < a < 1$ , we may assume that  $a$  is equal to 1/2. Therefore,  $Y=K^aL^{1-a}=K^{1/2}L^{1/2}$ . On a per capita basis,  $Y/L=K^{1/2}L^{1/2}/L=(K/L)^{1/2}$ . And since  $y=Y/L$  and  $k=K/L$ ,  $y=k^{1/2}$ . In other words,  $y=\sqrt{k}$ . If we assume that there is no population growth and the closed economy is also in the steady-state,  $\Delta k=sf(k)-\delta k=0$ , and to alter it around, we get  $k^*f(k^*)=s/\delta=k^*/\sqrt{k}$ . With this application, we can solve for the steady-state level of capital per-worker  $k^*$ .
12. With constant values of variables, a country will always reach its steady state, and there are two different ways of reaching it, as seen in Figure 3:
  - when capital accumulation is below the level of steady state, saving is greater than the amount of investment required to keep  $k$  constant, therefore  $k$  rises until output per effective worker reaches the steady-state level;

--- when capital accumulation is above the level of steady state, saving is less than the amount of investment required to keep  $k$  constant, therefore  $k$  falls until output per effective labor reaches the steady-state level.

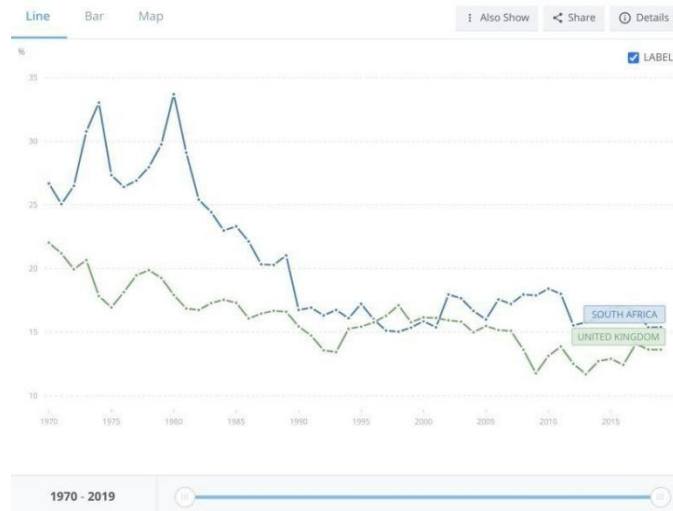
**Fig. 3. A simple illustration of the Solow Growth Model**



## 4.1 Various Factors presented in the Solow Model that Affect Economic Growth

After viewing the very basic structure of the Solow Growth Model, we have gained an overall grasp of what specific factors influence the economic growth of a country. According to the equation  $\Delta k = sf(k) - (\delta + n)k$ , these factors include the savings rate and the population growth rate, along with capital accumulation per capita. Moreover, capital accumulation per capita can be split into two categories—human capital and physical capital accumulation.

Although the Solow Growth Model does not account for technological advancement, it is still an important factor determining the upward and downward shifts of the aggregate production function, and it is also recorded in the original per capita production function  $y = af(k)$ . We will evaluate the factors mentioned one by one, and analyze the effects of differences between the two countries in regard to those respects.



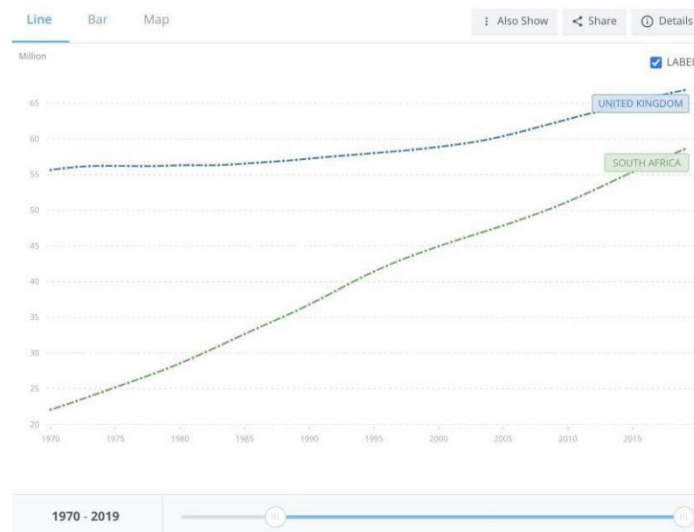
**Fig. 4. The savings rate(% of GNI) of South Africa and Britain**

**Source: Open Data, World Bank Databank, 2021**

In the case of savings rate, we normally consider the average propensity to save (APS). The average propensity to save (APS) is a macroeconomic term that refers to the proportion of income that is saved rather than spent on current goods and services, and it is usually expressed as a percentage of total household disposable income (income minus taxes). According to Figure 4, both the United Kingdom and South Africa have a decreasing gross savings (% of GNI).

