Palacký University Olomouc
University of Clermont Auvergne
University of Pavia

MASTER THESIS

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Supervisor: Dr. Jaromír Harmáček

GLODEP 2024

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Master's Thesis

The Relationship between Social Progress and Economic Growth: Assessing Countries' Effectiveness in Translating Growth into Social Progress

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Supervisor: Dr. Jaromír Harmáček

Academic year: 2023/2024

Declaration

I, Leyla Sariyeva, declare that the dissertation titled "The Relationship between Social Progress and Economic Growth: Assessing Countries' Effectiveness in Translating Growth into Social Progress" is my original work conducted under the supervision of Dr. Jaromír Harmáček and presented to the GLODEP consortium. Unless specified otherwise, all the work and ideas in this work are mine. Proper citation and referencing have been employed for all external ideas, texts, and methodologies utilized. I have maintained academic integrity throughout the research process and have not distorted any concepts or findings.

Leyla Sariyeva

22nd May 2024

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Funded by the Erasmus+ Programme of the European Union

Declaration of honour on the use of AI

During the writing of the submitted thesis, I used the following AI tools – ChatGPT, and Grammarly to enhance the writing, increase readability and for grammar check. After using this AI tool, I declare that I have reviewed and edited the text and I take full responsibility for the content of the submitted thesis.

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UNIVERZITA PALACKÉHO V OLOMOUCI

Přírodovědecká fakulta

Akademický rok: 2023/2024

ZADÁNÍ DIPLOMOVÉ PRÁCE

(projektu, uměleckého díla, uměleckého výkonu)

Jméno a příjmení:	**Leyla SARIYEVA**
Osobní číslo:	**R220683**
Studijní program:	**N0588A330004 Global Development Policy**
Téma práce:	**The relationship between social progress and economic growth: Assessing Countries' Effectiveness in Translating Growth into Social Progress**
Zadávající katedra:	**Katedra rozvojových a environmentálních studií**

Zásady pro vypracování

The research aims to analyze the relationship between economic development and social progress, with a special focus on examining how effectively countries translate their Gross Domestic Product (GDP) into advancements in societal well-being. Recognizing that economic growth is a pivotal driver of overall development, the study focuses on understanding the extent to which this growth positively impacts key social indicators. It is widely acknowledged that the success of economic prosperity should be measured not only by financial metrics but also by its capacity to enhance the quality of life for citizens. As countries pursue economic prosperity, the crucial link between this growth and key social indicators becomes a determining factor in overall development. The results will provide important insights into the association between economic growth and social progress, offering guidance for policymakers and practitioners to develop more focused and impactful strategies for development.

Rozsah pracovní zprávy:	**10-15 000 words**
Rozsah grafických prací:	**as needed**
Forma zpracování diplomové práce:	**tištěná/elektronická**
Jazyk zpracování:	**Angličtina**

Seznam doporučené literatury:

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Katedra rozvojových a environmentálních studií

Datum zadání diplomové práce: **9. ledna 2024**
Termín odevzdání diplomové práce: **31. května 2024**

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V Olomouci dne 15. ledna 2023

Acknowledgements

I am deeply grateful to several people who have played pivotal roles in completing this thesis. Their guidance and support have been indispensable.

First and foremost, I would like to express my gratitude to my supervisor, Dr. Jaromír Harmáček, whose unwavering support, insightful feedback, and guidance have been integral throughout this journey. From the beginning of the study to the last stage, Dr. Harmáček's encouragement and constructive feedback have pushed me to exceed my expectations.

I also extend my heartfelt thanks to my family and friends, whose continuous faith in me sustained me during moments of self-doubt. Their belief in me has been a source of strength and motivation and I am immensely grateful for their continuous support and enduring presence in my life.

Finally, I wish to express my sincere appreciation to the GLODEP program for providing me with this invaluable opportunity, and to my fellow cohort members. Over these two years, we shared countless experiences and learned together, facing and overcoming challenges as a united group. Their presence has truly made the GLODEP experience unforgettable.

Abstract

Numerous studies have highlighted the positive, and at times bidirectional, relationship between human development and economic growth. However, limited attention has been paid to the efficiency with which economic development translates into social outcomes. This study investigates the association between economic development and social outcomes across diverse income levels and regions, employing efficiency analysis as its analytical framework. Utilising comprehensive data spanning from 1990 to 2020 and conducting a global analysis, we study the trends in selected economic and social indicators. Our analysis employs two main methods: residual-based and ratio-based efficiency approaches, offering multifaceted insights into countries' efficiency. Through comparative analysis of the two methods and examination of trends over three decades, our findings shed light on the broader picture of economic and social disparities and efficiency levels among nations. Furthermore, our results suggest that residual-based analysis emerges as a preferable method for evaluating efficiency, particularly in the context of high-income and socially developed countries. This study highlights important implications. Firstly, it underscores the nuanced nature of efficiency, revealing that irrespective of a country's economic level and social development, there is always room for progress. Moreover, when conducting a global analysis, comparability should be considered according to countries' levels of development.

Keywords: Social Progress, Economic Development, Efficiency

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List of Abbreviations

BLI	Better Life Index
CV	Coefficient of Variation
DEA	Data Envelopment Analysis
ER	Efficiency Ratio
ES	Efficiency Score
FE	Fixed Effect
GDP	Gross Domestic Product
GNH	Gross National Happiness
GNI	Gross National Income
GNP	Gross National Product
HDI	Human Development Index
HPI	Happy Planet Index
IDI	Inclusive Development Index
MENA	Middle East and North Africa
NEF	New Economic Foundation
SDG	Sustainable Development Goals
SFA	Stochastic Frontier Analysis
SPI	Social Progress Index
SSA	Sub-Saharan Africa
UNDP	United Nations Development Programme

INTRODUCTION

In an era characterized by heightened global interconnectedness and the pursuit of sustainable development goals (SDGs), the association between economic growth and social progress stands as a pivotal area of inquiry. Over the past decades, the traditional paradigm equating development with economic growth solely has been challenged by the recognition of the multidimensional nature of human development.

Traditionally, measuring the progress of development efforts in developing countries has been centred on the rate at which per capita income increases, along with other similar monetary measures. Nevertheless, recent times have seen a paradigm shift among development economists. Examination of different strategies shows that the addition of human and social indicators can be a significant supplement to economic indicators; especially when these indicators concentrate on basic needs (Hicks & Streeten, 1979).

While Gross Domestic Product (GDP) remains a prominent measure of economic performance, its limitations in capturing the broader spectrum of societal well-being have led to the development of alternative metrics (which became known as the Beyond GDP approach). In the past few decades, numerous indicators have emerged, among them the Social Progress Index (SPI), a comprehensive metric designed to evaluate societal well-being beyond traditional economic indicators, which is employed in this study as a measure of societal development.

The primary objective of this study is to empirically examine countries' effectiveness in translating their economic development into social progress. Research has shown that there is a two-way relationship between human (or societal) development and economic growth (Ranis et al., 2000); however, the concept of efficiency within this dynamic remains relatively understudied.

The term 'effectiveness' usually evaluates the achievement of specific goals. However, in this context, it is necessary to explore further and determine whether a country demonstrated efficiency while pursuing these objectives. This entails examining whether a country achieved a level of accomplishment proportional to its economic development. It is important to recognise that development has various dimensions. Yet, it remains unclear how well countries transform their economic advantages into actual improvements in societal well-being.

This study contributes to the ongoing discourse by addressing key points and proposing potential directions for future research. In addition, this research will look at how economic growth and social progress relate to each other and what it means for efficiency evaluation. Through the analysis of the interrelationship between economic growth and social progress, with a focus on efficiency, this study aims to address the following research questions:

RQ1. How efficiently do countries convert economic growth into social progress?

RQ2. What are the longitudinal trends in the efficiency of countries in translating economic growth into social progress over the past few decades?

RQ3. How does the efficiency of countries in converting economic growth into social progress compare across different income groups and regions?

To address these research questions, two analytical approaches are employed: regression analysis, wherein the association between SPI and GDP is explored, with a focus on predicting residuals to measure efficiency. Subsequently, a ratio-based analysis is employed to evaluate countries' efficiency in converting economic growth into social progress.

The subsequent sections of the thesis are structured as follows: the first chapter delves into the literature review, which provides an overview of existing research on economic growth and social progress, with a particular focus on the effectiveness of countries. The second section, methodology and data, describes the empirical frameworks and data sources employed in this study. Finally, the last section, results and analysis, presents the empirical findings derived from residual-based and ratio-based analyses, accompanied by discussion and limitations.

CHAPTER 1 LITERATURE REVIEW

1.1 Social Progress Definition

The term “social progress" has been interpreted differently throughout history and by different scholars. It's a complex concept that lacks a universal definition, instead evolving through diverse interpretations across time and among scholars. Scholars from different historical periods to the present days have studied it, and their perspectives are influenced by their cultural, philosophical, and political beliefs.

In the late 19th century, Le Conte(1895) described social progress as organic evolution. From his perspective, societies can be seen as either, social statics which is a stable and orderly system that works together smoothly or social dynamics which is a constantly changing system that aims to become more advanced and complex. Social statics focuses on keeping society balanced and organized, while social dynamics studies how society changes and grows over time. This viewpoint sees society as always trying to improve, with changes helping society adapt and reach progress. Bernard (1922) sees social progress as the involvement of improvements in multiple areas, including morality, religion, law, politics, economy, and industry. According to him, these diverse types of progress are linked and can be collectively referred to as social progress.

On the other hand, Henderson (1940) considers that the question of “What is social progress?” cannot be answered because there are no reliable methods available to study or measure what it asks about. For him, defining this concept is inherently difficult, leading to arbitrary definitions that can be easily influenced by prevailing ideologies, power imbalances, and the needs of the moment.

For Estes and Morgan (1976) social progress is the achievement of meeting the basic and material needs of a growing population within a society. This definition highlights the importance of addressing people's needs and the capacity to fulfil them.

According to Osberg (2001), social progress is based on the definition of what constitutes a "good" society and on a way to measure whether society is getting closer or further away from that ideal. Furthermore, the author emphasises that individuals distinguish between their needs and wants, and they perceive progress as fulfilling their needs before addressing wants. Similarly, Porter et al. (2013) describe social progress as the ability of the society to attain the basic human needs of the population and establish strong infrastructure and resources that

enable people and communities to enhance and sustain their well-being, as well as, promote an inclusive environment where all individuals have the opportunity to fully develop and reach their potential. This definition is thorough and has been embraced by the Social Progress Imperative as the foundation for creating the global Social Progress Index (SPI), as we will see in the coming sections regarding the measurement of social progress.

1.2 Measurement of Social Progress

As stated earlier regarding the no universal definition of social progress, quantifying it is also a complex endeavour that encompasses various dimensions of human well-being and societal advancement. There have been many different views on using monetary indicators, such as Gross Domestic Product (GDP), as a reliable measure of societal advancement. For an extended period, employing a monetary indicator such as GDP per capita as a stand-in for the well-being of the population seemed logical; however, policymakers and individuals now consider a broader range of factors beyond just economic output (Giovannini et al., 2007).

The Beyond GDP movement, which gained momentum in the 2010s, represents a global effort to develop indicators that can either supplement or replace GDP as a measure of progress and societal well-being. While GDP has historically served as a key indicator for growth and economic evaluation, the extensive discourse in the literature underscores its inadequacy in capturing the entirety of societal well-being, sustainability, and inclusivity (Aitken, 2019; B. Wang & Chen, 2022). Also in his research, Estes (2015) describes how GDP alone does not provide a complete depiction of societal progress because it does not take into account distributional issues or non-economic factors like healthcare and education.

Advocates of the Beyond GDP movement argue that new indicators are not just about providing alternative metrics but are part of a broader societal transformation. This transformation involves shifting priorities from mere economic growth to encompass sustainability, equity, and well-being (Hayden, 2021). When we place a greater emphasis on material wealth, such as the production of goods, at the expense of factors related to well-being, such as health, education, and the environment, we adopt the constraints associated with these metrics, fostering a society that is excessively fixated on materialism. Furthermore, the inadequacy of GDP in accounting for the negative impacts of economic growth on the environment, such as resource depletion and environmental degradation, renders this indicator insufficient for social progress (Stiglitz et al., 2018).

The movement towards Beyond GDP is not limited to theoretical discussions but has practical implications as well. Different methods for assessing social advancement have been created using a range of indices that rely solely on social indicators, while others incorporate a combination of social and economic indicators. This section will review the evolution of metrics for measuring social progress through the creation of composite indices.

Key indices to measure social progress:

- **Gross National Happiness (GNH)**
    - The concept of Gross National Happiness (GNH) originating from Bhutan has garnered significant attention in academic literature. GNH represents a unique approach to assessing economic and social development, emphasising holistic well-being over mere economic growth (Yangka et al., 2018). This philosophy, introduced by the Fourth King of Bhutan in the 1970s, aims to achieve a balanced and sustainable form of development by considering the material and spiritual aspects of human society (E. Allison, 2019). GNH considers various factors beyond economic prosperity, including environmental conservation, cultural preservation, good governance, and mental and physical health. (Gupta & Agrawal, 2017)
- **Human Development Index (HDI) by UNDP**
    - The HDI is a composite statistic of life expectancy, education, and income indices used to rank countries into four tiers of human development. The HDI was introduced by the United Nations Development Programme (UNDP) in 1990 as a more comprehensive measure of human well-being than purely economic indicators such as GDP per capita. Life expectancy at birth is one of the key components of the HDI, and it reflects the overall health and healthcare access within a country. Education is measured by the average years of schooling for adults aged 25 years and the expected years of schooling for children entering school. Income is represented by Gross National Income (GNI) per capita, adjusted for purchasing power parity (UNDP, 2020). The HDI ranges from 0 to 1, with 1 indicating the highest level of human development. Countries are classified into very high human development, high human development, medium human development, and low human development based on their HDI scores.

- Critics of the HDI argue that it oversimplifies the complex nature of human development by reducing it to three indicators. They also point out that the HDI does not account for factors such as inequality, gender disparities, and environmental sustainability (Ranis et al., 2006). To overcome this the Inequality-adjusted Human Development Index was introduced, which modifies the conventional HDI by integrating indicators of inequality in health, education, and income. This adjustment allows the IHDI to emphasize the impact of disparities in these fundamental domains on the overall progress of human development (UNDP, n.d.).

- **Happy Planet Index (HPI) by New Economics Foundation (NEF) 2006**
  - The Happy Planet Index (HPI) is a composite index that measures the extent to which countries provide long, happy, and sustainable lives for their citizens without depleting the Earth's resources excessively. It evaluates well-being and sustainability by considering factors such as ecological footprint, life expectancy, and subjective well-being. The HPI was developed by the New Economics Foundation (NEF) as a global index of sustainable well-being, aiming to offer a holistic perspective on societal progress that goes beyond traditional economic indicators like GDP (Abdallah & Marks, 2014). A significant finding from comparing the HPI with other indicators, such as the HDI, is that when two countries have similar HDI results, their HPI outcomes can be different (Simms et al., 2006).

- **Better Life Index (BLI) by OECD 2011**
  - The BLI is a measure of well-being developed by the Organization for Economic Cooperation and Development (OECD) in 2011, that encompasses multifaceted components to assess the quality of life in different countries. The BLI is a tool that evaluates and compares the quality of life in different countries by looking at various indicators such as health, education, environment, work-life balance, and social connections, not just focusing on economic factors. This holistic approach provides a better understanding of well-being and helps policymakers pinpoint areas that need improvement. Users can tailor the index to their own preferences, allowing for a personalized assessment of what constitutes a "better life" (Balestra et al., 2018).

- **Inclusive Development Index (IDI) by World Economic Forum 2018**
    - The IDI is a comprehensive measure that evaluates the inclusivity of development within a country, taking into account various economic and social factors. It aims to assess not only the overall economic growth of a nation but also the extent to which this growth benefits all segments of society, particularly marginalized or vulnerable groups. Many individuals assess the economic advancement of their nations based on the changes in their personal standard of living, which includes factors such as income, employment prospects, economic stability, and overall quality of life. Despite this multidimensional perspective, policymakers and the media predominantly emphasize GDP growth as the central indicator of economic prosperity. Created as a substitute for Gross Domestic Product (GDP), the Inclusive Development Index (IDI) is structured to align more closely with the metrics individuals use to assess the economic advancement of their nations and effect on their lives (*World Economic Forum*, 2018).
    - To address the drawbacks of IDI, the Multidimensional Inclusiveness Index[1] (MDI) was introduced. This index expands upon the dimensions considered in the HDI by incorporating additional factors such as the environment. It also incorporates measures of inequality through the Inequality-adjusted Human Development Index (IHDI). Moreover, the MDI offers a broader coverage of countries and a longer historical perspective compared to the HDI, IDI and IHDI (Dörffel & Schuhmann, 2022).

- **Social Progress Index (SPI) by Social Progress Imperative 2013**
    - In 2013, the Social Progress Imperative introduced the Social Progress Index (SPI), which characterized social progress "the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential." (Porter et al., 2013, p. 14). The SPI is a comprehensive, outcome based measure of societal development that focuses on non-economic dimensions. It is based on a holistic definition that emphasizes meeting basic human needs, establishing foundations

[1] For the breakdown and detailed information see (Dörffel & Schuhmann, 2022)

for well-being, and creating opportunities for personal freedom and choice (D. Fehder et al., 2018). While the BLI, HDI, and other indicators incorporate economic factors, the SPI adopts a more comprehensive approach by considering a broader range of social factors beyond economic measures (Porter et al., 2013).

Upon observation, it is evident that the Social Progress Index (SPI) distinguishes itself as the primary metric exclusively dedicated to social aspects. Its comprehensive composition of numerous indicators further enhances its reliability and effectiveness. This emphasis on social factors is crucial, especially when examining the relationship between social development and economic prosperity. Hence, opting for the SPI in our analysis is justified, given its unparalleled emphasis on and reliability in evaluating social progress.

The Social Progress Index is specifically centred on non-economic factors of a country's performance. The goal is to employ a transparent and thorough methodology that focuses on the non-economic aspects of social performance. The Social Progress Index strives to focus on outcomes as much as it can. While both input and outcome-based indexes can assist countries in evaluating their progress, they do so in distinct manners. Input indexes evaluate a country's policy decisions or investments that are thought to result in significant outcomes, while outcome indexes directly assess the results of these choices or investments (Stern et al., 2021)

Alongside the annual SPI, which has been available from 2013 to 2024, the Social Progress Imperative also offers a time-series SPI. In our analysis, we will employ time-series SPI data, and in the subsequent section, we will have an in-depth understanding of the time-series SPI, examining its measurement methodology and the variety of indicators it includes.

Time-series SPI

There are three core ideologies in the definition of the SPI which also support the dimensions of the Social Progress Index: Basic Human Needs; Foundations of Wellbeing and Opportunity. Figure 1 provides a comprehensive breakdown of the component-level framework of the SPI, illustrating the types of questions that SPI typically addresses through its measurement. Firstly, for Basic Human Needs, questions include the essential elements necessary for survival and well-being, such as access to clean water and sanitation, nutrition, shelter, and basic medical care. Ensuring that individuals' basic needs are met forms the foundation for societal progress. Moving on to the Foundations of Wellbeing, the SPI expands beyond the essentials, covering

elements that improve quality of life and support overall happiness. This refers to having opportunities for education, healthcare, infrastructure, and living in a secure and steady environment. Lastly, the Opportunity is all about how people can easily exercise their rights, enjoy their freedoms, and make progress in their personal and community lives (Harmacek & Krylova, 2023).

