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Supervisor: Ing. Jaromír Harmáček, Ph.D.

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A Connection Between Social Progress and Pro-poor Growth

Khammailee Vangxaolee

Supervisor: Ing. Jaromír Harmáček, Ph.D.

GLODEP

Declaration

I, Khammailee Vangxaolee, hereby declare that this master's thesis, titled "A Connection between Social Progress and Pro-poor Growth," is my original work, completed under the guidance and supervision of Professor Jaromír Harmáček. I affirm that all theoretical and empirical sources, as well as data used in this study, have been appropriately cited and acknowledged in the text and the reference list provided in this document.

Khammailee Vangxaolee

27th May, 2024

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Declaration of honour on the use of AI

During the writing of the submitted thesis, I used the following AI tools: Chat GPT, Grammarly and QuillBot to improve readability and language, specifically checking for grammar mistakes, and paraphrasing. After using these AI tools, 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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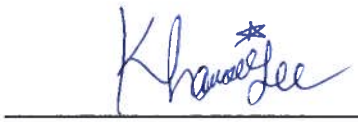

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Zásady pro vypracování

Despite the extensive research of pro-poor growth and social progress in recent times, the focus has mainly been on measuring and analyzing these two aspects separately. For pro-poor growth, numerous studies have primarily applied income-related indicators, such as GDP, to assess pro-poorness, with only a limited number of studies addressing non-income indicators related to social and environmental aspects. However, investigating the link between the two could yield significant findings regarding whether pro-poor growth enhances social progress or vice versa. Therefore, the objective of this study is to examine the relationship between the Social Progress Index (SPI) and pro-poor growth measures, applying quantitative techniques, and utilizing available data on social progress, income growth, poverty, and inequality.

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Abstract

This study examines the relationship between social progress and pro-poor growth in developing countries over 2010-2020. Using the latest data from the World Bank's PIP database, the Poverty Equivalent Growth Rate (PEGR) is calculated to measure pro-poor growth. Social progress is proxied by the Social Progress Index (SPI) for the same countries over the same time period. Pooled OLS regression is employed to analyze the association between the two variables. The results indicate a significant positive relationship between measures of pro-poor growth and social progress, suggesting that as the rate of PEGR increases, the SPI change also tends to increase. In addition, the findings show that when compared to non-pro-poor development, both relative pro-poor growth as well as (weak) absolute pro-poor growth, are associated with a higher SPI increases. These findings may underscore the importance of focusing on pro-poor growth to enhance the rate of social progress in developing countries.

Keywords: Social Progress, Pro-poor growth, Poverty Equivalent Growth Rate (PEGR), Relationship, Developing Countries.

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List of Abbreviations

BLI	Better Life Index
DASP	Distributive Analysis Stata Package
GDP	Gross Domestic Product
GIC	Growth Incidence Curve
GNP	Gross National Product
HDI	Human Development Index
MDGs	Millennium Development Goals
MPI	Multidimensional Poverty Index
OECD	Organization of Economic Cooperation and Development
OLS	Ordinary Least Squares
PBG	Poverty Bias of Growth
PEGR	Poverty Equivalent Growth Rate
PGC	Poverty growth curve
PIP	Poverty and Inequality Platform
PPG	Pro-poor Growth
PPGI	Pro-Poor Growth Index
RPPG	Rate of Pro-poor Growth
SDGs	Sustainable Development Goals
SPI	Social Progress Index
UN	United Nations
UNDP	United Nations Development Programme
WISP	Weighted Index of Social Progress

Chapter One

Introduction

1.1 Background of the study

The use of gross domestic product (GDP) to measure national economy and social well-being has been criticized by economists. For instance, Sen et al. (2010) argued that GDP is a limited measure of societal progress due to its focus on economic output, neglecting factors like income inequality, environmental degradation, and unpaid work. Consequently, this has led to the development of the Social Progress Index (SPI) by the Social Progress Imperative in 2013. This index offers a distinctive approach to measuring social well-being, centering solely on social and environmental progress metrics while excluding economic indicators (Porter et al., 2013). Since the introduction of the SPI, it has emerged as a significant measure in the field of development, and numerous studies have incorporated this relatively new measure alongside other dimensions to examine their associations. Notably, several studies have suggested a significant positive relationship between social progress (as measured by SPI) and economic growth, as measured by GDP per capita (Qaiser et al., 2018; Fehder et al., 2019; Social Progress Imperative, 2022).

In 2015, the United Nations (UN) adopted the Sustainable Development Goals (SDGs), comprising 17 goals and 169 targets, aimed at reducing poverty and addressing other deprivations such as health, education, inequality, and economic growth (United Nations, 2015). Three of these SDGs goals, namely Goal 1 (No Poverty), Goal 8 (Decent Work and Economic Growth), and Goal 10 (Reduced Inequalities), have been popular topics in the field of economic development. Poverty, growth, and inequality have been extensively examined either together or independently in the existing empirical literature. However, achieving these three goals simultaneously is highly challenging due to their dynamic interconnections (Murjani, 2021).