For South Africa (Figure 4), its historic peak was 33.7% in 1980; however, it plummeted during the eighties and remained at a constant level until 2019, when the savings ratio was about 15.4%. For the United Kingdom, savings ratio was the highest in 1970 with the number of 22.02%, and it declined by a greater percentage compared to South Africa afterward: in 2019, the savings rate (% of GNI) was 13.62%, almost half of the original figure. Though the total savings rate in South Africa is higher than the one in Britain (aside from the period from 1996 to 2001), the United Kingdom possesses a GNI approximately 6.9 times higher (constant 2010 USD) than that of South Africa. In this case, the actual savings on average in Britain were much higher than those in South Africa. Additionally, with a lower average propensity to save, Britain has a higher average propensity to consume, suggesting that the consumption level is higher, which can help stimulate present economic growth.





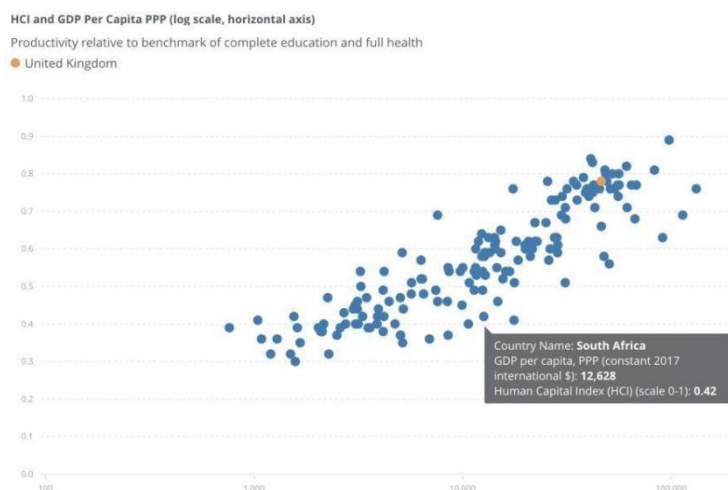
**Fig. 5. The population growth of South Africa and Britain**  
**Source: Open Data, World Bank Databank, 2021**

Moreover, one plausible reason for South Africa possessing a higher savings ratio is because the country is using a higher savings ratio to switch itself from a lower steady-state to a higher steady-state. With a higher steady-state, it gains a higher level of GDP per capita and therefore a higher average living standard. The same is true for the United Kingdom. If it desires to break its existing steady growth trend and pursue more rapid growth, it needs to improve the savings ratio farther.

In the case of population growth, according to Figure 5, the total population of the United Kingdom is well above the level of South Africa. In 1970, the population in Britain was 55,663,250 while that in South Africa was just 22,069,783. However, between 1970 and 2019, the British population growth rate was nearly 20%. If divided by the number of years, the annual average population growth rate should then be 0.41%.

On the contrary, even with a smaller initial population, South Africa has a much faster growth speed. In 2019, its population was 58,558,267, reaching nearly 90% of the British population. By the same method, we calculate the total growth rate and annual growth rate of the population in South Africa to be respectively 165.3% and 3.4%, both much higher than the values for the United Kingdom. In this case, we posit that at a certain point in the future, the South African population will exceed the British population. Apart from that, according to the Solow Growth Model, with a faster population growth rate, the per capita capital accumulation falls, indicating slower economic progress.

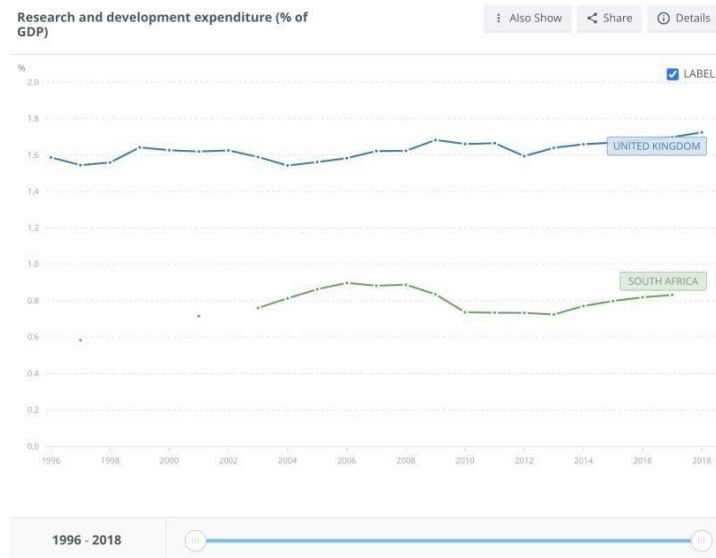
After analyzing the savings ratio and the population growth rate, we then shift our focus to the factors determining labor productivity. The factors influencing labor productivity include physical, human capital accumulation per capita, and technological advancement. Per capita human capital accumulation is measured by the Human Capital Index (HCI) in the World Bank system. According to its own description, with a range from 0 to 1, the index measures the amount of human capital that a child born today can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where her or she lives. It is designed to highlight how improvements in current health and education outcomes shape the productivity of the next generation of workers, assuming children born today experience over the next 18 years the educational opportunities and health risks that children in this age range currently face.