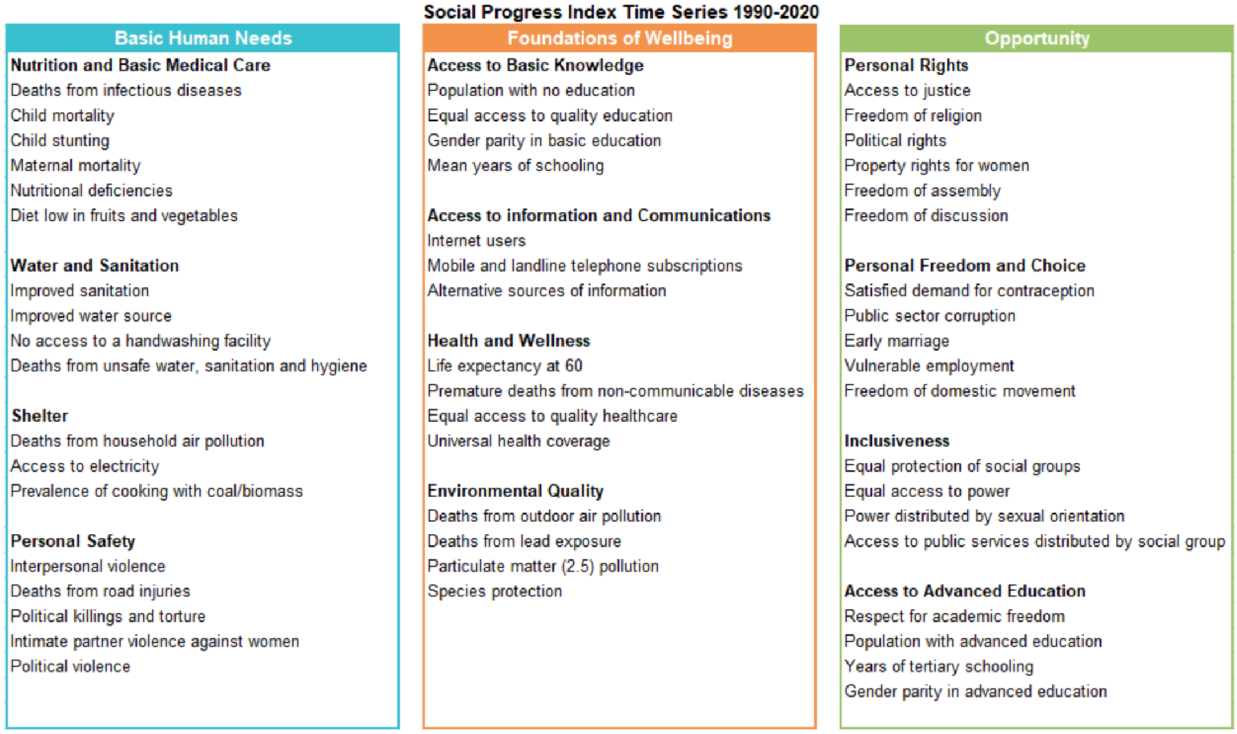
Figure 1. Social Progress Index Component-Level Framework

Source: Social Progress Imperative, 2023

Each dimension is accompanied by four components, and there are specific indicators for each component. These indicators, categorised by component, serve to define and assess specific facets of social progress. The twelve components symbolise the most comprehensive range of result categories based on the SPI's current knowledge of social advancement from various sources and the existing accessible data.

The time-series Social Progress Index is constructed based on 12 components and 52 social and environmental indicators with 3-6 indicators for each component (Figure 2). SPI exclusively incorporates indicators that are consistently measured with reliable methodologies by a single organization across all or nearly all countries within the sample. Each indicator undergoes thorough evaluation to ensure the validity of its measurement procedures and its alignment with its intended aspect of assessment. Furthermore, data for each indicator must originate from the same source to maintain consistency in measurement across countries (Harmacek & Krylova, 2023).

Figure 2. Social Progress Index Indicator-Level Framework



Source: Social Progress Imperative, 2023

The scores for the component, dimension, and overall Social Progress Index are standardized on a scale of 0 to 100 to facilitate a straightforward interpretation of performance levels. This scale allows for comparing a country's social progress performance against the highest and lowest achievable scenarios. Scaling also enables the monitoring of the absolute, rather than comparative, achievements of nations across various aspects, facets, and the comprehensive framework (Harmacek & Krylova, 2023).

1.3 Economic Growth Definition

The foundation of modern societies is grounded in the pursuit of economic growth, which leads to prosperity, innovation, and progress. Economic growth not only creates wealth, but also spurs improvements in education, healthcare, and infrastructure, ultimately benefiting society as a whole. Economic growth refers to the increase in a country's production of goods and services over time, typically measured by the growth rate of the GDP (Barro, 1989). It signifies the expansion of an economy's capacity to produce output and is a key indicator of a nation's overall economic development (Balakrishnan, 2010). Various factors contribute to economic growth, including inputs like capital and labour, as well as improvements in efficiency

(Frenken et al., 2007). Measuring economic growth involves different approaches, such as using real GDP per capita as a metric (Ivanov & Webster, 2007). Additionally, inclusive growth, which considers not only the pace but also the distribution of economic growth, has gained attention (Anand et al., 2014).

Human capital is another crucial factor influencing economic growth, with studies highlighting a direct relationship between human capital and economic growth (Muhammad et al., 2015). However, the empirical evidence supporting this relationship has faced criticism, indicating a need for further research in measuring human capital and its impact on economic growth (Thamma-Apiroam, 2015). Moreover, the link between economic growth and income inequality has been a subject of renewed interest, emphasising the importance of understanding the relationship between these two factors (Kuznets, 1985).

In measuring economic growth, it is essential to consider factors like regional economic growth, external debts and the impact of other possible factors on economic growth (Aljaloudi, 2020; Alwi et al., 2020). Furthermore, the concept of inclusive growth extends beyond economic aspects to encompass social inclusivity, employment opportunities, and poverty reduction (Kjøller-Hansen & Lindbjerg Sperling, 2020; Soleh & Suwarni, 2021). Understanding the dynamics of economic growth involves analysing various elements such as capital intensity, production accumulation, and production effects (Derkacz, 2020).

To sum up, economic growth is a multifaceted phenomenon influenced by a number of factors, from human capital to income distribution, and requires a comprehensive approach to measurement and analysis.

1.4 Measurements of Economic Growth

Various indicators and methodologies are employed in economic research to measure economic growth. Among the widely used and recognized indicators are Gross Domestic Product (GDP), Gross National Income (GNI), and Gross National Product (GNP). While each of these indicators serves to measure economic growth, they possess specific nuances that must be considered.

The GDP is a measure of the overall monetary worth of all products and services created within a nation's boundaries during a set timeframe, usually on a yearly basis (OECD, 2024a). Also, GDP per capita is a fundamental measure of economic performance and is often utilized as a

measure of typical living standards or economic prosperity, despite some acknowledged limitations. Both GDP and GDP per capita provide a comprehensive overview of the total economic output and the economic performance per person in a given country, respectively.

GDP is calculated using three main approaches: the production approach, the income approach, and the expenditure approach (IMF, n.d.).

1. Production Approach: This method calculates GDP by summing the value added at each stage of production. It involves adding up the value of all goods and services produced in different sectors of the economy, such as agriculture, manufacturing, and services.

2. Income Approach: The income approach calculates GDP by summing up all incomes earned in the production of goods and services. This includes wages, profits, rents, and taxes minus subsidies.

3. Expenditure Approach: This approach calculates GDP by summing up all expenditures on final goods and services in the economy. It includes consumption (C), investment (I), government spending (G), and net exports (exports - imports).

Furthermore, Gross National Income (GNI) which is characterized as the total income earned by a country's residents, both domestically and abroad, within a specific time period is another indicator to measure the economic growth (OECD, 2024b). While comparing GNI and GDP, GNI per capita is often considered a better measure of the standard of living compared to GDP per capita, as it reflects the income available to residents of a country. One key advantage of GNI over GDP is its ability to provide a more accurate representation of a country's economic performance by accounting for net foreign income. This distinction is crucial as GNI considers not only the domestic production within a country but also factors in the income earned from abroad. GNI can provide a more accurate representation of a country's economic performance, especially when analysing income distribution and living standards (Kinnunen et al., 2019).

On the other hand, GDP is a widely used measure of economic activity and is often used to assess the overall economic “health” of a country. Moreover, GDP is particularly useful in studies where continuous data for GNI per capita may be lacking for some countries, as GDP growth rates can be used as a substitute for GNI growth rates in such cases. This highlights the practicality and availability of GDP data compared to GNI data in certain research contexts.

Both GNI and GDP serve as crucial indicators for assessing economic performance and societal well-being, measured at the level of analysis.

Moreover, another key indicator for economic growth, Gross National Product (GNP), shares similarities with GNI. GNP refers to the total value of all final goods and services produced by a country's residents, regardless of their location, within a specific time period. The main difference is that while GNI represents the total income earned by a country's residents and businesses, regardless of where the economic activity takes place, GNP focuses on the production aspect.

1.5 Association between Social Progress and Economic Growth

The relationship between social progress and economic growth is complex and multifaceted, bearing significant implications for societal transformation and the allocation of resources for social policies. Social progress, as previously defined, is subject to various interpretations. Ranis et al. (2000) delve into the correlation between economic growth (EG) and human development (HD) in their study. They define HD as an expansion of people's choices to lead longer, healthier and more fulfilling lives. The authors analyse this relationship through two interconnected causal chains. First chain, from EG to HD, public investments in health and education, particularly for females, positively influence HD. Conversely, the second one, enhanced HD fosters economic growth. The research reveals that countries initially prioritising economic growth often fall into a vicious cycle, displaying poor performance in both EG and HD. Conversely, nations with better HD and weaker EG can transition into the virtuous category, demonstrating positive outcomes in both domains. The study suggests that the movement of countries across these categories is shaped by various factors such as public spending on health and education, investment rates, income distribution, and policy reforms. As economies grow, they tend to invest more in social programs, which, in turn, can further stimulate economic growth (Osberg, 2001). These elements play pivotal roles in determining the trajectories of countries and their transitions between performance categories.

Subsequent investigations have further explored this relationship, revealing a bidirectional causality between economic growth and social expenditures (Govdeli & Karakuş Umar, 2021).

Several studies have been conducted to comprehend the correlation between economic growth and social development. While the concept of human development encompasses broader aspects than those captured solely by metrics like the Human Development Index, HDI and various socio-economic indicators often serve as proxies for assessing social advancement in

the literature. Despite its limitations, HDI remains prevalent in studies exploring the relationship between economic growth and societal well-being.

In a study focusing on the impact of corruption on economic performance, the HDI index served as a proxy for poverty. Empirical research highlights that corruption indirectly contributes to poverty by influencing socio-economic, political, and administrative factors, rather than directly causing it. The study, conducted in the ECA region, underscores the crucial role of governance (Ildirar & İşcan, 2015).

Moreover, social entrepreneurship has been found to play a role in fostering sustainable economic growth, with innovation mediating the relationship between social entrepreneurship and economic growth (W. Wang, 2022).

As previously discussed, the Social Progress Index (SPI) serves as the primary indicator in this research for measuring social progress. Existing research in the literature has demonstrated that the quality of institutions consistently plays a significant role in promoting social advancement (Almatarneh & Emeagwali, 2019). Institutional quality is crucial for fostering both social progress and economic development. Countries with better institutional quality tend to exhibit a stronger relationship between SPI and GDP per capita (Qaiser et al., 2018), underscoring the significance of good governance in driving overall progress (Almatarneh & Emeagwali, 2019). While GDP growth is essential for enhancing basic human needs, both GDP growth and advancements in economic institutions contribute to bettering the foundations of well-being (D. C. Fehder et al., 2019).

1.6 Efficiency of the Countries

Evaluating the effectiveness of countries entails assessing how successful they are in reaching their desired goals or objectives, especially in areas like economic growth, societal welfare, and overall advancement. Effectiveness can be measured through different aspects such as economic achievements, social metrics, governance, environmental sustainability etc.

To evaluate the effectiveness of countries in achieving social progress, various studies provide insights into the factors influencing social progress and the challenges faced by different nations. The effectiveness of countries in their goals for social progress is influenced by a range of factors, including economic stability, macroeconomic conditions, and institutional quality.

Research by Bilan et al. (2019) focuses on the relationship between macroeconomic stability and social progress, suggesting that countries with greater stability are more likely to achieve social progress. Additionally, studies such as Ghak & Bakhouche (2023) highlight the impact of social progress on foreign direct investments in African countries, emphasising the importance of achieving economic and non-economic goals such as poverty reduction, education, health, and freedom.

To comprehend the complexities of socioeconomic development, it is crucial to differentiate between efficiency and effectiveness. Efficiency refers to achieving desired results with minimal resources, while effectiveness is how well those results align with overall goals. When assessing how well countries turn economic growth into social progress, understanding this difference is essential for uncovering the various factors at play.

When talking about efficiency and effectiveness, productivity should also be mentioned. Productivity is the process of transforming the resources used in a task (such as labour and capital) into favourable outcomes (like sales, profits, etc.) as stated by Solow (1956).

Productivity is the effective utilization of resources in the production of a good and is defined as the connection between the production and consumption of productive factors measured in physical units. In the realm of input/output dynamics, output can refer to any desired outcome or product generated by a company, while input encompasses all resources consumed in order to achieve that output (Diéguez & González, 1994). Moreover, Grönroos & Ojasalo (2004) described productivity as the efficacy of converting input resources in a process into economic outcomes for the provider and value for consumers.

Delving deeper, inputs and outputs are pivotal in economics, serving as fundamental constructs for analysing production processes and resource allocation. Inputs refer to the resources, such as labour, capital, and materials, that are used in the production of goods or services. Outputs, on the other hand, represent the final products or services that result from the production process. This nexus between inputs and outputs is critical for evaluating efficiency, productivity, and overall economic performance.

Efficiency in economics encompasses various dimensions and interpretations, constituting a fundamental concept centred on achieving maximum outcomes with minimal inputs or resources. Specifically, technical efficiency focuses on achieving the maximum output with a given set of inputs, while allocative efficiency involves the optimal distribution of resources to

maximise overall welfare. Economic efficiency combines both technical and allocative efficiency to assess the overall performance of an economic system or entity (Kalirajan, 1990). Diverse methodologies, such as efficiency ratios, Data Envelopment Analysis (DEA), and production frontier analysis, are employed to measure efficiency (Mizobuchi, 2014; Prieto & Zofío, 2007).

While studies have extensively explored countries' effectiveness in translating resources into GDP or GNI, there remains a notable gap in the literature concerning how efficiently countries convert economic development into social progress. Existing studies have scrutinised countries' resource allocation and their ability to generate GDP, particularly examining the role of natural resources in economic development with some questioning whether resource-rich economies develop more rapidly than those with fewer resources (Barbier, 2003). However, not enough focus has been given to exploring how countries use their economic development level to promote social advancement.

1.7 Gaps in the Literature and Contributions

As previously mentioned, many studies have investigated how economic growth impacts societal development, but there is a lack of research on how economic potential translates into social progress using only social indicators. Current studies tend to rely on economic metrics like GDP or GNI to measure development, neglecting the diverse aspects of societal well-being. Furthermore, studies that do incorporate social indicators typically investigate them in conjunction with economic factors, rather than as standalone measures of social progress.

Specifically, the literature lacks comprehensive investigations into how countries leverage their economic development to foster social advancement, particularly emphasising the role of social indicators in this process. While some studies have explored the relationship between economic growth and human development (Ranis et al., 2006; Ozturk & Suluk, 2020; Govdeli & Karakuş Umar, 2021), few have utilised a dedicated social progress indicator to assess countries' effectiveness in translating their economic potential into social well-being.

The main contribution of this study to the literature is addressing the aforementioned gap by focusing solely on social indicators and countries' efficiency levels in translating their economic growth into social progress. This research uniquely utilises the Social Progress Index (SPI) as a dedicated measure of societal well-being, distinct from traditional economic metrics.

By employing the SPI as the main indicator, this study seeks to provide a more comprehensive understanding of the relationship between economic growth and social progress. Specifically, it aims to investigate how different countries fare in terms of converting their economic development, in this case inputs, into tangible improvements in social well-being, outputs as measured by the SPI.

Furthermore, this research contributes to the broader discourse on development economics by highlighting the importance of considering social factors in addition to economic indicators when assessing overall progress and prosperity.

CHAPTER 2 DATA AND METHODOLOGY

This chapter outlines the methodology used to analyse the relationship between social progress and economic development, along with details about the data employed. Particular emphasis will be placed on evaluating the efficiency of countries in translating their economic development into social progress. The study is dedicated to investigating this connection from the perspective of efficiency, utilising data from 1990 to 2020 and covering 171 countries. This extensive time frame allows for a thorough examination of economic and social trends spanning three transformative decades.

2.1 Data

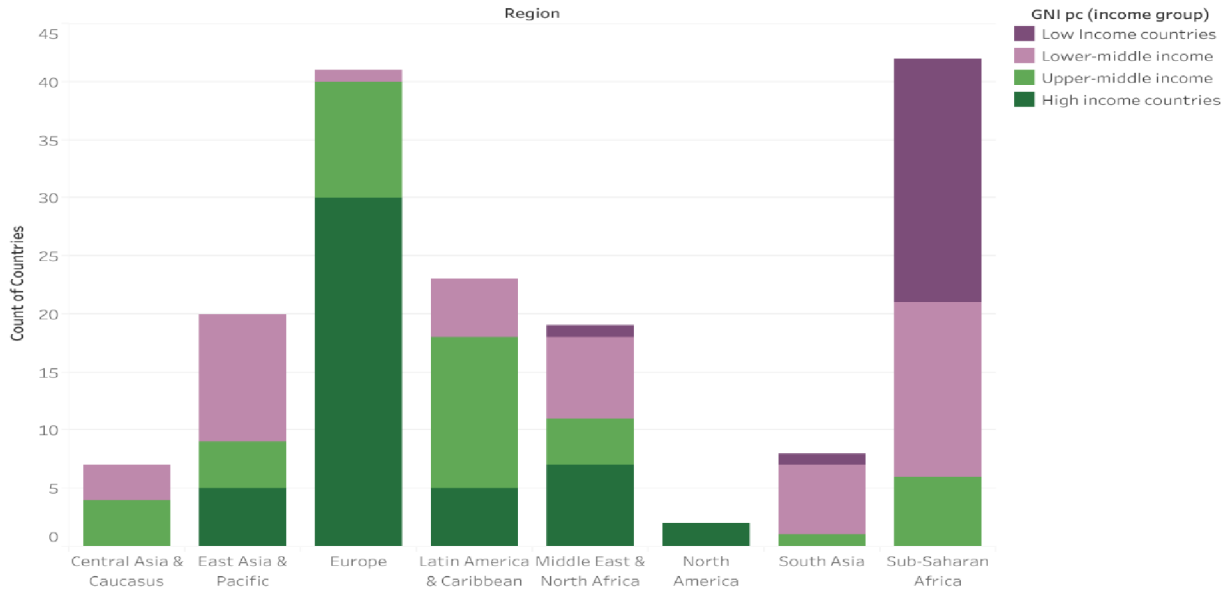
Economic growth. In our analysis, economic development is measured using GDP per capita. Additionally, countries are compared based on their income levels, with this classification derived from the World Bank using Gross National Income (GNI) per capita. Data for both GNI and GDP are sourced from World Bank open data and cover the period from 1990 to 2020 for 171 countries. Both indicators are measured in US dollars, with the GNI measurements using conversion factors determined by the Atlas method[2]. The datasets used in the study are characterized by their large size and balanced panel structure, comprising observations over time for almost all countries. However, not all countries have data availability for the same number of time periods, resulting in variations in the number of observations across countries.