In recent decades, global economic growth fueled by globalization and rapid technological advancement has lifted millions out of extreme poverty[1]. Nevertheless, widespread income inequality persists as the benefits are unevenly distributed, hindering overall poverty reduction

[1] According to World Bank's PIP data, over the last two decades, the global poverty rate decreased from 29% to 9.7%. A significant reduction in poverty was observed in many developing countries, particularly in China (Word Bank, 2023).

(Jmurova, 2017). Reducing poverty entails improving and enhancing human well-being, particularly the poor people in the society (Kakwani & Pernia, 2000) and the focus on poverty reduction in development policy has urged significant interest in pro-poor growth (Kakwani & Son, 2008).

The concept of pro-poor growth has gained popularity among various approaches to assess and combat poverty (Panek & Zwierzchowski, 2022). It can be defined either in relative and absolute perspectives. In the relative approach, economic growth is termed pro-poor if the poor benefit from growth relatively more than the non-poor, or where the poor suffer proportionally less from negative growth compared to the non-poor (Kakwani & Pernia, 2000). In the absolute approach, growth is considered pro-poor if it leads to a decrease in poverty incidence, indicating that the poor benefit in absolute terms (Ravallion & Chen, 2003). Thus, pro-poor growth is a concept used to measure the effects of growth on development, poverty, and inequality (Harmacek et al., 2017). Additionally, pro-poor growth, as measured by the poverty equivalent growth rate (PEGR), is an effective government policy for alleviating poverty (Kakwani & Son, 2008).

Despite extensive research on pro-poor growth and social progress, the focus has primarily been on analyzing these components separately. While some studies have explored the link between economic growth and the Social Progress Index (SPI), and others have examined determinants of pro-poor growth, they often overlook the connection between social progress and pro-poor growth. Currently, no research has explored this relationship. Consequently, this study aims to fill the existing research gap by examining the connection between social progress (as measured by the SPI) and pro-poor growth (as measured by the PEGR). Given that economic growth is a significant driver of social progress and pro-poor growth represents a distinct type of growth that benefits the poor, we hypothesize that income growth, combined with pro-poor distributional changes and poverty reduction as reflected in the PEGR, can also have a substantial impact on social progress.

1.2 Justification of the research

This research is justified for two main reasons. Firstly, while several studies have explored the relationship between social progress and economic growth (GDP per capita), to the best of our knowledge, none of the previous studies have investigated the association between social progress and economic growth that benefits the poor (pro-poor growth). In our study, pro-poor

growth is measured by the Poverty Equivalent Growth Rate (PEGR), which is a relative pro-poor growth that considers both the growth rate in the mean income and how benefits of growth are distributed among the poor and the rich. Secondly, instead of using one global poverty line to calculate the pro-poor growth measures, specifically the PEGR for all selected countries, this study applies different poverty lines for different country income groups. Additionally, this study mainly focuses on poor and developing countries to explore whether the income growth of the poor significantly drives social progress in the developing world.

1.3 Research Objectives

The main purpose of this study is to examine the relationship between social progress (as measured by the SPI) and pro-poor growth (as measured by the PEGR) in developing countries worldwide, including low-income, lower-middle-income, and upper-middle-income countries. To examine the association, the study first calculates the PEGR for developing countries over 2010-2020. Next, the study uses the SPI data from the same period to examine the statistical association between these two concepts.

Apart from the overall aim, the study also focuses on more specific objectives:

- Compute the PEGR for developing countries (with available data) over 2010-2020 to analyze whether the economic growth can be termed as pro-poor or not.
- Examine the relationship between the Social Progress Index (SPI) and pro-poor growth (the PEGR) using a regression approach.
- Compare the effects of pro-poor growth on SPI in comparison with non-pro-poor growth.

This research is structured into five chapters. This first chapter has introduced the background of the topic, explained the justifications for conducting the research and outlined the study's objectives. The following chapter delves into a comprehensive review of existing literature on social progress and pro-poor growth, covering their definitions, measurements, theoretical frameworks, and identifying the research gaps. The third chapter describes the sample, data sources, and analysis approaches. The subsequent chapter presents the research results and discussions. Finally, chapter five offers conclusions, discusses limitations, and provides policy recommendations and suggestions for further studies.

Chapter Two

Literature Review

2.1 Social Progress

2.1.1 Definition

The concept or definition of social progress is not new, as it has been up for debate for several decades by many sociologists and scholars. However, even until today, there is no universal agreement on its concrete definition. From the perspectives in the early 20th century, Bernard (1922) defined social progress as the highest form of progress since it cannot be achieved without simultaneously attaining significant amounts of other forms of progress, including cosmic and other forms of biological and geological progress (Bernard, 1922). Additionally, according to Henderson (1940), there are no suitable procedures, such as measurements or observations, for investigating the concept of social progress. However, he emphasizes the importance of taking a logical and scientific position when discussing social progress and acknowledges the existence of sentiments related to social progress, both based on concrete experience and conditioning, as well as intellectual activity (Henderson, 1940). Furthermore, the concept of social progress inherently assumes an understanding of "the good" and a method to determine whether society is moving towards or away from it (Osberg, 2001).