**Fig. 6. The relationship between GDP per capita and HCI worldwide**  
**Source: Open Data, World Bank Databank, 2021**

If we are just considering current performance (Figure 6), the United Kingdom has an HCI of 0.78 whereas South Africa's HCI is 0.42, 53.8% of the British figure. Viewing the general trend, the GDP per capita and HCI attain a positive correlation with each other. In other words, the more human capital possessed per capita, the greater the per capita output, the faster the economic growth.

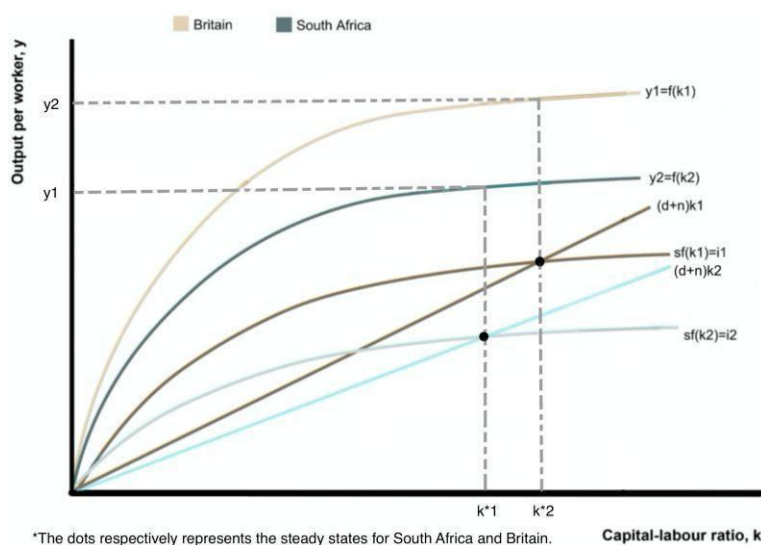
As for physical capital, we have examined that factor in the previous section, section 3.2.4 (investment), where Gross Fixed Capital Formation (GFCF) was discussed. While we regard the investment on fixed capital (physical capital mostly) as the probability of increasing physical capital accumulation, we can use the results obtained by the analysis in section 3.2.4: it is clearly observed that the United Kingdom has a higher per capita GFCF in general compared to South Africa; additionally, it also has a faster growth rate for GFCF. Such observations lead to the conclusion that the physical capital per capita in the United Kingdom is greater than the figure in South Africa, and it also has a higher rate of growth. Now, if we qualitatively apply the overall capital accumulation of the two countries to the Solow Growth Model, we find that Britain has its capital-labor ratio,  $k$ , greater than South Africa, indicating an output closer to full-capacity.



**Fig. 7. Research and development expenditure (%GDP) of the two countries**  
**Source: Open Data, World Bank Databank, 2021**

As for technological innovation, this type of indicator was not prevalent until the most recent years so the collection of data only began in 1996 in the United Kingdom and 1997 for South Africa. According to Figure 7, South Africa’s initial expenditure was 0.58% of the real GDP. Though it kept progressing, it never exceeded one percent. In 2017, the last recorded figure was 0.83%. In sharp contrast, the United Kingdom has a markedly higher expenditure (%GDP) on research and development. The figure was already 1.6% in 1996. Even it did not increase much afterwards, the United Kingdom still has over twice the “innovation” expenditure (%GDP) than South Africa, not to mention Britain’s comparatively higher real GDP. In this case, we are able to expect higher productivity growth in the United Kingdom for its higher capital accumulation and spending on research and innovation.