The World Bank Group categorizes global economies into four income groups - low, lower-middle, upper-middle, and high. These classifications are revised annually, using the GNI per capita from the previous year. The purpose of the World Bank's income classification is to represent a country's development level, utilising the Atlas GNI per capita as a widely accessible measure of economic capability (World Bank, 2023).

Figure 3 illustrates the classification of countries in our dataset based on their income level and regions for the year 2020. In the analysis part, these income classifications will give us an understanding of different economic development levels in various countries, as well as to see the efficiency levels for different income groups.

[2] For more detailed understanding of the Atlas method, please refer to the methodology of World Bank

Figure 3. World Bank Group country classifications by income level as of 2020



Source: Author's calculation based on data from the World Bank and Social Progress Imperative

The figure highlights notable differences among various regions. Specifically, Europe emerges as having the highest number of high-income countries, while Sub-Saharan Africa exhibits the highest proportion of low-income countries, reflecting the prevalence of economic challenges and disparities within the region.

Social Progress. To assess social progress in our analysis, the Social Progress Index is utilized. The main distinguishing characteristic and the reason to choose that specific indicator is that it lets us consider only social factors which have an effect on countries' social development. Moreover, the SPI offers a standardized methodology for measuring social progress, enabling comparisons across countries and over time. This standardized approach enhances the reliability and comparability of the analysis, facilitating robust insights into global social trends (Harmacek & Krylova, 2023).

The data for the SPI is sourced directly from the Social Progress Imperative, a US-based non-profit organization. The Social Progress Index Time-Series data utilizes 52 indicators related to social and environmental outcomes to assess the social progress of countries from 1990 to 2020. In the dataset, the SPI scores have been calculated for 170 countries annually from 1990 to 2020[3]. Scores for two other countries are available for a shorter time frame. Additionally,

[3] For breakdown, see the methodology of SPI by Harmacek & Krylova (2023)

data for 24 more countries have been included to calculate at least one component score for some years within the 1990-2020 period (Harmacek & Krylova, 2023).

2.1.1 Choice of Indicators

Economic growth. As discussed in earlier sections, GNI and GDP per capita are commonly used indicators to measure economic growth. While both metrics offer valuable insights into a country's economic performance, it's important to consider certain nuances. In our analysis, we aim to assess a country's development level within its borders. GNI encompasses the national income earned by all citizens and businesses regardless of their location, while GDP focuses solely on economic activities within a country's borders. Given that the Social Progress Index (SPI) also measures variables at the country level, the utilisation of GDP is more relevant in our study.

Social progress. To assess social progress across countries, the Social Progress Index (SPI) is employed. The Social Progress Index evaluates the performance of countries on specific indicators that align with the criteria and principles of the Social Progress Index at a national level (Harmacek & Krylova, 2023).

2.2 Methodology

In our study, we aim to assess the efficiency levels of countries in translating their economic development (measured by GDP per capita) into the social progress they achieve. To analyse this, in this section, we introduce two main methods that will be used: residual-based efficiency score analysis and ratio-based analysis. Each of these primary methods will be discussed in detail in the subsequent sections, providing a comprehensive understanding of our approach to measuring efficiency through the association of these two variables.

2.3 Residual-based Efficiency Scores Approach

In our study, we focus on evaluating countries' efficiency in translating economic development into social progress. To achieve this, we predict residuals from the most suitable model based on our data. These residuals represent the deviation of observed social progress from the

model's predictions. If a residual is positive – it is an SPI overperformer (given its GDP pc), if it is negative, it underperforms in SPI compared to its level of economic development. The biggest positive residuals have the highest efficiency, while the lowest residuals (negative) present the lowest efficiency. These residuals are then scaled to 0-100 scores showing the relative efficiencies.

To predict residuals, we employ the following empirical techniques:

- ***Non-panel estimators***

Under the category of non-panel estimators, we have two main methods to test for our analysis: Ordinary Least Squares (OLS) and Pooled Ordinary Least Squares (OLS). The OLS model is a widely used statistical method in econometrics for estimating the relationships between variables, assuming a normal distribution of errors and a linear relationship between the independent and dependent variables. Employing the OLS regression method, we examine the association between social progress and economic growth, incorporating variables such as the Social Progress Index and Gross National Income per capita. Pooled OLS, on the other hand, combines cross-sectional and time-series data to analyse the impact of independent variables on the dependent variable across different entities, such as countries and time periods. This approach allows for a comprehensive analysis of the overall relationship between economic growth and social progress. These models ignore the unobservable entity-specific characteristics.

- ***Panel estimators***

Under the category of panel estimators, we have random-effect (RE) and fixed-effect (FE) models. RE models are statistical models that are used to analyse data with a hierarchical or clustered structure, where the variability is attributed to both within-group and between-group differences. These models are particularly useful when dealing with data that exhibit heterogeneity or when the assumption of independence between observations is violated (Laird & Ware, 1982). FE model is a statistical method used to analyse panel data by controlling for unobserved time-invariant variables at the individual or group level. This technique involves including dummy variables for each individual or group in the regression model to capture the fixed effects specific to each entity. By doing so, fixed effect regression helps to eliminate biases that may arise from omitted variables that do not vary over time within the entities being studied (P. Allison, 2009).

Before choosing the ideal method to predict residuals, we implemented various tests[4] to determine the model that best fits our data, ultimately applying the Hausman[5] test to assess the suitability of our chosen approach. Our analysis prioritized panel data analysis with fixed effects to address unobserved differences across countries and time periods.

2.4 Ratio-based Efficiency Scores Approach

In this section, we outline another methodological approach employed to assess the efficiency of countries in translating the level of economic development into social progress. The methodology we use, which focuses on input-output analysis, is well supported by various studies, for example in the field of environmental efficiency of wellbeing. Research conducted by several scholars (Dietz et al., 2012; Wiedmann et al., 2006) has shown the effectiveness of this approach in assessing how resources are allocated and the level of output in environmental settings. These studies usually look at the relationship between inputs (environmental resources) and outputs (societal well-being), providing insights into how efficiently resources are used to achieve specific goals.

Furthermore, comparable approaches can be identified in other fields such as finance, and social sciences, particularly in research that examines public policies. For example Lee and Yoon (2010) have employed a measure called Return on Investment (ROI) to analyse the impact of policy interventions. By measuring the connection between resources invested in a policy, and the societal outcomes achieved, ROI offers a useful gauge of policy effectiveness. Building upon these insights, the ratio method goes beyond economic measures to evaluate how effectively economic resources contribute to social advancement. For instance, a study conducted by Clare et al. (2023) analysed food rescue programs by calculating the ratio of present value[6] to the value of inputs, providing a measure of the programs' impact.

In our analysis we define GDP per capita, representing the total economic production within countries' borders over a specific period as the input variable. Conversely, the Social Progress Index (SPI) serves as the output variable, reflecting the achievement attained through this input.

[4] Please refer to Appendix to see the test results
[5] The Hausman test evaluates whether the random effects model or the fixed effects model is more appropriate for a given dataset, based on the assumption of exogeneity of the explanatory variables(Guggenberger, 2010).
[6] "*Present value* is the value today of values to be available in the future." (Cristina, 2015))

The ratio can be calculated in the following way:

$$Efficiency\ ratio = \frac{Output}{Input} \quad (1)$$

Once we have established the efficiency ratio as the output variable (SPI) over the input variable (GDP per capita), our goal is to analyse whether and how much nations are successful in turning their economic development into social progress. The efficiency ratio serves as a quantitative measure of the efficiency with which economic resources contribute to social advancement. A higher efficiency ratio indicates superior conversion of potential, signifying more optimal utilisation of resources.

2.4.1 Data Treatment

Before calculating the ratio, a few steps were taken to align the data in order to ensure consistency and comparability of the analysis.. This alignment, achieved by retaining only the years and countries where both SPI and GDP per capita data were available, helped to mitigate potential biases in subsequent calculations.

After aligning the dataset, we narrowed it down to a total of 171 countries. Among these, 146 countries have data available for all 31 years in our study period. Remarkably, except for 6 countries, the remaining countries possess data availability for more than 20 years, underscoring the substantial coverage of our dataset across multiple years and countries.

2.4.2 Calculation of the Equalising Constant

One issue to consider when using a ratio as an indicator is that it can be influenced significantly by either the numerator or denominator due to differences in their variability and range (Dietz et al., 2012). The coefficient of variation (CV) is a measure of relative variability, and it is often used to compare the variability of different datasets that have different units or scales. It is calculated simply as the ratio of the standard deviation to the mean of a variable:

$$CV = \frac{\sigma}{\mu} \quad (2)$$

Following the methodology outlined by Dietz et al. (2012), the analysis proceeded through the subsequent steps. In our dataset, the coefficient of variation for our numerator, which is SPI, is

equal to 0.28 with a range of 19.61 to 94.12. For the denominator, GDP per capita, the coefficient of variation is 1.63 with a range from 22.85 to 123,678.7 USD. These coefficients of variation indicate that the relative variation in our denominator, GDP per capita, is significantly greater than the variation in SPI. Therefore, GDP per capita will have a greater impact on the ratio.

Various methods have been proposed to standardise indicators, but many of them fail to address the issue of numerator or denominator dominance (Dietz et al., 2012). In order to address the issue, a technique developed by the New Economics Foundation (Abdallah & Marks, 2014) is utilized, which involves adjusting one of the variables by adding a constant to ensure that the coefficient of variation of both the numerator and denominator are equal. By adding a constant to one variable, the mean is shifted without altering the variance, enabling the coefficient of variation of the numerator and denominator to be balanced (Dietz et al., 2012). The general formulation for calculating the efficiency ratio (ER) for our analysis can be outlined as follows:

$$ER = \frac{SPI}{GDP\ per\ capita + const} \tag{3}$$

The equation includes a constant term ($const$) that equalises the coefficient of variation between the indicators GNI per capita and SPI, and it is determined as described below:

$$const = \left(\frac{\sigma_{GDPpc} * \mu_{SPI}}{\sigma_{SPI}}\right) - \mu_{GDPpc} \tag{4}$$

In the equation, σ_{GDPpc} and μ_{GDPpc} represent the standard deviation and mean of our input variable, GDP per capita, respectively. Similarly, σ_{SPI} and μ_{SPI} denote the standard deviation and mean of the output variable (SPI) in the ratio. After calculation, the ratio values were scaled from 0 to 100 using the standard min-max approach following equation the equation below (Htitich et al., 2023)

$$ER_{sc} = \frac{ER - \min(ER)}{\max(ER) - \min(ER)} * 100 \tag{5}$$

To calibrate the ER_{sc} (i.e., to set the minimum and maximum for the min-max standardisation), the study adheres to the methodology of SPI (Htitich et al., 2023). To do so, a hypothetical scenario representing a utopian ideal is established where the maximum level of SPI, reaching 100, is achieved with minimal GDP. This utopian scenario provides us an ideal value for our maximum ER, calculated as $\frac{100}{const}$. Conversely, a dystopian scenario is considered where

achieving 0 SPI occurs with maximum GDP. This scenario yields a minimum value of 0 for our ER.

2.5 Alternative Approaches

After presenting methods that will be used in our analysis, this section will give more insights into other methodological approaches in the literature to measure efficiency. Efficiency in a company is often delineated through two distinct metrics: technical efficiency, which refers to the capacity of a company to attain maximal outputs given a specific set of inputs; and allocative efficiency, which reflects the firm's adeptness in utilising inputs in optimal ratios based on their corresponding prices (Farrell, 1957). These two indicators are aggregated to assess economic efficiency, as demonstrated in studies by Battese & Coelli (1992) and Coelli et al. (2005).

The efficiency frontier or the production frontier illustrates the highest possible level of production achievable based on technology and available resources, leading to the greatest level of utility or satisfaction within the limitations of resources (de la Fuente-Mella et al., 2020). The closer the production point is to the frontier, the more efficient the company is considered to be. A company operating directly on the frontier is considered to be operating at maximum efficiency, while any deviation from the frontier indicates inefficiency.

Estimating this frontier or efficiency level, involves two main approaches: Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA). SFA, first proposed by Aigner, Lovell, and Schmidt (1997) and Meeusen and van den Broeck (1977), operates on the principle that no economic entity can surpass the ideal production frontier, with deviations indicating inefficiencies (Belotti et al., 2013).

DEA, introduced by Charnes, Cooper, and Rhodes (CCR) in 1978, provides a method to convert a fractional linear efficiency measure into a linear programming (LP) model. This allows for the evaluation of decision-making units (DMUs) based on various inputs and outputs, even in the absence of a known production function (Adler et al., 2002).

Our study will not utilize frontier analyses, primarily because we focus exclusively on one input and one output. This differs from the majority of studies, which typically examine multiple inputs and outputs.

CHAPTER 3 ANALYSIS AND RESULTS

In this chapter, we commence by describing the data to provide a comprehensive overview of countries' economic and social conditions. This includes an examination of regional and income-level disparities. Following the data description, we conduct efficiency analysis employing two models: residual-based and ratio-based efficiency analyses. This allows us to gain a comprehensive understanding of countries' efficiency. Additionally, we present a comparative analysis of the two mentioned models, alongside income-level and regional analyses.

3.1 Descriptive Statistics

To present data and compare countries in the following section, we considered several classifications, including income levels and regional classifications[7]. Beginning with GDP per capita, Table 1 displays the population-weighted GDP pc for the regions in 1990, 2000, 2010, and 2020. Analysing the data across different decades will provide us with an overall understanding of the trends spanning from 1990 to 2020.

When looking at the data, a prominent observation emerges: certain regions, such as South Asia and Sub-Saharan Africa (SSA), exhibit significantly lower GDP pc compared to other regions, which is particularly evident in the early years of our study. Meanwhile, North America and Europe consistently ranked in the top positions throughout the three decades.

Across the studied period, North America, which includes the USA and Canada, stands out with the highest average population-weighted GDP per capita among the regions, reaching approximately $42,200 on average. This indicates a consistently strong economic performance over the years despite periodic fluctuations. Following closely, Europe, including not only European Union countries but also the Western Balkans, Moldova, Ukraine etc., maintains a solid position with an average population-weighted GDP per capita of $23,660.28, indicating a steady growth trajectory.

[7] Regions are categorized according to the SPI's classification, which closely aligns with the World Bank's classification, except for the ECA region. According to SPI's regional classification Europe and Central Asia are delineated separately, including the South Caucasus region. This nuanced classification allows for a more refined analysis, offering insights into regional efficiency trends in subsequent sections.

Table 1. Average population-weighted GDP pc for the regions

Mean population-weighted GDP pc for the regions within the studied time frame				
Regions	**1990**	**2000**	**2010**	**2020**
Central Asia & Caucasus	1,049.30	701.37	4,084.36	4,173.59
East Asia & Pacific	2,578.59	3,883.92	7,478.19	11,187.63
Europe	14,121.55	16,492.76	31,264.44	32,762.37
Latin America & Caribbean	2,612.07	4,322.68	8,783.16	7,200.65
Middle East & North Africa	4,537.08	5,040.73	10,620.36	10,739.06
North America	23,652.67	35,147.15	48,542.83	61,453.11
South Asia	354.64	457.82	1,253.95	1,853.85
Sub-Saharan Africa	721.32	624.72	1,725.99	1,546.13

Note: GDP pc is in current US$
Source: Author's calculation from World Bank data

East Asia & Pacific together with the Middle East & North Africa (MENA) region demonstrated significant economic advancement, with a population-weighted average GDP per capita of $6,282, and $7,734.3, respectively, indicating substantial growth over the decades. However, despite this growth, they still lag behind Europe and North America in terms of per capita income. Latin America & Caribbean exhibited moderate economic growth, with an average of $5,729.64. While showing improvement over the years, it still faces challenges in achieving sustained economic development comparable to regions with higher income.

Central Asia & Caucasus experienced notable fluctuations in weighted GDP per capita, averaging $2,502.16. While showing signs of improvement in recent years, the region still faces challenges in achieving significant economic growth compared to more developed regions. SA and Sub-Saharan Africa (SSA) both displayed lower weighted GDP per capita figures, standing at $980.06 and $1,154.54, respectively. These regions, especially SSA, face various economic challenges, including poverty, infrastructure deficits, and political instability, which hinder their economic development compared to other regions (Thirtle et al., 2003).

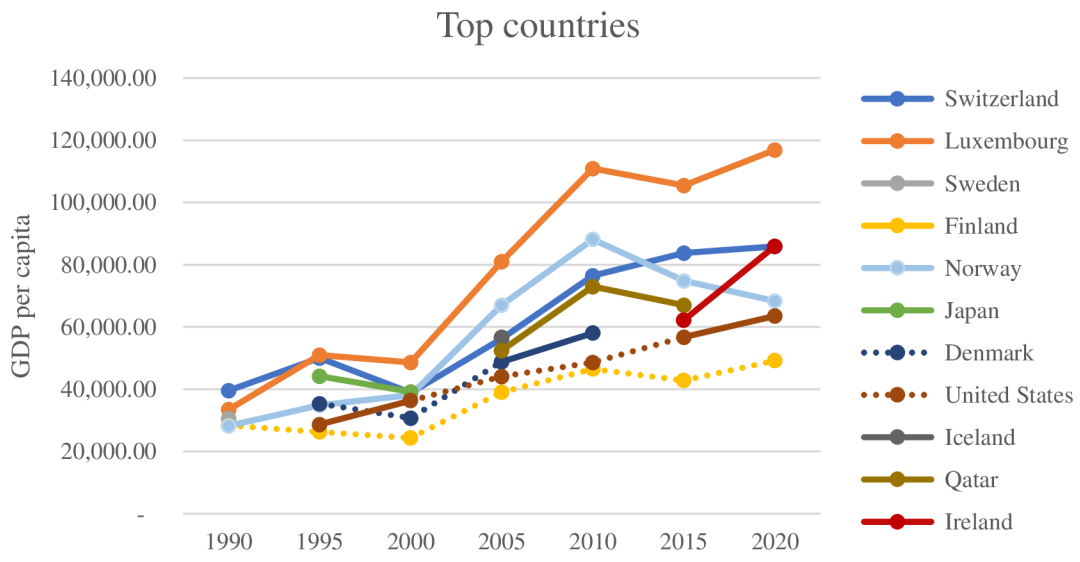
While examining the data at the country level within regions, even more significant differences become apparent. Referring to the World Bank's income classification for 2020 (which is however based on GNI pc data), among 162 countries available in our dataset, 23 are categorized as low-income countries, while 90 are under the middle-income category, with 48 classified as lower-middle income and 42 as upper-middle income. The remaining 49 countries are classified as high-income nations.