Additionally, sociologists are cautious of making value judgments and violating cultural relativism when defining social progress (Best, 2001). The concept of social progress is not subjective based on personal opinions, but it is subjective because it varies depending on the social backgrounds and perspectives of the people using it. Since it deals with human and societal issues, the concept of progress is influenced by people's different ideologies and viewpoints (Bazac, 2016). According to Estes and Morgan (1976), social progress represents the dynamic capability of countries to fulfill the essential social and material needs of their generally growing populations. Consequently, it can be posited that various disciplines and fields offer distinct definitions and interpretations of social progress.

In more recent times, Porter et al. (2013) presented a significant and comprehensive definition of social progress. They characterized social progress as the ability of a society to address the fundamental human needs of its residents, establish the necessary foundations for citizens and communities to improve and maintain their quality of life, and create an environment that enables all individuals to achieve their maximum capabilities (Porter et al., 2013). The

fundamental basis for the construction and development of the Social Progress Index (SPI) is established by this idea.

2.1.2 Social Progress Measurement

For many years, there has been an ongoing discussion about the effectiveness of using monetary indicators such as Gross Domestic Product (GDP) and Gross National Product (GNP) per capita as accurate reflections of societal progress. On the one hand, GDP has traditionally served as a broad indicator of progress and, due to inertia, is often used as a measure of progress, prosperity, and even well-being (Ivković, 2016). For a long time, especially in developed nations, GDP per capita was a good indicator of a population's well-being, reflecting a country's ability to meet its residents' material needs (Giovannini et al., 2007). Furthermore, policymakers and economists commonly regard GDP as a holistic measure that reflects a country's development, merging its economic prosperity and social welfare. Consequently, policies leading to economic growth are perceived as advantageous for societal well-being (Kapoor & Debroy, 2019). According to Van den Bergh (2009), GDP is often implicitly, and sometimes explicitly, equated with social welfare, as seen in its frequent synonym, "standard of living." This association does not stem from any theoretical framework positioning GDP as a social welfare metric but has developed over time (Van den Bergh, 2009).

On the other hand, a substantial body of theoretical and empirical research questions the efficacy of GDP per capita as a measure of well-being and development, proposing adjustments and alternative metrics. The use of GDP per capita as a measure of social wellbeing has faced significant criticism since the 1960s, with criticisms raised by renowned economists and Nobel Prize laureates of the 20th century (Van den Bergh & Antal, 2014). For instance, according to Stiglitz et al. (2018), it has been argued that GDP alone is insufficient in comprehensively capturing all dimensions of well-being. Consequently, there is a growing demand for a wider range of indicators beyond GDP to comprehensively evaluate a country's overall health, encompassing its economic, social, and environmental well-being. Costanza et al. (2009) criticized the use of GDP as a measure of national well-being. They argued that measures of progress and well-being should reflect how well a society meets its fundamental goals, such as the sustainable provision of basic needs, rather than merely quantifying economic transactions. Additionally, GDP does not account for income distribution within a society, an issue increasingly relevant amid rising inequality globally. It cannot distinguish between societies with equal and unequal wealth distribution, even if their economies are of similar size (Kapoor

& Debroy, 2019). Similarly, GDP provides little insight into the distribution of growth benefits across the population or the concentration of wealth in specific socioeconomic groupings. It also fails to include natural resource depletion and overall environmental sustainability (Terzi, 2021).

Even with substantial theoretical and empirical critiques of GDP as an indicator of social welfare and progress, its influence persists across economics, public policy, politics, and society (Van den Bergh, 2009). According to Oulton (2012), GDP serves as an indicator of human welfare, with cross-country analyses revealing a strong correlation between per capita GDP and crucial welfare metrics. Specifically, it exhibits a positive relationship with life expectancy and a negative correlation with both infant mortality and inequality.

Besides GDP per capita, multidimensional indices could provide deeper insights regarding development. One good example is the Human Development Index (HDI), which is a widely recognized measure that enriches our understanding of a country's development by including education, health, and longevity, alongside income. Despite its limitations and critiques, the HDI has successfully offered a distinct lens through which to assess and understand development (Al-Hilani, 2012).

In 2013, the Social Progress Index (SPI), developed by the Social Progress Imperative, offers a unique approach to assessing societal well-being by focusing exclusively on social and environmental progress metrics and omitting economic indicators. The Social Progress Index is based on the idea that our measurements influence our decisions. By focusing on what truly matters to individuals such as basic necessities, healthcare, education, and environmental quality, along with opportunities for personal advancement, aiming to redefine the discourse on development (Porter et al., 2013). According to the Social Progress Imperative (2022), SPI and GDP per capita exhibit a robust and positive correlation. However, there exists a non-linear relationship between economic development and social advancement. Specifically, at lower income levels, even slight variations in GDP per capita are linked to significant advancements in social development. As nations attain greater levels of prosperity, the pace of change decelerates. Social progress cannot be fully explained by GDP per capita. Countries exhibit varying degrees of social advancement despite having comparable levels of GDP per capita (Social Progress Imperative, 2022).