Lastly, we incorporate the data that we have analyzed previously into the Solow Growth Model. According to Figure 8, the United Kingdom has a steady-state higher than South Africa’s because though the savings ratio in South Africa exceeds the one in Britain, the actual savings in Britain are higher. Along with this, the capital-labor ratio  $k$  in the United Kingdom is greater than it is in South Africa due to the fact that capital per worker in Britain is higher. As one propellant of GDP per capita, the greater amount of capital per worker in the UK leads to the difference on the y-axis—the United Kingdom’s output per worker is greater than that of South Africa.



**Fig. 8. Applying the conditions of the two countries to the Solow Model**

Besides, Britain's curve of the per capita production function is at an overall higher position compared to the South African one, seeing that technology is more advanced in the UK. As for the slope of the break-even investment curve, we observe that the gradient of Britain's curve is greater than that of South Africa's curve: if we keep the depreciation rate constant, although the population growth rate in South Africa is much higher than the one in the UK, the higher level of capital accumulation per effective worker counterbalances the lower level of population. In this case, if we convert  $k_1$  and  $k_2$  to the same unit— indicating the same independent variable— we still get a higher coefficient for the UK's curve, thereby leading to a greater slope of the British break-even investment curve. The same method is applied to the savings curve. Though the average savings ratio in South Africa is higher than the one in Britain, if a unified independent variable is provided, again, the value of coefficient for the UK's curve is higher, and therefore, a larger gradient.

Overall, due to the higher actual savings (investment) and a higher capital-labor ratio,  $k$ , the United Kingdom will have a more powerful economic performance in future global competitions as well as a higher level of GDP per capita.

## V. Policy Recommendation

In applying the data of the two countries to the Solow Model, we saw the catalysts and hindrances to growth. In light of the flaws existing inside their economic systems, the following policy recommendations are designed to solve the current problems: encouraging savings, capital accumulation and technological advancement, but curbing population growth. These are recommended not only to the countries under consideration, but also to developing countries around the world.

As for savings rate—suggested by the Solow Model—the higher it is, the greater the investment, and therefore, the greater the future economic growth. In this case, we establish policies to promote savings rate. These policies are generally called contractionary policies, and they can be classified into two categories: fiscal and monetary. The former includes decreasing government spending and increasing taxation and so on, while the latter is comprised of increasing the various base interest rates and decreasing money supply. Sometimes, we can also promote government interventions in the foreign exchange market, such as devaluation, to decrease the countries' exchange rates.

However, such contractionary policies cannot be used unlimitedly, or they may lead to economic crisis. As suggested by the consumption function,  $y=c+i$ , consumption and investment are in a trade-off relationship, meaning that over-encouraging savings for future investment can lead to low present consumption. In this case, since

$GDP=C+I+G+NX$ , too severe of a decrease in consumption causes a recession. Therefore, while enacting policies that reduce deficits, governments should also launch policies that stimulate household consumption and therefore promote economic growth in the short run. Apart from the above, governments may simply promote national savings. For example, they can establish policies that set up tax-free savings accounts, meaning that people's portion of incomes saved will no longer be taxed. Along with this method, we can try to attract more FDI (foreign savings) by conducting policies favorable for foreign investors, such as building more complete infrastructure, reforming government systems, etc. In general, governments of developing countries should encourage savings but never omit the importance of current consumption levels.

Next, for population growth rate, policies should be considered that would reduce it. One method is to decrease the birth rate: we can improve education for females about family planning, which can lead to delayed childbirth. Another way is to improve healthcare, reducing couples' incentive to have more children, whose responsibilities include taking care of their parents as they grow up. Governments can also enact laws that raise the minimum age for marriage. This largely raises people's awareness about the issue, thereby reducing the chance for females to get pregnant. Moreover, along with education for females, increasing gender equality in society can also decrease the birth rate by offering females more employment opportunities. With more females at work, the opportunity costs of having children increase as taking time off from work to raise children reduces wages and income. As a result, the birth rate tends to decline as gender equality rises.

Apart from controlling birth rate, we can also restrict migration. If simply for the sake of controlling population, we just restrict immigration while staying open to emigration. However, the emigrants may be highly skilled workers who contribute much towards the country's real GDP, causing the problem of "brain drain". In order to cope with this, governments can permit less competent workers in terms of emigration; meanwhile, rather than enacting "flat" immigration policies, governments can reduce the total number of immigrants allowed but increase the percentage that are highly-skilled.

As for the last two (capital accumulation and technological advancement), we stimulate them by encouraging innovation to increase labor productivity. Innovation can be in any field, including education, technology and so on. To be more specific, governments should launch policies to reduce the burden on innovative firms, and at the same time, create incentives for more people to do so. For example, governments may reduce corporation taxes on high-tech companies by an extra 30%. Meanwhile, it may even create "green channels" for those innovative companies to get their production licenses. As a result, these companies tend to be rewarded with a higher profit, leading to more entrepreneurs entering the field. This act causes more competitions, which generates greater efficiency in the market.