After observing regional and income differences, a selection was made to highlight trends over the last three decades by focusing on 11 countries with the highest GDP per capita. To ensure

a broader sample, the top 5 best-performing countries in terms of GDP per capita were collected every 5 years within the specified period. Some countries, such as Luxembourg, Switzerland, and Norway consistently ranked among the top performers. Figure 4 presents GDP per capita values for these selected countries, offering a snapshot of their economic performance and growth trajectories over the past three decades. Countries that have shown consistent trends are represented with solid lines, whereas countries that appeared only once or twice within the selected period are illustrated with dashed lines. For instance, Denmark made it to the top 5 in 2005 and 2010 but was not ranked among the top 5 highest GDP per capita countries before that. Similarly, the USA is present in the top 5 only in the last two years of the selected period.

Overall, we observe a consistent upward trend in the GDP per capita levels of the countries. Analysing the trends and patterns in GDP per capita can provide valuable insights into each country's economic development and relative prosperity.

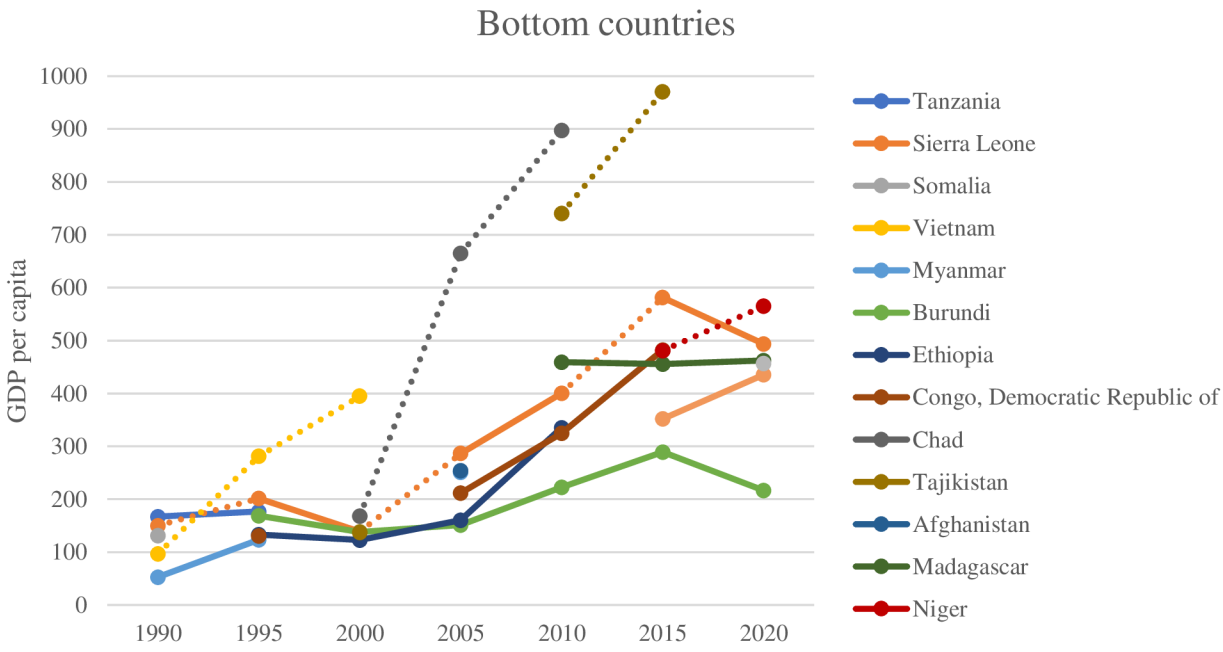
Figure 4.Top countries for GDP pc over the studied time frame



Note: GDP pc is in current US$
Source: Author's calculation from World Bank data

Conversely, Figure 5 shows the bottom 5 countries with the lowest GDP per capita levels among the 170 countries for each selected year. As we can observe, some countries are consistently among the worst-performing, such as Burundi, Ethiopia, and the Democratic Republic of Congo. On the other hand, due to increases in their GDP per capita throughout the period, countries like Tajikistan, Vietnam, and Chad appeared only once among the worst-performing countries.

Figure 5. Bottom countries for GDP pc over the studied time frame



Note: GDP pc is in current US$
Source: Author's calculation from World Bank data

After analysing the data for our economic development variable, GDP per capita, in the coming paragraphs, we will focus on the indicator of social progress, SPI. Similar to the GDP analysis, we will explore the regional averages for each decade.

Table 2 below presents the overall trends observed over the three decades. Just as we noted with GDP per capita, regions such as Europe and North America consistently demonstrate strong performance in the SPI scores. These two regions record the highest population-weighted SPI scores, indicating strong social progress. Despite slight fluctuations, both regions maintain relatively high SPI scores: Europe, with 41 countries, range from 73.06 to 84.13, and North America, with 2 countries, ranges from 81.84 to 88.08.

East Asia & Pacific and Latin America & Caribbean regions demonstrate similar trends in social progress, with both showing improvements over the decades but still exhibiting lower SPI scores compared to Europe and North America. While East Asia & Pacific displays average SPI scores increasing from 49.24 in 1990 to 67.55 in 2020, Latin America & Caribbean regions show scores ranging from 60.04 to 72.91 during the same period, indicating room for further development.

The remaining regions, MENA, South Asia, Central Asia & Caucasus, and SSA display similar trends in social progress, with all showing lower average SPI scores compared to other regions.

However, within these regions, MENA experienced moderate growth, with average SPI scores increasing from 48.30 in 1990 to 64.34 in 2020. Additionally, among these four regions, Central Asia & Caucasus maintain more stable and relatively higher scores.

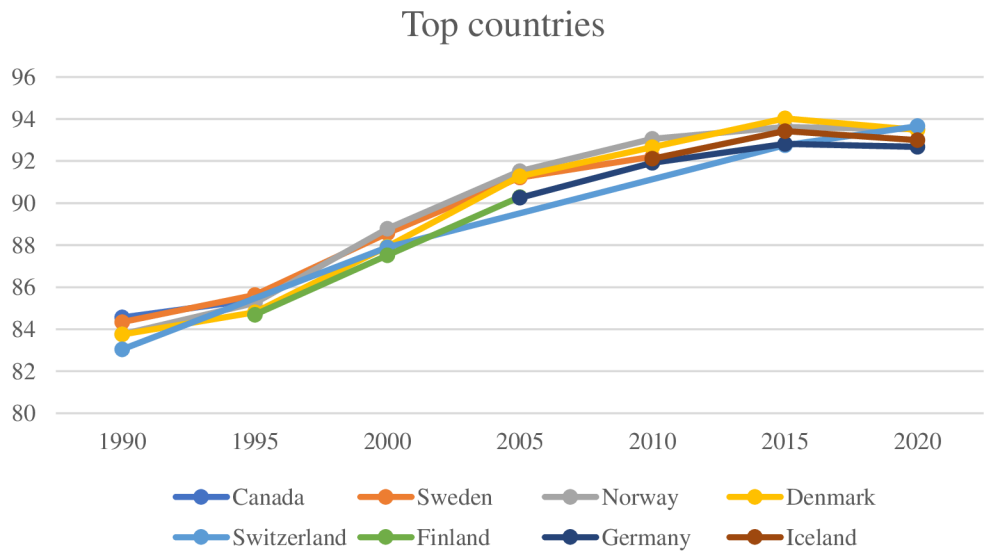
Table 2. Average population-weighted SPI score for the regions

Mean population-weighted SPI score for the regions within the studied time frame				
Regions	**1990**	**2000**	**2010**	**2020**
Central Asia & Caucasus	57.85	56.32	61.10	66.99
East Asia & Pacific	49.24	55.47	62.22	67.55
Europe	73.06	77.07	83.03	84.13
Latin America & Caribbean	60.04	65.10	71.41	72.91
Middle East & North Africa	48.30	53.57	59.50	64.34
North America	81.84	84.46	88.08	88.08
South Asia	40.31	44.52	51.28	55.94
Sub-Saharan Africa	34.67	40.25	46.33	52.33

Source: Author's calculation based on SPI data

After examining the regional results, Figures 6 and 7 depict the top and bottom countries, respectively, based on their SPI scores throughout the period under study. As anticipated from the regional analysis, the top-performing countries predominantly are from Europe and North America. Notably, countries like Denmark and Norway maintain consistently high ranks for all the selected years, with Switzerland, Germany, and Iceland also appearing in the top ranks over the last 15 years of analysis. In 2020, all top 5 countries had a score higher than 90, Switzerland being the first one with a score of 93.66.

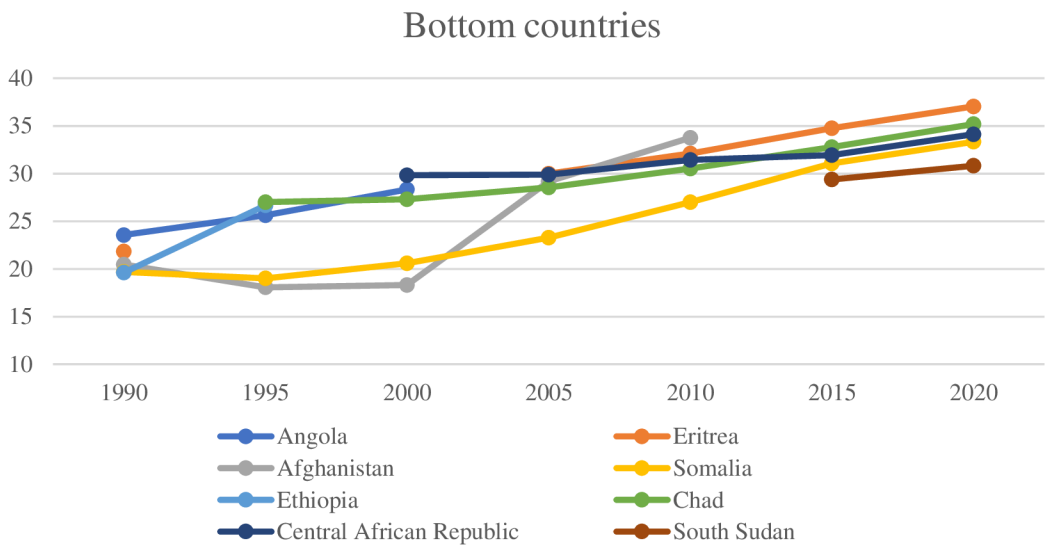
Figure 6. Top countries for SPI scores



Source: Author's calculation based on SPI data

The flip side of the coin reveals the bottom countries with low SPI levels. Countries such as Angola, Eritrea, Afghanistan, Somalia, and Ethiopia consistently appear among the bottom countries. Despite facing significant challenges, there are instances of improvement in SPI scores for some of these countries over time.

Figure 7. Bottom countries for SPI scores



Source: Author's calculation based on SPI data

To sum up, our descriptive analysis has provided insights into the dynamics of population-weighted GDP pc and the SPI across different regions, income levels, and countries. We have observed significant regional disparities in both economic prosperity and social progress, with North America and Europe consistently ranking high in both. However, it's noteworthy that not all high GDP pc countries are ranked at the top for SPI, and conversely, not all low GDP pc countries are ranked at the bottom for SPI. Moving forward, our focus will shift towards exploring the association between GDP pc and SPI, with a special focus on the efficiency levels of countries.

3.2 Association between Social Progress and Economic Growth

Before delving into the main analysis of efficiency, this section first examines the association between SPI and GDP. Table 3 below presents the correlation between SPI and GDP pc variables. Looking at our variables, the correlation coefficient between SPI and GDP per capita is 0.651, indicating a moderate positive correlation. This implies that as GDP per capita

increases, there is a corresponding tendency for the SPI to rise (or vice versa). However, it is important to note that this relationship is not perfect; other factors may influence social progress beyond economic growth alone.

Table 3. Pairwise correlation between variables

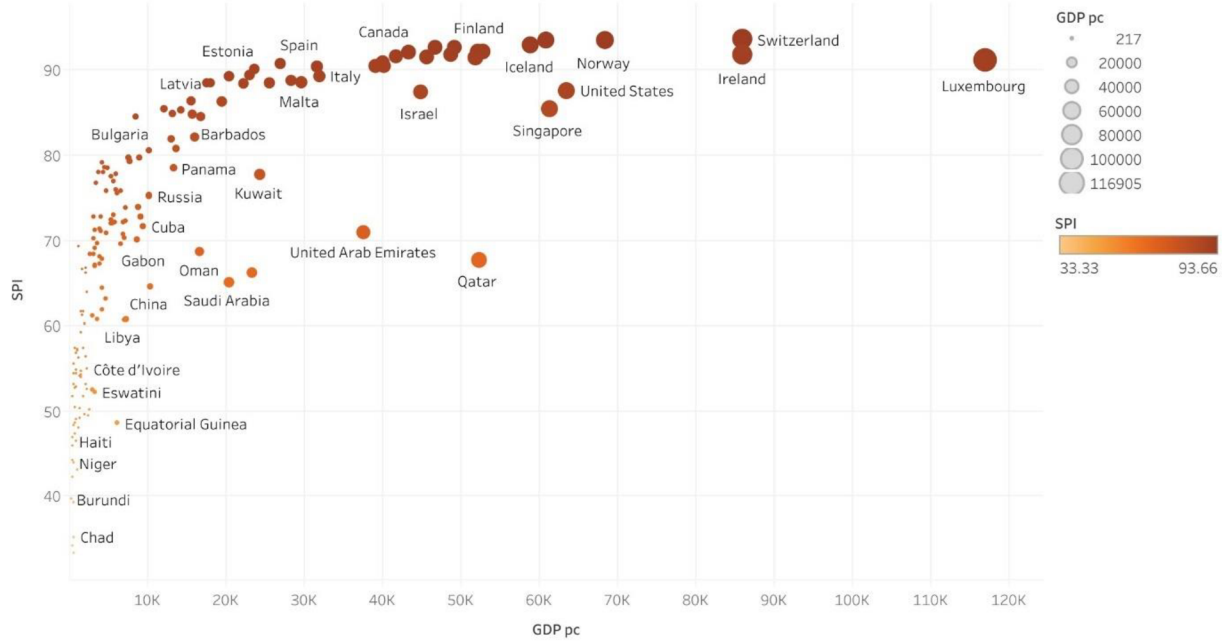
Variables	SPI	GDP pc
SPI	1.000	
GDP pc	0.651	1.000

Source: Author's calculation based on SPI and World Bank data

This relationship is visually depicted in Figure 8, which illustrates the scatterplot between SPI and GDP pc for the year 2020. There is a positive logarithmic relationship between variables, indicating that higher GDP per capita tends to correlate with higher SPI scores. However, notable exceptions exist where high GDP per capita countries do not necessarily exhibit correspondingly high SPI scores.

Countries like Qatar, Saudi Arabia, and the United Arab Emirates demonstrate relatively high GDP per capita figures but do not maintain corresponding SPI scores. Conversely, there are instances where countries with lower GDP per capita achieve comparable SPI scores to those of higher GDP per capita nations. For instance, countries like Costa Rica, Latvia, and Estonia exhibit SPI scores similar to those with very high GDP per capita (countries such as the United States, Norway, Ireland, and Luxembourg). This suggests that factors beyond GDP per capita alone influence a nation's overall social progress, as evidenced by the disparities observed in social development levels among countries with similar economic performance.

Figure 8. Scatterplot between GDP pc and SPI for 2020



Source: Author's calculation based on World Bank and SPI data

As discussed in section 2.3, to predict the residuals, the best-fitting model was selected based on regression outputs and test results[8]. Fixed-effect (FE) model was chosen as a desirable model considering the characteristics of our data set. Our equation for the FE model is as follows:

$$SPI_{it} = \alpha_i + \beta_1 \ln\_gdppc_{it} + \varepsilon_{it} \quad (6)$$

Where SPI_{it} is the dependent variable and indicates the SPI for a given country i at time t. α_i represents the country-specific intercept. It accounts for the fixed effects unique to each country i, capturing the unobserved heterogeneity that is constant over time for each country. $\beta_1$is the coefficient showing the effect of the natural log of GDP per capita on SPI. ε_{it} represents the error term (or residual) for country i at time t which captures all the other factors affecting the SPI that are not included in the model.

We opted to use a logarithmic transformation for the independent variable, *ln_gdppc*, to best approximate the functional relationship between the two variables, as evidenced by Figure 8.

In Table 4 below, we present the association between SPI and *ln_gdppc*. The model demonstrates statistical significance, as shown by the p-value of basically 0, indicating a strong

[8] Please refer to Appendix A for the test results.

relationship between the variables. Furthermore, the 95% confidence interval for the coefficient of *ln_gdppc* excludes zero, further supporting its significance.

Table 4. FE regression analysis

SPI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ln_gdppc	7.016	.341	20.58	.000	6.343	7.689	***
Constant	5.818	2.741	2.12	.035	.408	11.228	**
Mean dependent var		62.212	SD dependent var			17.590	
R-squared:			Number of obs.			5121	
Within		0.6614					
Between		0.7645					
F-test		423.381	Prob > F			.	
Akaike crit. (AIC)		25697.077	Bayesian crit. (BIC)			25703.618	

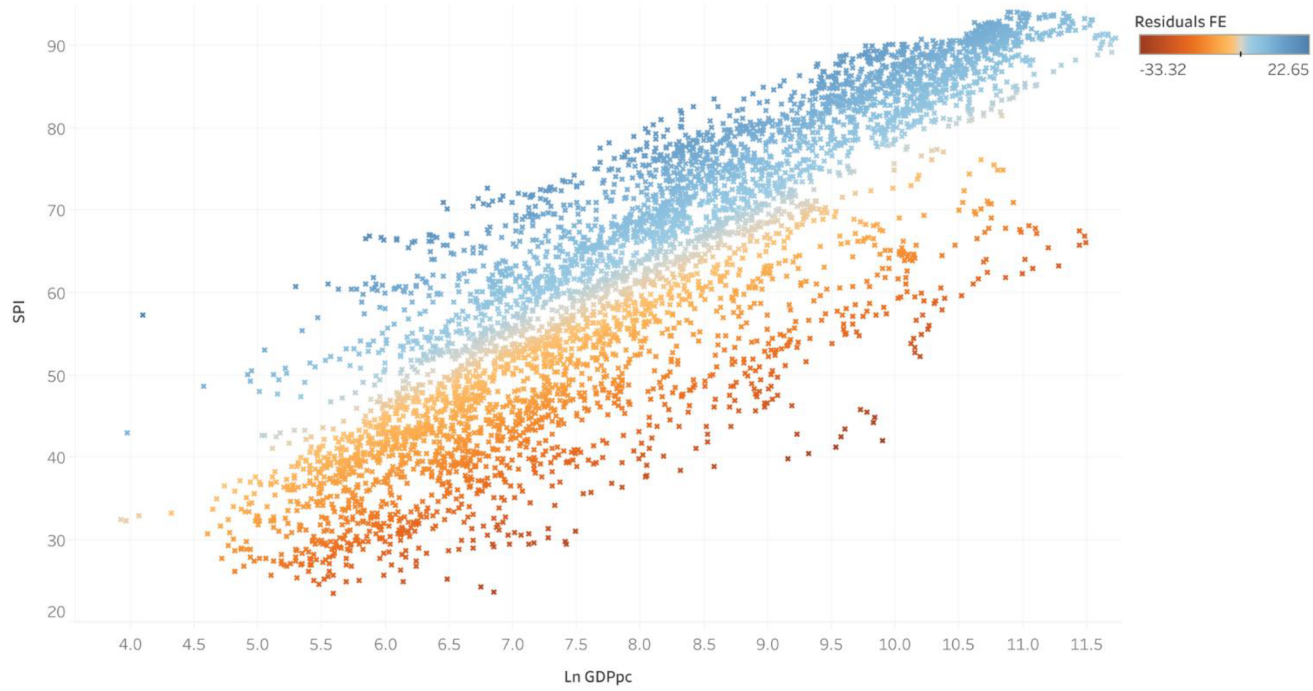
*Note: Significance level at 1%,5% and 10%, respectively *** p<.01, ** p<.05, * p<.1*
Source: Author's calculation

Given the model's significance and a within R-squared value of 0.661 and between R-squared value of 0.765, which indicate a good fit, we will utilize this model to estimate residuals to conduct our residual base efficiency analysis.