Several indicators[2] have been developed and proposed to evaluate social progress, with some solely relying on social elements while others combine both social and economic factors. Some notable composite indicators for measuring social progress are briefly presented as follows:

Weighted Index of Social Progress (WISP – 1973)

In 1973, Richard J. Estes developed one of the first social progress measurements, the Index of Social Progress (ISP) (Estes and Morgan, 1976). However, over the years, the ISP index transformed into the Weighted Index of Social Progress (WISP), which is currently utilized to evaluate nations' evolving ability to meet their populations' basic social and material needs (Estes 2014). Currently, the Index of Social Progress (ISP) is composed of 46 social indicators, which are categorized into 10 distinct sub-indices. These sub-indices include health status, education, status of women, defense effort, economic factors, demographic characteristics, geographical considerations, political participation, welfare effort and cultural diversity. Moreover, the ISP's 46 indicators are widely utilized by socioeconomic development specialists, indicating their validity (Estes, 1997). The primary goal of the index is to evaluate how effectively societies are succeeding in reducing the development obstacles that prevent individuals from improving the quality of their lives overall, even though it is not a direct measure of life quality (Estes, 2014).

Human Development Index (HDI – 1990)

The Human Development Index (HDI) was introduced by the Introduced by the United Nations Development Programme (UNDP) in 1990. The Human Development indicator (HDI) is a composite indicator that measures average accomplishment in three essential dimensions of human development: long & and healthy life, knowledge, and a decent standard of living (UNDP, 2022a). The HDI evaluates health through life expectancy at birth, education via the average years of schooling for adults over 25 and expected schooling for entering children, and standard of living by per capita gross national income, applying the logarithm of income to account for its decreasing marginal utility with rising GNI. These dimensions are combined into a single composite index using the geometric mean (UNDP, 2022a). In addition, one of

[2] Besides the indicators presented, other important indicators include Gross National Happiness (GNH), the Happy Planet Index (HPI), and the Inclusive Development Index (IDI).

the key elements of the HDI is that it can be used to examine national policy choices, such as how two countries with the same GNP per capita can have different human development outcomes, which these discrepancies can spark controversy regarding the government's policy priorities. (UNDP, 2022a).

Multidimensional Poverty Index (MPI - 2010)

In 2010, the Multidimensional Poverty Index (MPI) was introduced by the Oxford Poverty & Human Development Initiative (OPHI) and the United Nations Development Programme. The new unique measure goes beyond the typical focus on income to include the various deprivations that a poor person confronts in terms of education, health, and living standards (Alkire & Santos, 2010). The global MPI is an important worldwide resource that monitors severe multidimensional poverty in over 100 developing nations to advance SDG 1 (ending poverty in all its forms everywhere) by measuring interrelated deprivations across indicators related to SDGs 1, 2, 3, 4, 6, 7, and 11. The global MPI initiates its assessment by creating a detailed deprivation profile for every individual and household, monitoring deprivations across 10 indicators spanning as health, education, and living standards (UNDP, 2023).

Better Life Index (BLI – 2011)

In May 2011, the Organization for Economic Co-operation and Development (OECD) introduced the Better Life Index (BLI), a new well-being index. Building on research in multi-criteria evaluation within economic and social domains, the BLI seeks to provide an alternative to GDP for comparing countries by considering not just their total wealth but also well-being indicators (Kasparian and Rolland, 2012). The "Your Better Life Index", part of the OECD's Better Life Initiative, is a tool designed to measure well-being and progress. It enables citizens to compare life across 34 countries according to 11 dimensions – such as housing, income, and health—allowing users to assign their own importance to each dimension (OECD, 2011). Life encompasses more than just the stark figures of GDP and economic data – This Index offers a means to contrast well-being among nations, focusing on 11 topics deemed crucial by the OECD, covering both material living standards and life quality (OECD, 2020).

2.1.3 Social Progress Index (SPI)

In 2013, the Social Progress Imperative launched the Social Progress Index (SPI), which defined "social progress" as a society's ability to meet its residents' basic human needs, establish foundations for citizens and communities to enhance and preserve their quality of life, and create conditions for all people to reach their full potential (Social Progress Imperative, 2013). According to the Social Progress Imperative (2013), the Social Progress Index is a comprehensive, objective, outcome-based measure of a country's well-being that is not influenced by economic indicators. Therefore, the index was created in response to the 'Beyond GDP' campaign, with the goal of providing a thorough evaluation of social progress. The SPI is a well-established indicator aimed at accelerating development and motivating action by presenting social result data in an understandable and reliable manner. It has numerous dimensions and can be used to benchmark success, providing a comprehensive, transparent, outcome-based evaluation of a country's well-being based exclusively on social and environmental indicators (Social Progress Imperative, 2024).

Additionally, the SPI uniquely emphasizes non-economic factors of national success, distinguishing social progress from traditional economic indicators like GDP per capita. Unlike the Human Development Index or the OECD Better Life Index that mix economic and social measures, this index aims to clearly and methodically spotlight the non-economic facets of social achievement (Social Progress Imperative, 2024).