Governments can also establish their own national laboratories or provide funds for research universities to promote scientific innovation. In this case, technological advancement expands at a faster rate and investments increase, leading to more physical capital accumulation. On the aspect of education, governments can provide free education for citizens nationwide, which increases the literacy rate and improves the level of human capital accumulation.

For any of the above objectives, if a country can achieve one successfully, it voluntarily enters a cycle of wealth accumulation and then automatically accomplishes the others. Through this process, this country is very likely to achieve higher rates of economic growth in the near future.

## **VI. Summary and Discussion**

Various factors affect the economic growth of a country---no single indicator can determine the overall macro performance.

In this paper, we compared the distinct economic growth paths of the United Kingdom and South Africa, discussed their political and socio-economic backgrounds, and applied their growth paths to the Solow Growth Model. Though there were researchers who focused on explaining the growth of Britain and South Africa, none of them did this in a comparative way, or utilized an economic model to accompany the data while analyzing. Through the above analysis, the

determinants of successful economic growth were unraveled and explained: high savings rate, slow population growth, high capital-labor ratio, etc.

On the political level, we have found that South Africa lacked a stable political institution during its apartheid years, which was partially why it experienced periods of stagnation in the seventies and eighties. On the contrary, due to its long history, Britain's regime of Constitutional Monarchy was much more stable, and this advantage won it a better broad environment to grow in.

As analyzed later in this paper, the erratic political complexion created numerous problems for the South African economy in the apartheid years, such as the low level of foreign direct investments and riots. As mentioned in the Solow Model, this low FDI to some extent affected the overall savings and therefore, it negatively influenced economic growth. For riots, they interrupted production, acting as an obvious reduction of output—real GDP.

On the socio-economic level, it is also conspicuous that the United Kingdom has a much better performance on almost all aspects including HDI, life expectancy, literacy rate (primary school enrollment rate) and income inequality. Even on the international stage, it still achieves a commonly top twenty position worldwide, which greatly demonstrates its socio-economic strength. Comparatively, South Africa lagged behind Britain by large due to the marked problems of income inequality and short life expectancy.

In addition, the economic profiles of the two countries were evaluated in detail. By examining several macroeconomic indicators such as real GDP, real GDP per capita, sector performance, exports and imports, and investments, we can see that the signature industries of Britain and South Africa are marked with geographical features: South Africa has plenty of natural resources (especially minerals) while Britain can only depend on imports on this aspect. As a result, Britain mainly excels in the tertiary sector while South Africa has a higher percentage of real GDP relying on the primary sector, indicating a lower average income in South Africa.

A significant part of this paper is about applying the Solow Growth Model to the growth path analysis of the two countries. Numerous factors that centered on the equation  $\Delta k = sf(k) - (\delta + n)k$  were looked into. Among all factors, South Africa only won on the side of savings rate, and even on this side it was believed that the higher savings rate acted as a prerequisite for what is known as "catching-up growth." This catching-up growth was the most marked in the period when South Africa retracted itself out of the apartheid government in 1994; however, this promising growth trend was throttled by the lack of an effective organization as well as the serious corruption inside the administrative center.

By contrast, the United Kingdom has a controlled rate of population growth (though may experience the problem of an aging population), a high level of per capita capital accumulation, a comparatively large investment in scientific research and a higher actual saving. It has observably gained a more prosperous economic growth in the past, and will continue to grow in the future.

In the last part of the paper, three types of suggestion for policies promoting growth were provided in light of all previous analysis. These policies incorporated contractionary policies, eliminating sexual/racial discrimination, encouragements for innovation and so on, which should be executed with government's consideration of minimizing possible conflicts with other objectives.

Although the researcher has conducted a rather extensive review over the economic growth path of South Africa and the United Kingdom, there are still several limitations to be addressed here. First, the researcher proposed the time period of investigation to be from 1945 and 1961 till now respectively for Britain and South Africa. However, due to data incompleteness in World Bank Databank, an approximate range instead of the exact time period was presented.

Second, one of the main research goals was to find out the real determinants of growth speed. Unfortunately, due to the constraints on time and resources, only two countries were studied and only a single model was used for further analysis. Therefore, no general conclusions can be drawn.

Third, this research focused mainly on basic quantitative studies rather than utilizing comprehensive econometrical approaches. As a result, the exact degrees of influence different factors have on economic growth could not be presented in detail, and more thorough research is needed to reveal them.

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