3.3 Residual-based Efficiency Score Analysis

Across 171 countries, we have a total of 5,121 observations. The residuals from the FE model represent the differences between the observed SPI values and the values predicted by the model, based on *ln_GDPpc* as the independent variable. The estimated residuals vary from a minimum of -33.32 to a maximum of 22.65. Referring to Figure 9 below, we can observe data spanning all 31 years and 171 countries. The blue and orange colours in the figure represent the positive and negative residuals, respectively. Positive residuals indicate that the observed SPI values are higher than what the model predicts, while negative residuals indicate that the observed SPI values are lower than predicted. Notably, darker shades of blue indicate overperformance, signifying that a country has achieved a high SPI relative to its economic development. Conversely, darker shades of orange indicate underperformance, suggesting that despite a country's economic development, its SPI level does not correspond to its productive base.

Figure 9. FE predicted residuals



Source: Author's calculation

Using the estimated residuals, we compute the efficiency scores (ES) for each country with the following formula:

$$ES_{res} = \left(\frac{res_{fe} - res_{min}}{res_{max} - res_{min}}\right) * 100 \quad (7)$$

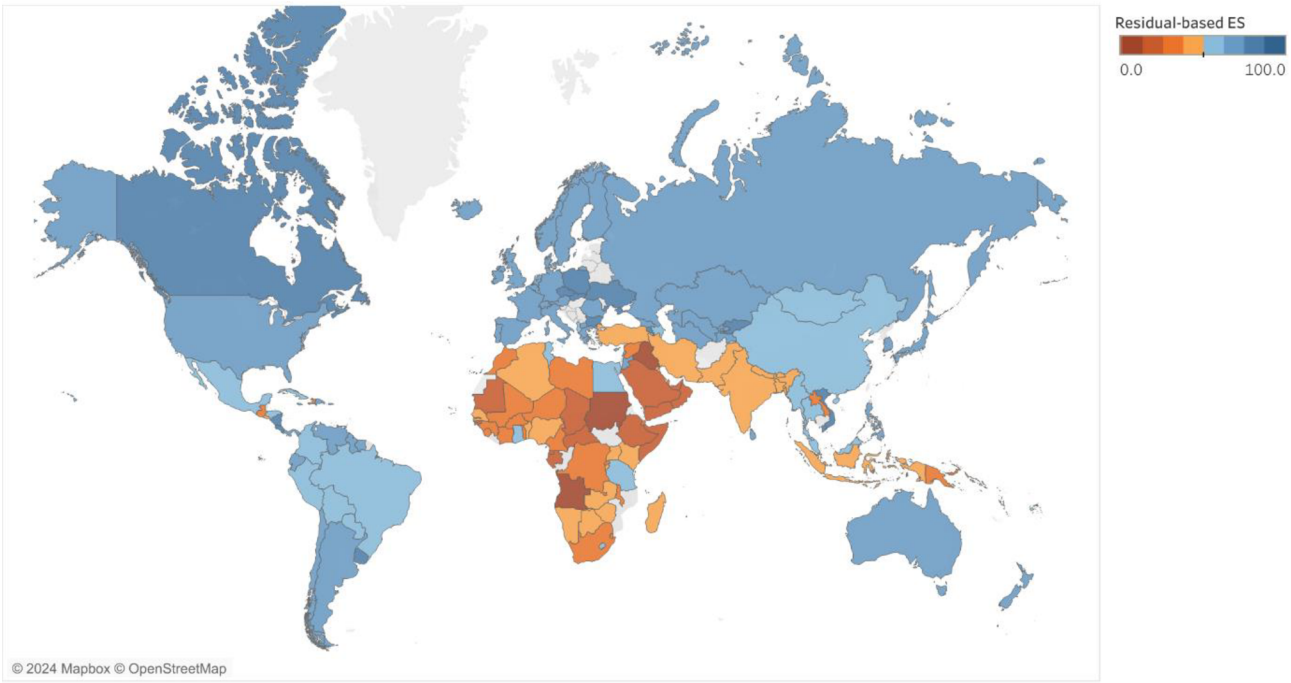
Where res_{min} and res_{max} represent the minimum and maximum values of the predicted residuals in the dataset, respectively. Using this formula, calculated efficiency scores are scaled from 0 to 100, providing an easily understandable range and facilitating comparison among the countries based on their efficiency levels.

The scores reflect each country's efficiency in translating its GDP per capita into social progress outcomes. A higher score indicates that a country is achieving a relatively higher social progress level given its GDP pc compared to all other countries. This implies that the country is effectively utilising its wealth to improve social well-being. Conversely, a lower score indicates that a country is achieving a relatively lower level of social progress given its GDP pc in comparison to all other countries. This indicates a relative inefficiency in using economic resources for social development.

To illustrate the results and trends over time, we selected three years – 1990, 2005, and 2020 – to showcase the efficiency scores. We will present the results of the first and last year using both a map and a table, while results for 2005 will be presented only through a table.

In 1990, data is available for 150 countries and the residual-based efficiency scores (ES) are displayed in Figure 10. For the comparability, all scores are scaled from 0 to 100, with the 1990 scores ranging from 5.28 to 86.83. In the map, we observe a gradient from orange to blue, indicating an increase in scores. From the map higher efficiency scores indicated in darker blue are more present in Europe, especially Eastern European countries. On the other hand, countries in SSA and the MENA regions tend to have relatively lower efficiency scores, suggesting that they achieved less social progress compared to their GDP levels.

Figure 10. Residual-based ES for 1990



Source: Author's calculation

Table 5 further presents rankings of the top and bottom 10 countries based on their efficiency scores in 1990. Poland led with an efficiency score of 86.83, followed closely by Ukraine at 86.64. Armenia from the Central Asia & Caucasus region achieved scores of 85.85 securing the 3rd place. Notably, countries like Czechia, Slovakia, and Bulgaria from Europe and several Latin American & Caribbean nations were among the top performers.

Additionally, Table 5 includes GNI pc data for the countries. This information is relevant for comparing income levels and understanding income disparities in the top and bottom countries.

While GNI per capita data is not available for all countries, the available data reveals significant differences in income levels between the top and bottom countries.

Table 5. Residual-based ES ranking for 1990

Rank	Country	Year	Region	GNI pc	Efficiency score
1	Poland	1990	Europe	N/A	86.83
2	Ukraine	1990	Europe	1,580	86.64
3	Armenia	1990	Central Asia & Caucasus	N/A	85.85
4	Costa Rica	1990	Latin America & Caribbean	1,720	85.37
5	Czechia	1990	Europe	N/A	82.70
6	Nicaragua	1990	Latin America & Caribbean	300	82.13
7	Uruguay	1990	Latin America & Caribbean	2,840	81.44
8	Slovakia	1990	Europe	N/A	80.63
9	Bulgaria	1990	Europe	2,250	78.71
10	Vietnam	1990	East Asia & Pacific	130	78.64
…..	…..	…..	…..	…..	…..
141	Central African Republic	1990	SSA	480.0	19.69
142	Saudi Arabia	1990	MENA	7,490.0	18.96
143	Gabon	1990	SSA	4,660.0	18.05
144	Yemen	1990	MENA	N/A	15.12
145	Congo, Republic of	1990	SSA	N/A	15.09
146	Ethiopia	1990	SSA	260.0	14.74
147	United Arab Emirates(UAE)	1990	MENA	N/A	14.61
148	Sudan	1990	SSA	780.0	11.96
149	Iraq	1990	MENA	6,970.0	9.83
150	Angola	1990	SSA	780.0	5.28

Source: Author's calculation

Among the bottom 10 countries, Angola and Iraq obtained the lowest scores for efficiency. However, it's important to note that the GNI per capita levels of these two countries differ significantly. Additionally, high-income countries such as Saudi Arabia and Gabon also ranked poorly.

Moving to 2005, data is available for 169 countries. Table 6 highlights the best and worst-performing countries based on their efficiency scores. Once again, Eastern European countries stand out. Despite their comparatively lower economic development, as measured by the GDP, these countries demonstrate efficient translation of their economic resources into social progress when compared to Western European counterparts with higher GDP levels like Germany and France. Furthermore, countries from other regions, notably Costa Rica and Georgia, maintain their positions among the top 10 performers as well.

Table 6. Residual-based ES ranking for 2005

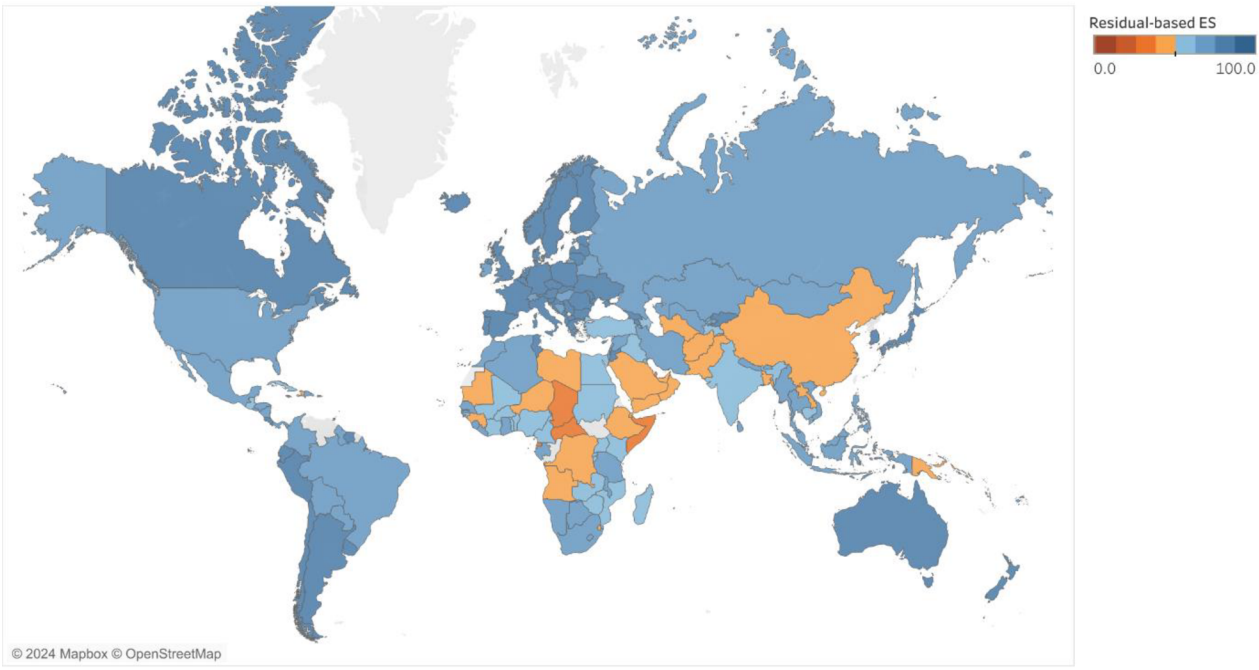
Rank	Country	Year	Region	GNIpc	Efficiency score
1	Lithuania	2005	Europe	7,560.0	88.51
2	Estonia	2005	Europe	9,730.0	87.49
3	Latvia	2005	Europe	7,390.0	85.44
4	Ukraine	2005	Europe	1,540.0	85.43
5	Moldova	2005	Europe	1,120.0	83.69
6	Costa Rica	2005	Latin America & Caribbean	4,610.0	83.30
7	Poland	2005	Europe	7,330.0	83.10
8	Bulgaria	2005	Europe	3,800.0	82.70
9	Georgia	2005	Central Asia & Caucasus	1,520.0	82.46
10	Czechia	2005	Europe	12,480.0	82.39
….	……	……	……	…..	…..
160	Eritrea	2005	SSA	390.0	28.00
161	Saudi Arabia	2005	MENA	12,350.0	25.99
162	Sudan	2005	SSA	790.0	25.89
163	UAE	2005	MENA	40,190.0	25.75
164	Congo, Republic of	2005	SSA	N/A	24.37
165	Qatar	2005	MENA	39,010.0	23.37
166	Eswatini	2005	SSA	2,970.0	19.99
167	Chad	2005	SSA	470.0	18.69
168	Angola	2005	SSA	1,370.0	18.10
169	Equatorial Guinea	2005	SSA	3,370.0	5.29

Source: Author's calculation

When examining the bottom-ranked countries, the SSA and MENA regions continue to prevail. The past trend persists into 2005, with countries of very high GNI per capita levels, such as Qatar and UAE, occupying very low positions as well.

The results for the residual-based efficiency scores in 2020 are shown in Figure 11 and Table 7. The map visualisation indicates an increase in the shades of blue, suggesting an improvement in efficiency levels for many countries compared to 1990. This improvement is particularly noticeable in Africa. However, some countries, like China and Turkmenistan, have experienced a decline in efficiency compared to their performance in 1990.

Figure 11. Residual-based ES for 2020



Source: Author's calculation

The specific country scores in Table 7 show greater regional diversity among the top-performing countries. Particularly, the top two countries are now Argentina and Georgia. Tunisia from the MENA region also emerges as one of the top-performing countries in terms of efficiency score. Other countries come from European regions, especially (but not exclusively) from Eastern Europe that are characterized by relatively lower GNI per capita levels.

Table 7. Residual-based ES ranking for 2020

Rank	Country	Year	Region	GNIpc	Efficiency score
1	Argentina	2020	Latin America & Caribbean	9,010	86.80
2	Georgia	2020	Central Asia & Caucasus	4,260	85.76
3	Ukraine	2020	Europe	3,570	85.33
4	Greece	2020	Europe	17,920	84.72
5	Latvia	2020	Europe	17,900	84.42
6	Lithuania	2020	Europe	19,700	84.38
7	Armenia	2020	Central Asia & Caucasus	4,470	83.98
8	Tunisia	2020	MENA	3,220	83.98
9	Estonia	2020	Europe	23,470	83.85
10	Costa Rica	2020	Latin America & Caribbean	11,500	83.76
….	…..	……	……	…..	…..
159	Eswatini	2020	SSA	3,350	40.59
160	Laos	2020	East Asia & Pacific	2,470	40.13
161	Yemen	2020	MENA	N/A	39.62
162	Papua New Guinea	2020	East Asia & Pacific	2,420	39.59
163	Guinea	2020	SSA	950	38.70

164	Central African Republic	2020	SSA	460	33.95
165	Qatar	2020	MENA	58,440	33.93
166	Chad	2020	SSA	660	30.94
167	Somalia	2020	SSA	540	29.44
168	Equatorial Guinea	2020	SSA	5,150	26.51

Source: Author's calculation

In 2020, the pattern observed in the bottom 10 countries remains consistent. The MENA and SSA regions continue to be among the worst performers. However, in 2020, Laos and Papua New Guinea from the East Asia & Pacific region also appeared in this group.

To summarise the residual-based analysis section, it becomes evident that efficiency cannot solely be attributed to higher GDP per capita or very high levels of SPI. The best-performing countries in the analysis, are those that have achieved higher levels of SPI relative to their economic output. Examples of such countries include Lithuania, Estonia, Latvia, Poland, Georgia, Greece, Ukraine, Armenia, Costa Rica, and Argentina. However, special emphasis should be given to countries like Kyrgyzstan, Ukraine, and Armenia, which have attained relatively high social progress despite having very low GDP per capita compared to other top-performing countries. Kyrgyzstan, in particular, ranks second to last in the Central Asia & Caucasus region for its GDP per capita and 4th for the SPI in 2020; nevertheless, the country ranked 12th among all countries for its efficiency level.

On the other hand, the worst-performing countries such as Chad, Angola, and Equatorial Guinea consistently rank among the worst. Additionally, Qatar, despite having the highest GDP per capita in the MENA region (and one of the highest in the world) as of 2020 and a GDP per capita 80 times higher than that of Chad and Angola, ranks 165th among 168 countries, indicating significant inefficiency in translating its economic output into social outcomes.

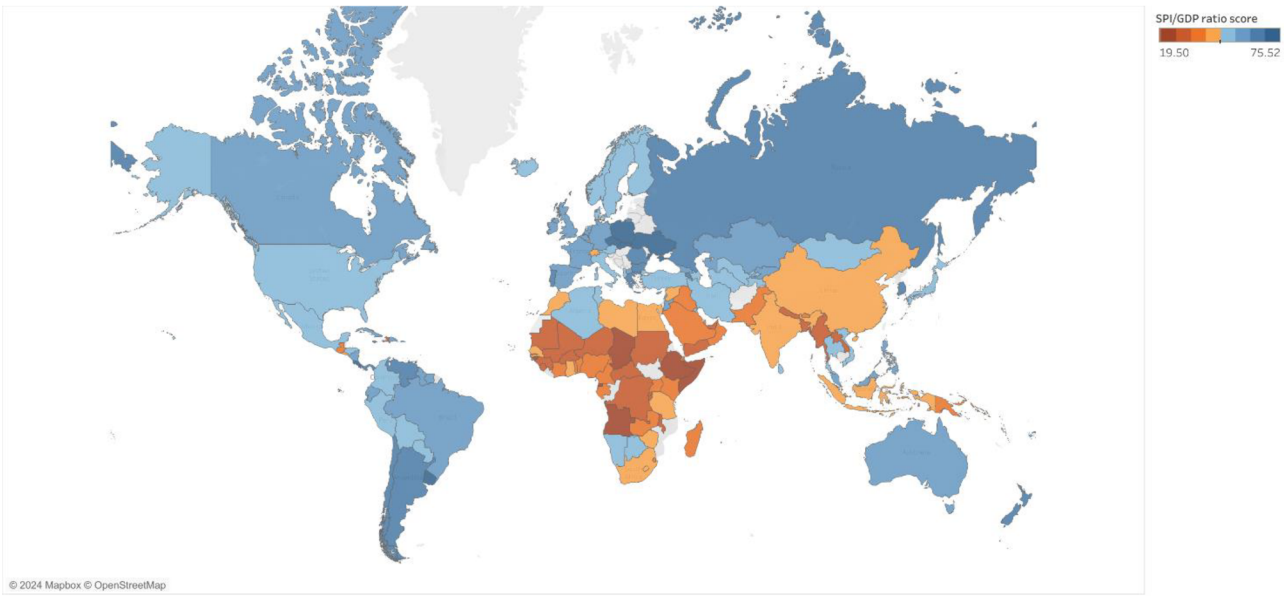
Contrary to expectations, countries renowned for their high SPI scores such as Denmark, Switzerland, and Norway did not feature among the best-performing countries in any of the analysed years. Similarly, countries with the highest GDP pc, such as Luxembourg, Switzerland, and Finland, did not rank highly in terms of efficiency either. This highlights the nuanced nature of efficiency measurement.