Theoretical background of the SPI

The structure of the Social Progress Index comprises three distinct factors or dimensions such as basic human needs, opportunity and foundations of wellbeing. Each dimension consists of four components, which are influenced by questions that aim to be addressed using existing data. Each component is then further elaborated by a set of outcome indicators that meet the conceptual questions raised. The aforementioned interrelated components collectively contribute to a specific degree of social progress (Social Progress Imperative, 2014). According to the Social Progress Imperative (2024), the approach employed by the SPI enables the assessment of each components and dimensions, leading to the generation of a comprehensive score and ranking. Figure 1 offers an in-depth look at the component-level structure of the SPI, illustrating the specific questions the SPI aims to address through its measurements.

The first dimension, Basic Human Needs, evaluates the ability of a population to sustain life with sufficient food and basic healthcare, access to clean water and sanitation, suitable housing, and personal security. The second dimension of social progress, Foundations of Wellbeing, warrants equal consideration. It assesses a country's ability to provide basic education, unrestricted access to information and communication, modern healthcare, and a healthy environment for a long life. The last dimension, Opportunity, requires that any analysis of social progress also takes into account whether the population of a country possesses the freedom and opportunity to make personal decisions and pursue higher education. Elements such as personal rights, freedom of choice, inclusiveness, and the accessibility of advanced education are all crucial in shaping the opportunities available within a society (Social Progress Imperative, 2024).

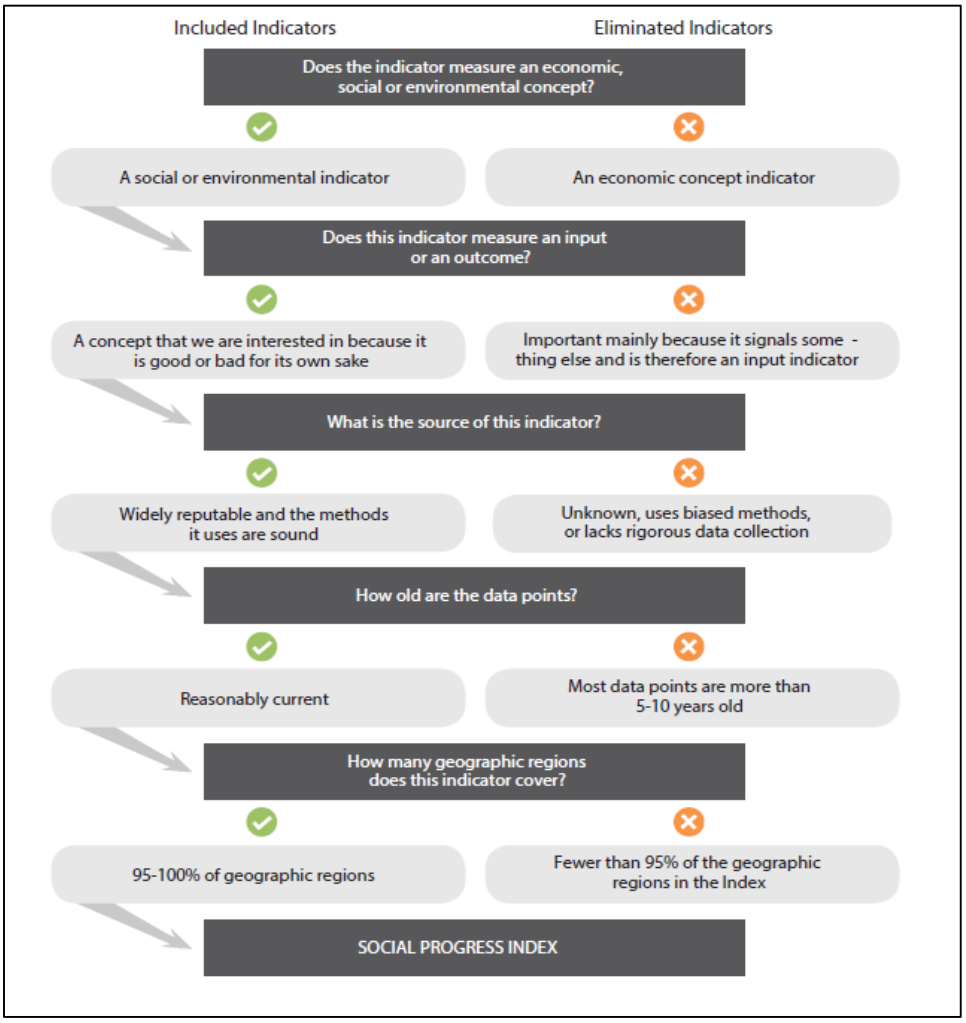
Figure 1: Social Progress Index Component-Level Framework

Source: Social Progress Imperative, 2024

SPI Indicator Selection

The global Social Progress Index (SPI) for 2024 adheres to five principles in choosing the indicators for index construction, as shown in Figure 2. Firstly, the selected indicators must pertain to social or environmental aspects. Secondly, the focus is on outcome-based rather than input-based indicators. Thirdly, the indicators are chosen for their widespread credibility and the reliability of their methodologies. Fourthly, the data for the indicators must be reasonably current and up-to-date by considering the most recent available data. Lastly, the indicators should encompass a broad range of geographic areas (Social Progress Imperative, 2024).

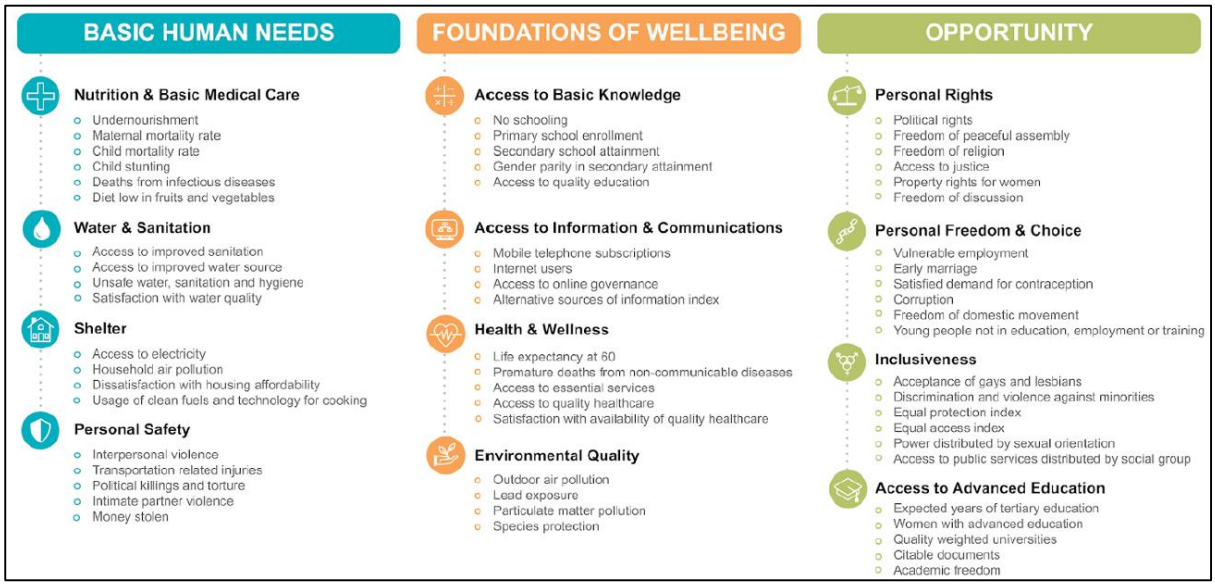
Figure 2: Social Progress Index Indicator Selection Tree



Source: Social Progress Imperative, 2024

Following these principles, the 2024 global Social Progress Index utilizes 57 indicators to capture the essence of its 12 components, with each component being depicted and evaluated by 4 to 6 indicators (See Figure 3). Indicators included are those measured reliably, employing a consistent methodology by the same organization, across all or nearly all countries in the sample. Each indicator undergoes evaluation to confirm the integrity of its measurement processes and its effectiveness in accurately reflecting the intended concept. In addition, to ensure consistency in measurement across countries, data for each indicator must be sourced from a single organization.

Figure 3: Social Progress Index Indicator-Level Framework



Source: Social Progress Imperative, 2024

The SPI serves as a baseline by which nations may measure themselves and identify existing areas of strength or weakness. Furthermore, scoring on a 0-100 scale[3] provides nations with a more realistic standard than an abstract metric. This scale enables us to monitor nations' absolute, rather than relative, performance over time across each component, dimension, and total model (Social Progress Imperative, 2024). According to the Social Progress Imperative (2024), the SPI scoring is divided into 6 performance tiers, from Tier 1 for countries with the lowest score (indicating the lowest social progress) to Tier 6 for countries with the highest score (indicating the highest social progress). For example, countries such as South Sudan, Central African Republic, Somalia, and Chad belong to Tier 6. Most countries in Africa also fall into Tier 5, while countries like Canada, the US, Japan, South Korea, and the majority of countries in Europe belong to Tiers 1 and 2. In addition, emerging markets like China, Brazil, Russia, Indonesia, Mexico, and India belong to Tier 3 and 4 (Social Progress Imperative, 2024).

More importantly, the SPI provides time series data since 2011, covering 170 countries worldwide to observe each country's overall performance over time and to track changes in terms of ranking and improvement. Besides the overall SPI score, the time series data also offer a deeper look at the performance of each dimension and its key components over time (Social Progress Imperative, 2024).

[3] The higher the SPI score, the better the performance in social progress

2.2 Pro-Poor Growth

2.2.1 Concept

The concept of pro-poor growth (PPG) has been broadly defined by numerous scholars and international organizations over the years. Global organizations, including the United Nations (United Nations, 2000) and the Organization for Economic Co-operation and Development (OECD, 2007), describe pro-poor growth as a form of economic growth that benefits the poor, allowing them to improve their economic circumstances. Nevertheless, this definition is quite vague and imprecise, offering limited guidance for its measurement or for the formulation of pro-poor policies (Panek & Zwierzchowski, 2022). In the past several years, several proposals have been created for a more specific definition of pro-poor growth. For instance, those proposed by Kakwani & Pernia (2000), Ravallion and Chen (2003), Son (2004), Kraay (2006), Klasen (2008), and Kakwani and Son (2008).