3.4 Ratio-based Efficiency Score Analysis

As outlined in the methodology section, the ratio-based efficiency score is calculated using SPI as the output variable over GDP per capita as the input variable. As before, this section also uses map visualisation to provide an overview of the efficiency levels of countries worldwide along with ranking tables[9].

Starting from 1990, Figure 12 displays the efficiency map of world countries. Throughout the entire study period, countries show ratio-based efficiency scores ranging from a minimum of 19.50 to a maximum of 75.52. In 1990, countries exhibited ratio-based efficiency scores from 19.50 to 70.88, with rankings spanning from 1 to 150. A higher efficiency score (indicated by shades of blue) reflects a better conversion of economic input (GDP per capita) to social output (SPI). Notably, Czechia secured the top rank in efficiency, followed by Poland. Costa Rica, Uruguay, Argentina, and Armenia also ranked among the top countries. The map reveals that predominantly Eastern European and Latin American & Caribbean countries demonstrate relatively higher efficiency. Conversely, shades of orange, indicating lower levels of efficiency, are mostly visible in the SSA, MENA and South Asia. As shown in Figure 12, high GDP pc European countries, Switzerland and Luxembourg, also exhibit lower efficiency (indicated in orange) in converting their economic input to social output.

Figure 12. Ratio-based ES for 1990



Source: Author's calculation

[9] For the whole list of countries please refer to the Appendix B

Table 8 below shows the respective rankings and ratio-based ES of the countries. As of 1990, the countries with the lowest efficiency in the SSA region are Ethiopia, Somalia, and Angola.

Table 8. Ratio-based ES ranking for 1990

Rank	Countries	Year	Region	GNIpc	Ratio ES
1	Czechia	1990	Europe	N/A	70.88
2	Poland	1990	Europe	N/A	70.78
3	Costa Rica	1990	Latin America & Caribbean	1,720	70.18
4	Ukraine	1990	Europe	1,580	70.15
5	Uruguay	1990	Latin America & Caribbean	2,840	69.75
6	Slovakia	1990	Europe	N/A	68.71
7	Bulgaria	1990	Europe	2,250	67.63
8	Malta	1990	Europe	7,600	65.72
9	Argentina	1990	Latin America & Caribbean	3,190	65.48
10	Armenia	1990	Central Asia & Caucasus	N/A	64.94
…..	……	…..	….	….	…..
141	Yemen	1990	MENA	N/A	28.45
142	Sierra Leone	1990	SSA	190	27.55
143	Central African Republic	1990	SSA	480	27.00
144	Congo Dem. Rep.	1990	SSA	N/A	26.91
145	Guinea-Bissau	1990	SSA	220	25.07
146	Chad	1990	SSA	270	24.65
147	Equatorial Guinea	1990	SSA	240	24.45
148	Angola	1990	SSA	780	23.09
149	Somalia	1990	SSA	140	19.61
150	Ethiopia	1990	SSA	260	19.50

Source: Author's calculation

In 2005, Table 9 below shows the rankings and scores of the countries. The top-performing countries are predominantly from Europe and the Latin America & Caribbean regions, with Lithuania, Latvia, and Costa Rica ranking in the top three, respectively. Poland, Ukraine, and Uruguay showed improvement in their rankings compared to 1990.

The bottom 10 countries show significant differences in income levels. Despite having the highest GNI and GDP per capita, Luxembourg ranks 164th out of 169 countries. In addition, the United Arab Emirates (UAE) and Qatar, with the two highest GNI per capita in the MENA region, rank among the worst-performing countries.

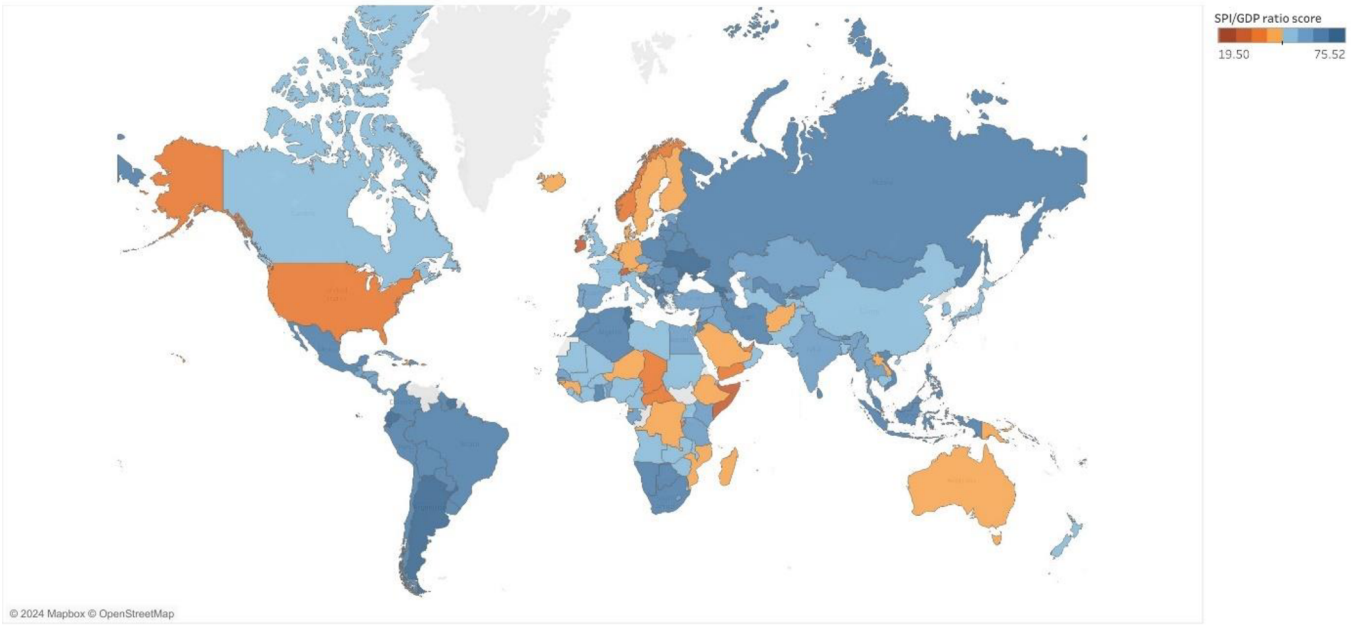
Table 9. Ratio-based ES ranking for 2005

Rank	Countries	Year	Region	GNIpc	Ratio ES
1	Lithuania	2005	Europe	7,560.0	72.72
2	Latvia	2005	Europe	7,390.0	71.39
3	Costa Rica	2005	Latin America & Caribbean	4,610.0	71.27
4	Bulgaria	2005	Europe	3,800.0	70.88
5	Argentina	2005	Latin America & Caribbean	4,240.0	70.74
6	Uruguay	2005	Latin America & Caribbean	4,730.0	70.73
7	Estonia	2005	Europe	9,730.0	70.61
8	Ukraine	2005	Europe	1,540.0	70.40
9	Poland	2005	Europe	7,330.0	70.04
10	Georgia	2005	Central Asia & Caucasus	1,520.0	68.20
…..	……	……	……	……	….
160	Ethiopia	2005	SSA	160.0	33.88
161	Congo Dem. Rep.	2005	SSA	200.0	33.86
162	Equatorial Guinea	2005	SSA	3,370.0	33.00
163	United Arab Emirates	2005	MENA	40,190.0	32.37
164	Luxembourg	2005	Europe	73,180.0	32.05
165	Eritrea	2005	SSA	390.0	29.74
166	Central African Republic	2005	SSA	320.0	29.69
167	Qatar	2005	MENA	39,010.0	29.10
168	Afghanistan	2005	South Asia	N/A	29.02
169	Chad	2005	SSA	470.0	28.16

Source: Author's calculation

Lastly, Figure 13 below presents the results for 2020. Overall, comparing the map visualisation to 1990, there has been notable improvement, especially in Africa. Many countries from the SSA region have shown progress compared to the previous two periods. Specific rankings in Table 10 reveal that only Chad, Somalia, and the Central African Republic (CAR) from SSA ranked among the least efficient countries (indicated in darker shades of orange). Moreover, when comparing the two maps, it's evident that the USA, shown in orange, exhibits lower efficiency compared to 1990. Furthermore, the number of relatively inefficient countries in Europe (also highlighted in orange) has increased, particularly in Northern and Western Europe.

Figure 13.Ratio-based ES for 2020



Source: Author's calculation

In Table 10, in terms of the best-performing countries, three regions—Europe, with Eastern Europe being particularly prominent, Latin America & Caribbean, and Central Asia & Caucasus—maintain the highest rankings.

When it comes to the least efficient countries, those with very high levels of economic development, as evidenced by their high GDP per capita levels, often rank among the lowest performers. For instance, countries like Luxembourg, Norway, and Ireland, which have both high SPI levels and GDP per capita, fell to some of the lowest ranks.

Table 10. Ratio-based ES ranking for 2020

Rank	Countries	Year	Region	GNIpc	Ratio ES
1	Georgia	2020	Central Asia & Caucasus	4,260.0	72.51
2	Ukraine	2020	Europe	3,570.0	72.20
3	Armenia	2020	Central Asia & Caucasus	4,470.0	71.61
4	Argentina	2020	Latin America & Caribbean	9,010.0	71.53
5	Tunisia	2020	MENA	3,220.0	71.40
6	Moldova	2020	Europe	4,360.0	71.29
7	Jamaica	2020	Latin America & Caribbean	4,900.0	71.07
8	Albania	2020	Europe	5,270.0	69.58
9	Republic of North Macedonia	2020	Europe	5,730.0	69.03
10	Suriname	2020	Latin America & Caribbean	4,500.0	68.80

…..	……	…..	……	……	……
160	Norway	2020	Europe	78,610.0	37.94
161	United States	2020	North America	64,650.0	37.11
162	Singapore	2020	East Asia & Pacific	55,260.0	36.96
163	Chad	2020	SSA	660.0	34.71
164	Central African Republic	2020	SSA	460.0	33.81
165	Switzerland	2020	Europe	81,740.0	32.97
166	Somalia	2020	SSA	540.0	32.94
167	Ireland	2020	Europe	65,230.0	32.30
168	Qatar	2020	MENA	58,440.0	31.93
169	Luxembourg	2020	Europe	80,980.0	26.01

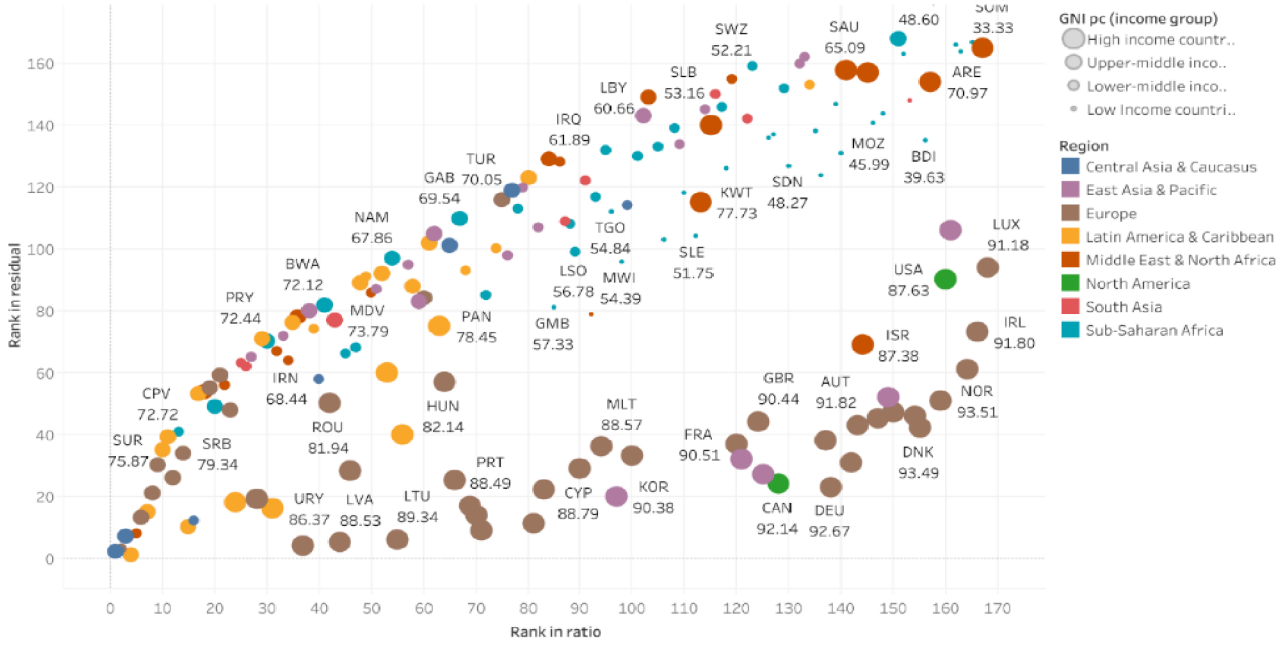
Source: Author's calculation

3.5 Comparative Analyses between Two Models

After examining the results of each method individually, our focus shifts to comparative analyses of 2020, where we delve into regional and income-based classifications to compare the efficiency of both methods together.

Figure 14 below depicts eight regions in the study, each indicated in a different colour. The x-axis represents the respective ranking of countries in the ratio-based analysis, while the y-axis denotes the rankings of countries in the residual-based analysis. Countries closer to the intersection of the two axes exhibit higher performance (i.e., better ranking) in both analyses.

Figure 14. Regional and income level comparison



Source: Author's calculation

Additionally, countries are categorized into four groups based on their income levels: high-income, upper-middle-income, lower-middle-income, and low-income[10]. The size of a dot in the chart indicates the income level, and the larger the size, the higher the income level. Furthermore, the labels also show the SPI scores of countries for 2020.

Looking at the intersection of the axes, the best-performing regions in both analyses are Latin America & Caribbean (LAC), represented by Argentina, Central Asia & Caucasus with Georgia, Armenia, and Kyrgyzstan, and Eastern European and Balkan countries. Additionally, Tunisia from the MENA region stands out as one of the better-performing countries as well.

Delving deeper into the regional differences, in the LAC, particularly Argentina, Jamaica, and Costa Rica, upper-middle-income countries, secure the best ranks in both analyses compared to their high-income counterparts from the same region such as Barbados, Panama, and Uruguay. This trend is also observed in the Central Asia & Caucasus region, where countries with relatively higher income per capita, such as Kazakhstan and Turkmenistan, ranked very low compared to Armenia, Georgia and Kyrgyzstan.

Furthermore, we observe that Europe (depicted in brown), primarily comprised of high-income countries, achieves significantly better rankings in the residual-based analysis compared to the ratio-based analysis. However, this trend particularly applies to Western and Northern European countries with relatively high levels of economic development. In the case of other high-income countries in the East Asia & Pacific region (represented in purple), we also observe a similar trend. Countries like Korea, New Zealand, Japan, and Australia perform better in terms of the residual-based analysis than in the ratio-based analysis. However, the same trend does not apply to the high-income nations of the MENA region (represented by orange), except for Israel. Notably, the countries following this trend obtain a high level of SPI.

When examining North America (depicted in green), Canada exhibits a similar pattern to the previously discussed high-income European countries, with better results in the residual-based rather than ratio-based analysis. Similarly, the USA, while ranking relatively lower than Canada in both rankings, still achieved a better ranking in the residual-based analysis. Our findings suggest that the USA cannot be considered efficient, which however contrasts with Mizobuchi's (2014) and Fuente-Mella et al. (2020)[11], who identified the USA and the UK as

[10] World Bank's GNI per capita classification for 2020

[11] Both Mizobuchi (2014) and Fuente-Mella et al.(2020) conducted their analyses by employing frontier analysis techniques.

successful countries with significant well-being levels balanced with their productive bases. Conversely, Greece and Spain, which are considered relatively efficient countries in our analysis, performed poorly in Mizobuchi's (2014) study in comparison to their productive bases and achieved well-being.

Overall, our study reveals that countries with high income and SPI scores tend to perform better in the residual-based efficiency analysis across all regions. Conversely, most upper-middle income and upper-mid-level SPI (scores ranging from 70 to 80) countries demonstrate better performance in the ratio-based analysis. Among all countries, the best-performing ones in both analyses include Argentina, Armenia, Georgia, Ukraine, and Tunisia.

3.6 Discussion and Limitations

As discussed in section 1.7, there have been relatively few studies examining countries' efficiency levels in the use of economic development resources to achieve human development, however, to the best of our knowledge there was no study particularly using the SPI. This scarcity of prior research can be viewed as both a limitation and a research gap that our study attempts to fill. In light of this, three main points emerge from our analysis, each serving as a consideration or limitation.

Our findings indicate that residual-based analysis may better reflect the efficiency compared to ratio-based analysis, especially for countries with high incomes and high SPI levels. This superiority can be attributed to several reasons.

Firstly, in the ratio-based analysis, high-income countries with high SPI scores may have reached thresholds where further increases in GDP per capita do not necessarily lead to increases in social progress, thus failing to capture the diminishing returns of economic growth on social progress. Additionally, considering the core idea behind ratio-based analysis suggests that a higher ratio (SPI/GDPpc) is achieved when a high SPI is obtained with a relatively lower GDP per capita. However, this can be contradictory for high-income and high-SPI countries, as the ratio-based analysis does not accurately reflect efficiency for these categories of countries.

In contrast, the residual-based analysis effectively accounts for these effects because it is based on the functional logarithmic relationship between GDP per capita and SPI for which

diminishing returns are inherent. Moreover, while the ratio-based analysis solely relies on the GDP per capita-SPI relationship, the residual-based analysis incorporates additional unobserved factors, thanks to the fixed effect model, that may influence the association.

Finally, both sets of results suggest that the concept of comparability becomes crucial, focusing on the comparison of countries with similar economic backgrounds. While our analyses compared all countries irrespective of their economic development level, assessing relative performance requires methods using a segmented approach based on the economic performance of countries. The Social Progress Imperative utilizes its so-called scorecard methodology[12] to evaluate countries' performance relative to their (fifteen) peers with similar economic conditions. Moving forward, future research can build upon this paper by utilising SPI's scorecards to compare countries with their economic counterparts and applying the methods highlighted in this paper. Moreover, incorporating additional indicators of economic development and expanding the range of output variables can provide further insights and nuances in efficiency analysis.