According to Kakwani & Pernia (2000), pro-poor growth is inclusive economic growth that ensures the poor actively engage in and greatly benefit from economic activities, aiming for a society where no one lacks basic capabilities. Recently, pro-poor growth has gained prominence among researchers and policymakers as a vital strategy for fulfilling the Millennium Development Goals (MDGs) (Grosse et al., 2008), and it became the central framework for donor policy guidance, prioritizing equity in line with the SDGs (Shepherd et al., 2016). Additionally, pro-poor growth is necessary to reduce extreme poverty, improve welfare, and enhance resilience against shocks that could lead back to poverty (Shepherd et al., 2019).

The definition of pro-poor growth, fundamentally aimed at benefiting the poor, remains significantly debated, with the research and policy community mainly divided between the absolute and relative perspectives (Ravallion, 2004; Klasen, 2008). This distinction is linked to the fundamental approaches to evaluating poverty and inequality (Panek & Zwierzchowski, 2022). According to the absolute approach, the emphasis is solely on the final outcome of the growth process. In this context, the process of growth is considered pro-poor if and only if the poor people benefit in absolute terms, as indicated by a reduction in poverty incidence (Ravallion & Chen, 2003; Ravallion, 2004). According to this definition, the degree to which growth is considered pro-poor depends entirely on the pace at which poverty levels change (Ravallion, 2004). As a result, this concept does not assess and compare the way in which the benefits of growth are distributed between the poor and the non-poor (Panek & Zwierzchowski, 2022).

According to Klasen (2008), growth is viewed as beneficial to the poor if the incomes of the poor increase. Furthermore, Klasen (2008) differentiates between strong and weak forms of absolute growth that benefit the poor. Strong absolute growth benefits the poor is identified when the income gains of the poor exceed those of the non-poor. On the other hand, weak absolute growth favors the poor is characterized by an absolute increase in the poor's incomes, although the incomes of the non-poor rise even more, indicating that the growth rate of the poor's incomes is greater than 0 (Klasen, 2008).

In terms of the relative PPG approach, growth is regarded as pro-poor when the benefits to the poor are proportionally higher than the non-poor (Kakwani & Pernia, 2000). Under the relative approach, growth is considered pro-poor only if the income growth rate of the poor surpasses the overall average income growth rate, and there is a reduction in the disparity between the poor and the non-poor (Klasen, 2008). This represents a relative notion of pro-poor growth, as it results in a decrease in relative inequality (Kakwani & Son, 2008). Furthermore, this definition highlights that for growth to be considered pro-poor, the incomes of the poor must increase faster than those of the non-poor, focusing on changes in inequality (Ravallion, 2004). However, according to Ravallion (2004), one concern with this concept is that in shrinking economies, changes regarded "pro-poor" might not lead to real benefits for the poor, possibly resulting in worsened living conditions.

It is important to note that the above definitions of pro-poor growth depend on how the poor are defined, meaning they are based on the poverty threshold (Grosse et al., 2008). More importantly, according to Grosses et al. (2008), the absolute definition represents the most stringent criterion for pro-poor growth and is the most difficult to achieve. Consequently, most empirical and policy research has concentrated on the weak absolute and relative definitions (Grosse et al., 2008).

2.2.2 Pro-Poor Growth Measurements

In this section, we provide a brief overview of the theoretical and conceptual framework for assessing pro-poor growth. Several measurements of pro-poor growth have been developed and proposed by many scholars and development researchers, which consist of both relative and absolute methods. For our study, we mainly focus on one pro-poor growth measurement[4]

[4] Other notable pro-poor growth measures include the Pro-Poor Growth Index (PPGI), Growth Incidence Curve (GIC), Poverty Bias of Growth (PBG) and Poverty growth curve (PGC).

called the Poverty Equivalent Growth Rate (PEGR) as the relative approach. However, we also present a brief background of an absolute pro-poor growth measure called the Rate of Pro-Poor Growth (RPPG).

Poverty Equivalent Growth Rate (PEGR)

The PEGR is a relative approach proposed by Kakwani and Son (2008) for measuring whether economic growth is pro-poor. One significant contribution of this approach is that it considers both the growth rate in average income and the allocation of growth benefits among the poor and the non-poor (Kawakni & Son, 2008). The authors defined the PEGR as the income growth rate γ^* that could lead to the same proportional poverty reduction as the present growth rate γ, assuming that assuming growth benefits are evenly distributed across society without any changes in relative inequality (Kawakni & Son, 2008). The PEGR[5] is mathematically written as follows:

$$\text{PEGR} = \gamma^* = \left(\frac{\delta}{\eta}\right)\gamma = \varphi\gamma \qquad (1)$$

Where: γ = the actual rate of growth of mean income

φ = the pro-poor growth index (PPGI)

δ = the total poverty elasticity

η = the percentage change in poverty results from a 1% change in mean income in while inequality stays constant (the neutral growth elasticity of poverty).