To conclude, although there are differences between the two methods, with residual-based analysis being superior, it is important to emphasise their relatedness in terms of scores and ranks. This relationship is demonstrated by two correlations: the Pearson correlation coefficient of 0.783 which shows a strong positive linear association between the two variables, and Spearman's rank correlation coefficient of 0.767 indicating a strong positive rank correlation between the two scores studied.

[12] For the SPI scorecards methodology applied to the annual Social Progress Indices, please refer to Stern et al. (2024).

CONCLUSION

In recent decades, we have observed an overall upward trajectory in both economic development and social progress. Existing literature underscores a positive bidirectional relationship between these two variables. While countries may possess abundant resources—whether monetary, natural, or capital—the crucial consideration lies in how efficiently they harness these resources to enhance the well-being of their citizens. In our study, we sought to explore the association between these variables through the lens of efficiency, employing both ratio- and residual-based analyses. The levels of economic efficiency observed provide insights into countries' economic behaviours, and the employed models yield scores enabling cross-country comparisons.

Before delving into efficiency, we found a significant positive association between the economic and social indicators in our study. Countries with very high levels of income were associated with high levels of social development, except for some countries mostly from the MENA region. Conversely, we observed cases where the opposite scenario was true.

Regarding efficiency, our study employed two distinct approaches. One approach involved calculating efficiency from residuals predicted by a fixed-effect model regression. We found an overall improvement in efficiency scores across countries compared to previous years, particularly notable among the least efficient countries. Performance disparities in efficiency were significant across regions and income categories. Notably, the highest-performing countries in terms of efficiency were not necessarily those with the highest GDP or social progress. However, among the best-performing countries, those with higher SPI scores relative to their economic development were evident. The regional-level efficiency analysis predominantly highlighted three regions: Europe, Central Asia & Caucasus, and Latin America & the Caribbean (LAC), although noteworthy improvements were observed in Africa throughout the studied period.

The alternative approach using ratios yielded similar results; however, it revealed that countries with very high levels of economic and social development, such as Luxembourg, and Norway, often ranked lower in terms of efficiency, a counterintuitive finding. Based on these findings, we assert that the residual-based analysis provided superior results to the ratio-based analysis, given its ability to capture nuances more effectively.

Future research could explore additional input and output variables for a more comprehensive analysis. Incorporating other measures in addition to GDP in the residual-based analysis could provide further insights into economic development. Furthermore, other alternative methods mentioned in the paper, such as DEA, and SFA, can be applied, also with SPI serving as a proxy for social and human development.

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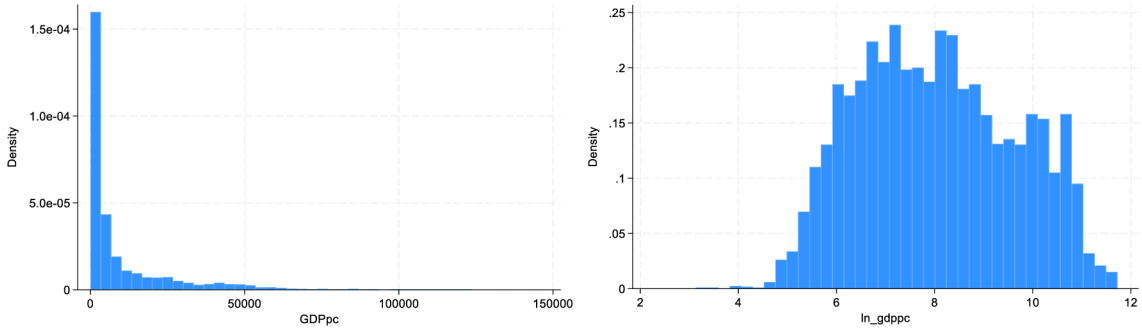
Appendix A

- ***The distribution of GDPpc and ln_GDPpc***



- ***Breusch and Pagan Lagrangian test to choose the ideal regression method***
  - *H_0= pooled OLS estimator is better*
  - *H_1= a random effect is better*

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        SPI[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     SD = sqrt(Var)
                 --------+------------------------------
                     SPI |   309.393       17.58957
                       e |   9.151125      3.025083
                       u |   69.09834      8.312541

        Test: Var(u) = 0
                                  chibar2(01) =  53363.40
                              Prob > chibar2 =    0.0000
```

With Prob>chibar2=0.00, we reject the null hypothesis of the pooled OLS method being better.

- ***Hausman test to choose the ideal regression method***
  - *H_0= a random effect is better*
  - *H_1= a fixed effect is better*

```
. hausman fixed random

                 ---- Coefficients ----
                 |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                 |     fixed       random       Difference          Std. err.
-----------------+------------------------------------------------------------
        ln_gdppc |   7.01612     7.097939      -.0818184        .0095081

                b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

    chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            =  74.05
Prob > chi2 = 0.0000
```

With Prob>chibar2=0.00, we reject the null hypothesis of random effect being better.

Appendix B

- ***Full country rankings in 1990 for residual-based efficiency scores***

Rank in residual analysis	*Countries*	*Year*	*ES*	*Region*
1	Poland	1990	86.83	Europe
2	Ukraine	1990	86.64	Europe
3	Armenia	1990	85.85	Central Asia & Caucasus
4	Costa Rica	1990	85.37	Latin America & Caribbean
5	Czechia	1990	82.70	Europe
6	Nicaragua	1990	82.13	Latin America & Caribbean
7	Uruguay	1990	81.44	Latin America & Caribbean
8	Slovakia	1990	80.63	Europe
9	Bulgaria	1990	78.71	Europe
10	Vietnam	1990	78.64	East Asia & Pacific
11	Kyrgyzstan	1990	75.71	Central Asia & Caucasus
12	Canada	1990	75.15	North America
13	New Zealand	1990	74.46	East Asia & Pacific
14	Suriname	1990	74.42	Latin America & Caribbean
15	Jamaica	1990	73.51	Latin America & Caribbean
16	Malta	1990	73.33	Europe
17	Guyana	1990	73.15	Latin America & Caribbean
18	Chile	1990	72.82	Latin America & Caribbean
19	Argentina	1990	72.03	Latin America & Caribbean
20	Mauritius	1990	72.01	SSA
21	Greece	1990	71.45	Europe
22	Venezuela	1990	71.27	Latin America & Caribbean
23	Portugal	1990	71.09	Europe
24	Lebanon	1990	71.01	MENA
25	Denmark	1990	70.92	Europe
26	Australia	1990	70.88	East Asia & Pacific
27	Romania	1990	70.40	Europe
28	Sweden	1990	70.35	Europe
29	Norway	1990	70.32	Europe
30	Belgium	1990	70.29	Europe
31	Philippines	1990	70.01	East Asia & Pacific
32	Germany	1990	69.99	Europe
33	Barbados	1990	69.54	Latin America & Caribbean
34	Trinidad and Tobago	1990	69.14	Latin America & Caribbean
35	Netherlands	1990	68.95	Europe
36	Spain	1990	68.68	Europe
37	Finland	1990	68.53	Europe
38	Ireland	1990	68.53	Europe
39	United States	1990	68.47	North America
40	Korea, Republic of	1990	68.46	East Asia & Pacific
41	France	1990	68.45	Europe
42	Tajikistan	1990	67.93	Central Asia & Caucasus
43	Dominican Republic	1990	67.86	Latin America & Caribbean
44	Panama	1990	67.81	Latin America & Caribbean

45	Ecuador	1990	67.61	Latin America & Caribbean
46	Sri Lanka	1990	67.52	South Asia
47	Uzbekistan	1990	66.67	Central Asia & Caucasus
48	Kazakhstan	1990	66.58	Central Asia & Caucasus
49	Austria	1990	66.58	Europe
50	Cyprus	1990	66.03	Europe
51	Japan	1990	65.97	East Asia & Pacific
52	Iceland	1990	65.64	Europe
53	Russia	1990	65.59	Europe
54	Republic of North Macedonia	1990	65.39	Europe
55	Jordan	1990	65.19	MENA
56	Switzerland	1990	64.80	Europe
57	Georgia	1990	64.52	Central Asia & Caucasus
58	United Kingdom	1990	64.51	Europe
59	Italy	1990	63.65	Europe
60	Turkmenistan	1990	63.37	Central Asia & Caucasus
61	Albania	1990	62.49	Europe
62	Luxembourg	1990	61.94	Europe
63	Bolivia	1990	60.48	Latin America & Caribbean
64	Brazil	1990	59.49	Latin America & Caribbean
65	Peru	1990	59.21	Latin America & Caribbean
66	Singapore	1990	58.54	East Asia & Pacific
67	Tanzania	1990	58.28	SSA
68	Fiji	1990	57.14	East Asia & Pacific
69	Myanmar	1990	57.01	East Asia & Pacific
70	Azerbaijan	1990	56.69	Central Asia & Caucasus
71	Tunisia	1990	56.60	MENA
72	Cabo Verde	1990	56.59	SSA
73	Thailand	1990	56.45	East Asia & Pacific
74	China	1990	56.25	East Asia & Pacific
75	Cuba	1990	55.99	Latin America & Caribbean
76	Honduras	1990	55.87	Latin America & Caribbean
77	Paraguay	1990	55.38	Latin America & Caribbean
78	Colombia	1990	55.13	Latin America & Caribbean
79	Mongolia	1990	54.72	East Asia & Pacific
80	Malaysia	1990	54.41	East Asia & Pacific
81	Lesotho	1990	52.07	SSA
82	Vanuatu	1990	51.81	East Asia & Pacific
83	Mexico	1990	51.69	Latin America & Caribbean
84	Ghana	1990	51.09	SSA
85	Egypt	1990	50.32	MENA
86	India	1990	49.61	South Asia
87	Algeria	1990	49.59	MENA
88	Zimbabwe	1990	48.68	SSA
89	Turkey	1990	47.78	Europe
90	Gambia, The	1990	47.39	SSA
91	Indonesia	1990	46.79	East Asia & Pacific
92	Botswana	1990	46.74	SSA
93	Kenya	1990	46.67	SSA
94	Namibia	1990	46.60	SSA
95	Benin	1990	46.35	SSA
96	El Salvador	1990	45.93	Latin America & Caribbean

97	Maldives	1990	45.49	South Asia
98	Uganda	1990	44.74	SSA
99	Bhutan	1990	43.24	South Asia
100	Solomon Islands	1990	43.13	East Asia & Pacific
101	Iran	1990	42.75	MENA
102	Zambia	1990	42.60	SSA
103	Kuwait	1990	42.08	MENA
104	Nepal	1990	41.95	South Asia
105	Pakistan	1990	41.61	South Asia
106	Senegal	1990	41.15	SSA
107	Burundi	1990	39.16	SSA
108	Nigeria	1990	38.43	SSA
109	Bangladesh	1990	37.97	South Asia
110	Madagascar	1990	37.66	SSA
111	Morocco	1990	37.48	MENA
112	Papua New Guinea	1990	37.43	East Asia & Pacific
113	Togo	1990	37.25	SSA
114	Syria	1990	36.42	MENA
115	Burkina Faso	1990	35.94	SSA
116	Sierra Leone	1990	35.69	SSA
117	Guatemala	1990	35.51	Latin America & Caribbean
118	Côte d'Ivoire	1990	35.44	SSA
119	Malawi	1990	34.92	SSA
120	Laos	1990	34.21	East Asia & Pacific
121	South Africa	1990	33.75	SSA
122	Mali	1990	33.10	SSA
123	Haiti	1990	32.11	Latin America & Caribbean
124	Niger	1990	31.52	SSA
125	Djibouti	1990	30.60	MENA
126	Comoros	1990	30.27	SSA
127	Eswatini	1990	30.10	SSA
128	Rwanda	1990	29.88	SSA
129	Bahrain	1990	29.38	MENA
130	Libya	1990	28.02	MENA
131	Congo, Democratic Republic of	1990	27.82	SSA
132	Cameroon	1990	26.90	SSA
133	Guinea	1990	26.01	SSA
134	Qatar	1990	25.06	MENA
135	Guinea-Bissau	1990	24.92	SSA
136	Equatorial Guinea	1990	24.31	SSA
137	Mauritania	1990	23.47	SSA
138	Somalia	1990	23.17	SSA
139	Chad	1990	22.03	SSA
140	Oman	1990	20.48	MENA
141	Central African Republic	1990	19.69	SSA
142	Saudi Arabia	1990	18.96	MENA
143	Gabon	1990	18.05	SSA
144	Yemen	1990	15.12	MENA
145	Congo, Republic of	1990	15.09	SSA
146	Ethiopia	1990	14.74	SSA
147	United Arab Emirates	1990	14.61	MENA
148	Sudan	1990	11.96	SSA

149	Iraq	1990	9.83	MENA
150	Angola	1990	5.28	SSA

- ***Full country rankings in 2020 for residual-based efficiency scores***

Rank in residual analysis	***Countries***	***Year***	***ES***	***Region***
1	Argentina	2020	86.8	Latin America & Caribbean
2	Georgia	2020	85.8	Central Asia & Caucasus
3	Ukraine	2020	85.3	Europe
4	Greece	2020	84.7	Europe
5	Latvia	2020	84.4	Europe
6	Lithuania	2020	84.4	Europe
7	Armenia	2020	84.0	Central Asia & Caucasus
8	Tunisia	2020	84.0	MENA
9	Estonia	2020	83.8	Europe
10	Costa Rica	2020	83.8	Latin America & Caribbean
11	Spain	2020	83.4	Europe
12	Kyrgyzstan	2020	83.4	Central Asia & Caucasus
13	Moldova	2020	83.4	Europe
14	Czechia	2020	83.0	Europe
15	Jamaica	2020	82.9	Latin America & Caribbean
16	Uruguay	2020	82.4	Latin America & Caribbean
17	Portugal	2020	81.8	Europe
18	Chile	2020	81.8	Latin America & Caribbean
19	Croatia	2020	81.6	Europe
20	Korea, Republic of	2020	80.7	East Asia & Pacific
21	Albania	2020	80.1	Europe
22	Slovenia	2020	80.1	Europe
23	Germany	2020	79.9	Europe
24	Canada	2020	79.9	North America
25	Slovakia	2020	79.6	Europe
26	Montenegro	2020	79.4	Europe
27	New Zealand	2020	79.4	East Asia & Pacific
28	Poland	2020	79.3	Europe
29	Cyprus	2020	79.3	Europe
30	Republic of North Macedonia	2020	79.3	Europe
31	Finland	2020	79.2	Europe
32	Japan	2020	78.8	East Asia & Pacific
33	Italy	2020	78.7	Europe
34	Serbia	2020	78.7	Europe
35	Suriname	2020	78.4	Latin America & Caribbean
36	Malta	2020	78.3	Europe
37	France	2020	78.3	Europe
38	Belgium	2020	78.3	Europe
39	Ecuador	2020	78.2	Latin America & Caribbean
40	Barbados	2020	78.2	Latin America & Caribbean
41	Cabo Verde	2020	78.2	SSA

42	Denmark	2020	78.1	Europe
43	Austria	2020	77.9	Europe
44	United Kingdom	2020	77.8	Europe
45	Netherlands	2020	77.6	Europe
46	Iceland	2020	77.6	Europe
47	Sweden	2020	77.6	Europe
48	Bulgaria	2020	77.5	Europe
49	Mauritius	2020	77.4	SSA
50	Romania	2020	76.7	Europe
51	Norway	2020	76.7	Europe
52	Australia	2020	76.4	East Asia & Pacific
53	Peru	2020	75.7	Latin America & Caribbean
54	Jordan	2020	75.1	MENA
55	Bosnia and Herzegovina	2020	74.9	Europe
56	Algeria	2020	74.6	MENA
57	Hungary	2020	74.5	Europe
58	Uzbekistan	2020	74.4	Central Asia & Caucasus
59	Belarus	2020	74.4	Europe
60	Trinidad and Tobago	2020	74.1	Latin America & Caribbean
61	Switzerland	2020	74.1	Europe
62	Bhutan	2020	73.5	South Asia
63	Sri Lanka	2020	73.1	South Asia
64	Iran	2020	72.2	MENA
65	Mongolia	2020	72.0	East Asia & Pacific
66	Ghana	2020	71.9	SSA
67	West Bank and Gaza	2020	71.4	MENA
68	Sao Tome and Principe	2020	71.2	SSA
69	Israel	2020	71.0	MENA
70	South Africa	2020	71.0	SSA
71	Paraguay	2020	70.9	Latin America & Caribbean
72	Vietnam	2020	70.9	East Asia & Pacific
73	Ireland	2020	70.7	Europe
74	Bolivia	2020	70.7	Latin America & Caribbean
75	Panama	2020	70.3	Latin America & Caribbean
76	Colombia	2020	70.2	Latin America & Caribbean
77	Maldives	2020	69.6	South Asia
78	Lebanon	2020	69.6	MENA
79	Syria	2020	69.5	MENA
80	Fiji	2020	69.4	East Asia & Pacific
81	Gambia, The	2020	69.4	SSA
82	Botswana	2020	69.2	SSA
83	Malaysia	2020	68.0	East Asia & Pacific
84	Russia	2020	67.9	Europe
85	Senegal	2020	67.7	SSA
86	Morocco	2020	67.6	MENA
87	Philippines	2020	67.6	East Asia & Pacific
88	Mexico	2020	67.2	Latin America & Caribbean
89	Brazil	2020	67.1	Latin America & Caribbean
90	United States	2020	67.1	North America
91	El Salvador	2020	66.9	Latin America & Caribbean
92	Dominican Republic	2020	66.9	Latin America & Caribbean

93	Honduras	2020	66.0	Latin America & Caribbean
94	Luxembourg	2020	65.8	Europe
95	Indonesia	2020	65.7	East Asia & Pacific
96	Malawi	2020	65.7	SSA
97	Namibia	2020	65.6	SSA
98	Timor-Leste	2020	65.5	East Asia & Pacific
99	Lesotho	2020	65.1	SSA
100	Nicaragua	2020	64.9	Latin America & Caribbean
101	Kazakhstan	2020	64.9	Central Asia & Caucasus
102	Guyana	2020	64.6	Latin America & Caribbean
103	Liberia	2020	64.0	SSA
104	Sierra Leone	2020	63.9	SSA
105	Thailand	2020	63.7	East Asia & Pacific
106	Singapore	2020	63.7	East Asia & Pacific
107	Myanmar	2020	63.4	East Asia & Pacific
108	Tanzania	2020	63.3	SSA
109	Nepal	2020	63.1	South Asia
110	Gabon	2020	63.0	SSA
111	Cuba	2020	62.2	Latin America & Caribbean
112	Togo	2020	62.0	SSA
113	Kenya	2020	61.9	SSA
114	Tajikistan	2020	61.8	Central Asia & Caucasus
115	Kuwait	2020	61.4	MENA
116	Turkey	2020	60.7	Europe
117	Benin	2020	60.5	SSA
118	Rwanda	2020	60.1	SSA
119	Azerbaijan	2020	59.5	Central Asia & Caucasus
120	Vanuatu	2020	58.5	East Asia & Pacific
121	Zambia	2020	57.5	SSA
122	India	2020	56.9	South Asia
123	Guatemala	2020	56.3	Latin America & Caribbean
124	Madagascar	2020	56.2	SSA
125	Zimbabwe	2020	55.2	SSA
126	Burkina Faso	2020	55.1	SSA
127	Sudan	2020	55.0	SSA
128	Egypt	2020	55.0	MENA
129	Iraq	2020	55.0	MENA
130	Comoros	2020	55.0	SSA
131	Mozambique	2020	54.5	SSA
132	Nigeria	2020	54.1	SSA
133	Cameroon	2020	54.0	SSA
134	Cambodia	2020	53.3	East Asia & Pacific
135	Burundi	2020	52.5	SSA
136	Uganda	2020	52.2	SSA
137	Mali	2020	51.9	SSA
138	Guinea-Bissau	2020	51.4	SSA
139	Côte d'Ivoire	2020	50.0	SSA
140	Oman	2020	49.9	MENA
141	Congo, Democratic Republic of	2020	49.6	SSA
142	Pakistan	2020	48.9	South Asia
143	China	2020	48.5	East Asia & Pacific

144	Niger	2020	48.2	SSA
145	Solomon Islands	2020	47.5	East Asia & Pacific
146	Mauritania	2020	47.4	SSA
147	Ethiopia	2020	46.6	SSA
148	Afghanistan	2020	46.5	South Asia
149	Libya	2020	46.5	MENA
150	Bangladesh	2020	46.4	South Asia
151	Turkmenistan	2020	46.0	Central Asia & Caucasus
152	Angola	2020	45.8	SSA
153	Haiti	2020	45.3	Latin America & Caribbean
154	United Arab Emirates	2020	43.9	MENA
155	Djibouti	2020	42.8	MENA
156	Congo, Republic of	2020	42.4	SSA
157	Bahrain	2020	41.3	MENA
158	Saudi Arabia	2020	41.0	MENA
159	Eswatini	2020	40.6	SSA
160	Laos	2020	40.1	East Asia & Pacific
161	Yemen	2020	39.6	MENA
162	Papua New Guinea	2020	39.6	East Asia & Pacific
163	Guinea	2020	38.7	SSA
164	Central African Republic	2020	33.9	SSA
165	Qatar	2020	33.9	MENA
166	Chad	2020	30.9	SSA
167	Somalia	2020	29.4	SSA
168	Equatorial Guinea	2020	26.5	SSA

- ***Full country rankings in 1990 for ratio-based efficiency scores***

Rank in ratio	***Countries***	***Year***	***ES***	***Region***
1	Czechia	1990	70.88	Europe
2	Poland	1990	70.78	Europe
3	Costa Rica	1990	70.18	Latin America & Caribbean
4	Ukraine	1990	70.15	Europe
5	Uruguay	1990	69.75	Latin America & Caribbean
6	Slovakia	1990	68.71	Europe
7	Bulgaria	1990	67.63	Europe
8	Malta	1990	65.72	Europe
9	Argentina	1990	65.48	Latin America & Caribbean
10	Armenia	1990	64.94	Central Asia & Caucasus
11	Chile	1990	64.66	Latin America & Caribbean
12	Portugal	1990	64.36	Europe
13	Mauritius	1990	64.26	SSA
14	Jamaica	1990	64.05	Latin America & Caribbean
15	Trinidad and Tobago	1990	63.91	Latin America & Caribbean
16	Venezuela	1990	63.80	Latin America & Caribbean
17	Greece	1990	63.71	Europe
18	Barbados	1990	63.67	Latin America & Caribbean
19	Korea, Republic of	1990	63.53	East Asia & Pacific

20	New Zealand	1990	62.64	East Asia & Pacific
21	Panama	1990	62.19	Latin America & Caribbean
22	Russia	1990	61.82	Europe
23	Romania	1990	61.69	Europe
24	Cyprus	1990	61.18	Europe
25	Suriname	1990	60.96	Latin America & Caribbean
26	Republic of North Macedonia	1990	60.42	Europe
27	Spain	1990	60.05	Europe
28	Ireland	1990	59.85	Europe
29	Kazakhstan	1990	59.63	Central Asia & Caucasus
30	Ecuador	1990	59.59	Latin America & Caribbean
31	Kyrgyzstan	1990	59.09	Central Asia & Caucasus
32	Brazil	1990	58.29	Latin America & Caribbean
33	Georgia	1990	58.25	Central Asia & Caucasus
34	Australia	1990	58.24	East Asia & Pacific
35	Lebanon	1990	58.07	MENA
36	Canada	1990	57.87	North America
37	Philippines	1990	57.74	East Asia & Pacific
38	Dominican Republic	1990	57.66	Latin America & Caribbean
39	Jordan	1990	57.23	MENA
40	Guyana	1990	56.81	Latin America & Caribbean
41	Singapore	1990	56.67	East Asia & Pacific
42	Nicaragua	1990	56.59	Latin America & Caribbean
43	Belgium	1990	56.56	Europe
44	Cuba	1990	56.02	Latin America & Caribbean
45	Netherlands	1990	55.63	Europe
46	Germany	1990	55.43	Europe
47	United Kingdom	1990	55.18	Europe
48	France	1990	55.10	Europe
49	Malaysia	1990	54.92	East Asia & Pacific
50	Fiji	1990	54.71	East Asia & Pacific
51	Uzbekistan	1990	54.51	Central Asia & Caucasus
52	Austria	1990	54.49	Europe
53	Mexico	1990	54.33	Latin America & Caribbean
54	Turkmenistan	1990	53.99	Central Asia & Caucasus
55	Peru	1990	53.97	Latin America & Caribbean
56	United States	1990	53.94	North America
57	Italy	1990	53.86	Europe
58	Thailand	1990	53.83	East Asia & Pacific
59	Tunisia	1990	53.61	MENA
60	Tajikistan	1990	53.36	Central Asia & Caucasus
61	Denmark	1990	53.13	Europe
62	Sri Lanka	1990	52.88	South Asia
63	Paraguay	1990	52.86	Latin America & Caribbean
64	Colombia	1990	52.85	Latin America & Caribbean
65	Azerbaijan	1990	52.79	Central Asia & Caucasus
66	Algeria	1990	52.23	MENA
67	Norway	1990	52.18	Europe
68	Iceland	1990	52.07	Europe
69	Japan	1990	51.96	East Asia & Pacific
70	Albania	1990	51.86	Europe

71	Turkey	1990	51.78	Europe
72	Finland	1990	51.49	Europe
73	Mongolia	1990	51.47	East Asia & Pacific
74	Bolivia	1990	51.41	Latin America & Caribbean
75	Botswana	1990	51.30	SSA
76	Honduras	1990	50.99	Latin America & Caribbean
77	Sweden	1990	50.94	Europe
78	Cabo Verde	1990	50.52	SSA
79	Namibia	1990	49.86	SSA
80	Kuwait	1990	49.64	MENA
81	Vanuatu	1990	49.56	East Asia & Pacific
82	Vietnam	1990	48.49	East Asia & Pacific
83	Iran	1990	48.23	MENA
84	Luxembourg	1990	46.74	Europe
85	Egypt	1990	46.37	MENA
86	Zimbabwe	1990	46.36	SSA
87	Maldives	1990	45.18	South Asia
88	El Salvador	1990	45.04	Latin America & Caribbean
89	Switzerland	1990	44.93	Europe
90	South Africa	1990	44.89	SSA
91	China	1990	44.70	East Asia & Pacific
92	Bahrain	1990	44.38	MENA
93	Syria	1990	44.13	MENA
94	Libya	1990	43.73	MENA
95	Senegal	1990	42.96	SSA
96	Indonesia	1990	42.83	East Asia & Pacific
97	Ghana	1990	42.44	SSA
98	Morocco	1990	42.23	MENA
99	Lesotho	1990	42.06	SSA
100	Solomon Islands	1990	41.63	East Asia & Pacific
101	India	1990	41.40	South Asia
102	Tanzania	1990	40.88	SSA
103	Qatar	1990	40.33	MENA
104	Bhutan	1990	40.07	South Asia
105	Oman	1990	39.98	MENA
106	Papua New Guinea	1990	39.92	East Asia & Pacific
107	Benin	1990	39.82	SSA
108	Kenya	1990	39.79	SSA
109	Saudi Arabia	1990	39.37	MENA
110	Côte d'Ivoire	1990	39.35	SSA
111	Guatemala	1990	38.95	Latin America & Caribbean
112	Gambia, The	1990	38.90	SSA
113	Gabon	1990	38.68	SSA
114	Eswatini	1990	38.60	SSA
115	Zambia	1990	38.49	SSA
116	Nigeria	1990	38.04	SSA
117	Comoros	1990	37.09	SSA
118	Pakistan	1990	36.55	South Asia
119	Uganda	1990	35.94	SSA
120	Djibouti	1990	35.78	MENA
121	Cameroon	1990	35.72	SSA

122	Togo	1990	35.41	SSA
123	Iraq	1990	35.09	MENA
124	Madagascar	1990	34.04	SSA
125	Bangladesh	1990	33.44	South Asia
126	Burkina Faso	1990	33.26	SSA
127	United Arab Emirates	1990	33.20	MENA
128	Haiti	1990	32.97	Latin America & Caribbean
129	Nepal	1990	32.47	South Asia
130	Niger	1990	32.22	SSA
131	Myanmar	1990	32.19	East Asia & Pacific
132	Burundi	1990	31.67	SSA
133	Mauritania	1990	31.58	SSA
134	Malawi	1990	31.56	SSA
135	Mali	1990	30.84	SSA
136	Rwanda	1990	30.07	SSA
137	Congo, Republic of	1990	29.78	SSA
138	Guinea	1990	29.17	SSA
139	Laos	1990	28.72	East Asia & Pacific
140	Sudan	1990	28.71	SSA
141	Yemen	1990	28.45	MENA
142	Sierra Leone	1990	27.55	SSA
143	Central African Republic	1990	27.00	SSA
144	Congo, Democratic Republic of	1990	26.91	SSA
145	Guinea-Bissau	1990	25.07	SSA
146	Chad	1990	24.65	SSA
147	Equatorial Guinea	1990	24.45	SSA
148	Angola	1990	23.09	SSA
149	Somalia	1990	19.61	SSA
150	Ethiopia	1990	19.50	SSA

- ***Full country rankings in 2020 for ratio-based efficiency scores***

Rank in ratio	***Countries***	***Year***	***ES***	***Region***
1	Georgia	2020	72.51	Central Asia & Caucasus
2	Ukraine	2020	72.20	Europe
3	Armenia	2020	71.61	Central Asia & Caucasus
4	Argentina	2020	71.53	Latin America & Caribbean
5	Tunisia	2020	71.40	MENA
6	Moldova	2020	71.29	Europe
7	Jamaica	2020	71.07	Latin America & Caribbean
8	Albania	2020	69.58	Europe
9	Republic of North Macedonia	2020	69.03	Europe
10	Suriname	2020	68.80	Latin America & Caribbean
11	Ecuador	2020	68.60	Latin America & Caribbean
12	Montenegro	2020	68.46	Europe
13	Cabo Verde	2020	68.15	SSA
14	Serbia	2020	68.06	Europe
15	Costa Rica	2020	67.71	Latin America & Caribbean

16	Kyrgyzstan	2020	67.41	Central Asia & Caucasus
17	Peru	2020	67.23	Latin America & Caribbean
18	Jordan	2020	66.97	MENA
19	Bosnia and Herzegovina	2020	66.84	Europe
20	Mauritius	2020	66.82	SSA
21	Belarus	2020	66.46	Europe
22	Algeria	2020	66.41	MENA
23	Bulgaria	2020	66.21	Europe
24	Chile	2020	66.14	Latin America & Caribbean
25	Sri Lanka	2020	65.88	South Asia
26	Bhutan	2020	65.76	South Asia
27	Mongolia	2020	65.41	East Asia & Pacific
28	Croatia	2020	65.30	Europe
29	Paraguay	2020	64.98	Latin America & Caribbean
30	South Africa	2020	64.94	SSA
31	Uruguay	2020	64.68	Latin America & Caribbean
32	West Bank and Gaza	2020	64.67	MENA
33	Vietnam	2020	64.64	East Asia & Pacific
34	Iran	2020	64.64	MENA
35	Colombia	2020	64.63	Latin America & Caribbean
36	Lebanon	2020	64.28	MENA
37	Greece	2020	64.25	Europe
38	Fiji	2020	64.22	East Asia & Pacific
39	Bolivia	2020	64.17	Latin America & Caribbean
40	Uzbekistan	2020	64.15	Central Asia & Caucasus
41	Botswana	2020	64.06	SSA
42	Romania	2020	64.04	Europe
43	Maldives	2020	63.91	South Asia
44	Latvia	2020	63.79	Europe
45	Ghana	2020	63.71	SSA
46	Poland	2020	63.29	Europe
47	Sao Tome and Principe	2020	63.29	SSA
48	Brazil	2020	62.78	Latin America & Caribbean
49	El Salvador	2020	62.75	Latin America & Caribbean
50	Morocco	2020	62.73	MENA
51	Philippines	2020	62.69	East Asia & Pacific
52	Dominican Republic	2020	62.59	Latin America & Caribbean
53	Trinidad and Tobago	2020	62.47	Latin America & Caribbean
54	Namibia	2020	62.19	SSA
55	Lithuania	2020	62.18	Europe
56	Barbados	2020	62.10	Latin America & Caribbean
57	Indonesia	2020	62.09	East Asia & Pacific
58	Mexico	2020	62.06	Latin America & Caribbean
59	Malaysia	2020	61.83	East Asia & Pacific
60	Russia	2020	61.74	Europe
61	Guyana	2020	61.60	Latin America & Caribbean
62	Thailand	2020	61.11	East Asia & Pacific
63	Panama	2020	61.06	Latin America & Caribbean
64	Hungary	2020	61.04	Europe
65	Kazakhstan	2020	60.88	Central Asia & Caucasus
66	Slovakia	2020	60.86	Europe

67	Gabon	2020	60.83	SSA
68	Honduras	2020	60.82	Latin America & Caribbean
69	Portugal	2020	59.93	Europe
70	Czechia	2020	59.88	Europe
71	Estonia	2020	59.82	Europe
72	Senegal	2020	59.73	SSA
73	Cuba	2020	59.47	Latin America & Caribbean
74	Nicaragua	2020	59.32	Latin America & Caribbean
75	Turkey	2020	59.11	Europe
76	Timor-Leste	2020	59.07	East Asia & Pacific
77	Azerbaijan	2020	59.05	Central Asia & Caucasus
78	Kenya	2020	57.86	SSA
79	Vanuatu	2020	57.61	East Asia & Pacific
80	Guatemala	2020	57.52	Latin America & Caribbean
81	Spain	2020	57.51	Europe
82	Myanmar	2020	57.36	East Asia & Pacific
83	Slovenia	2020	57.19	Europe
84	Iraq	2020	56.72	MENA
85	Gambia, The	2020	56.48	SSA
86	Egypt	2020	56.36	MENA
87	Nepal	2020	55.83	South Asia
88	Tanzania	2020	55.75	SSA
89	Lesotho	2020	55.69	SSA
90	Cyprus	2020	55.28	Europe
91	India	2020	55.10	South Asia
92	Syria	2020	54.88	MENA
93	Benin	2020	54.85	SSA
94	Malta	2020	54.20	Europe
95	Nigeria	2020	53.98	SSA
96	Togo	2020	53.82	SSA
97	Korea, Republic of	2020	53.80	East Asia & Pacific
98	Malawi	2020	53.67	SSA
99	Tajikistan	2020	53.46	Central Asia & Caucasus
100	Italy	2020	53.03	Europe
101	Comoros	2020	52.95	SSA
102	China	2020	52.76	East Asia & Pacific
103	Libya	2020	52.71	MENA
104	Zimbabwe	2020	52.55	SSA
105	Cameroon	2020	52.48	SSA
106	Liberia	2020	52.48	SSA
107	Turkmenistan	2020	52.45	Central Asia & Caucasus
108	Côte d'Ivoire	2020	52.31	SSA
109	Cambodia	2020	52.20	East Asia & Pacific
110	Rwanda	2020	51.92	SSA
111	Zambia	2020	51.80	SSA
112	Sierra Leone	2020	51.21	SSA
113	Kuwait	2020	51.11	MENA
114	Solomon Islands	2020	50.74	East Asia & Pacific
115	Oman	2020	50.55	MENA
116	Bangladesh	2020	50.19	South Asia
117	Mauritania	2020	49.82	SSA

118	Burkina Faso	2020	49.57	SSA
119	Djibouti	2020	49.36	MENA
120	France	2020	49.20	Europe
121	Japan	2020	48.96	East Asia & Pacific
122	Pakistan	2020	48.91	South Asia
123	Eswatini	2020	48.69	SSA
124	United Kingdom	2020	48.58	Europe
125	New Zealand	2020	48.32	East Asia & Pacific
126	Uganda	2020	48.14	SSA
127	Mali	2020	47.81	SSA
128	Canada	2020	47.77	North America
129	Angola	2020	47.75	SSA
130	Sudan	2020	47.65	SSA
131	Congo, Republic of	2020	47.57	SSA
132	Laos	2020	47.47	East Asia & Pacific
133	Papua New Guinea	2020	46.94	East Asia & Pacific
134	Haiti	2020	46.78	Latin America & Caribbean
135	Guinea-Bissau	2020	46.62	SSA
136	Madagascar	2020	46.52	SSA
137	Belgium	2020	46.31	Europe
138	Germany	2020	46.29	Europe
139	Ethiopia	2020	45.57	SSA
140	Mozambique	2020	45.54	SSA
141	Saudi Arabia	2020	45.29	MENA
142	Finland	2020	45.09	Europe
143	Austria	2020	44.89	Europe
144	Israel	2020	44.56	MENA
145	Bahrain	2020	44.06	MENA
146	Congo, Democratic Republic of	2020	43.71	SSA
147	Netherlands	2020	43.51	Europe
148	Niger	2020	43.39	SSA
149	Australia	2020	43.30	East Asia & Pacific
150	Sweden	2020	43.25	Europe
151	Equatorial Guinea	2020	42.90	SSA
152	Guinea	2020	42.15	SSA
153	Afghanistan	2020	41.82	South Asia
154	Iceland	2020	41.13	Europe
155	Denmark	2020	40.58	Europe
156	Burundi	2020	39.45	SSA
157	United Arab Emirates	2020	39.29	MENA
158	Yemen	2020	38.82	MENA
159	Norway	2020	37.94	Europe
160	United States	2020	37.11	North America
161	Singapore	2020	36.96	East Asia & Pacific
162	Chad	2020	34.71	SSA
163	Central African Republic	2020	33.81	SSA
164	Switzerland	2020	32.97	Europe
165	Somalia	2020	32.94	SSA
166	Ireland	2020	32.30	Europe
167	Qatar	2020	31.93	MENA
168	Luxembourg	2020	26.01	Europe