From the above equation, the growth is pro-poor in a relative sense if $\gamma^*>\gamma$ and anti-poor if $\gamma^*<\gamma$. However, if $0<\gamma^*<\gamma$, then growth is trickle-down, meaning that the poor benefit proportionally less from the growth than the non-poor. In other words, the growth leads to a reduction in poverty, but at simultaneously increases inequality. Growth is considered "super pro-poor" if $\gamma^*\geq \gamma\ (\eta^*/\eta)$, wherein η^* represents the poverty elasticity in relation to growth that benefits everyone individual in a society equally. Furthermore, if $\gamma^*<0$, then growth is immiserising (Kakwani et al., 2003; Kawani & Son, 2008). It is important to note that the PEGR is the only pro-poor growth measure that satisfies the monotonicity condition, which indicates that the higher the PEGR, the greater the poverty alleviation. Thus, the PEGR can

[5] For more details on the technical computation of this relative measure of pro-poor growth, refer to Kakwani and Son (2008) in their paper titled *Poverty Equivalent Growth Rate*.

help determine whether growth is absolutely pro-poor, relatively pro-poor, or poverty-reducing (Kakwani & Son, 2008; Harmáček et al. 2017).

Rate of pro-poor growth (RPPG)

The RPPG was developed by Ravallion and Chen (2003) as an absolute approach to measure pro-poor growth. The authors challenged the concept of relative approaches to assessing pro-poor growth and they argued that when economic growth benefits the poor more than the non-poor in relative terms, yet results in the poor being worse off in absolute terms, then such a situation cannot be regarded as pro-poor growth. Therefore, they argued that pro-poor growth occurs when the poor experience benefits from economic growth, regardless of the impact on the non-poor. This means there is pro-poor growth as long as the poor benefit in absolute terms, even if the non-poor benefit disproportionately more (Harmácek et al., 2017).

According to Ravallion and Chen (2003), there are two essential assumptions for any measure of pro-poor growth. First, a positive (or negative) economic growth automatically results to a decrease (or rise) in poverty decline. Second, a poverty indicator should be included in a pro-poor measure. To construct and calculate the RPPG, Ravallion and Chen (2003) firstly determine the growth incidence curve (GIC), which is a graphical approach that illustrates the mean growth rates at each centile or percentile within a society's income distribution.

The rate of pro-poor growth (RPPG)[6] proposed by Ravallion and Chen (2003) is defined by dividing the area under the Growth Incidence Curve (GIC) up to the headcount index by the headcount index (H_t) and it is mathematically formulated as follows:

$$\text{RPPG} = \frac{\int_0^{H_t} g_t(p)dp}{H_t} \qquad (2)$$

The RPPG can be interpreted in both absolute and relative terms. In absolute terms, if RPPG>0, it implies that growth is pro-poor in a weak sense (reduction in poverty). However, if RPPG<0, it means that poverty is rising. In relative terms, the growth is considered pro-poor if RPPG>g (the growth rate of mean income) and not pro-poor if RPPG<g (Harmáček, 2017; Panek & Zwierzchowski, 2022).

[6] For more details on the technical computation of this absolute measure of pro-poor growth, refer to Ravallion and Chen (2003) in their paper titled *Measuring pro-poor growth.*

2.3 Studies on Social Progress Index and Pro-poor Growth

2.3.1 Studies on Social Progress Index (SPI)

Many international organizations, such as the United Nations Development Programme (UNDP), the Social Progress Imperative, and the OECD, measure social progress or well-being using different indicators and approaches. For example, the Human Development Reports, released annually by the UNDP, primarily focus on the Human Development Index (HDI), delving into health, education, and income data. These reports aim to provide a comprehensive understanding of each country's development and overall well-being (UNDP, 2022b). Similarly, the Social Progress Imperative releases the Social Progress Index reports on a yearly basis to measure social progress in more than 160 countries around the world. Meanwhile, the OECD consistently releases the How's Life? Report alongside its Better Life Index to measure and compare well-being for its member countries (OECD, 2020). However, our study mainly emphasizes the Social Progress Index (SPI) as a proxy for social progress and uses this measure for our analysis.

Since its inaugural introduction in 2013, the Social Progress Index (SPI) has significantly enhanced its reputation and importance within the field of development research. Numerous studies have utilized the SPI alongside various factors, from economic growth to corruption, to explore their relationships. Qaiser et al. (2018) examined the relationship between the SPI and GDP per capita in 119 countries by applying simple linear regression and found that the SPI is positively correlated with GDP per capita. A study conducted by Fehder et al. (2019) also revealed a strong positive relationship between SPI and GDP per capita. Likewise, the Social Progress Imperative (2022) indicates that there exists a robust and positive association between the SPI and GDP per capita; however, this relationship does not follow a linear pattern.

In addition to the relationship with GDP, Jahić and Cinjarević (2017) explored the relationship between the Social Progress Index (SPI) and education on corruption across 84 countries globally. The regression results indicated that both social progress and education have significant negative correlations with corruption. In 2019, De la Hoz-Rosales et al. (2019) investigated the impact of entrepreneurship and information and communication technology (ICT) on social development, as measured by the SPI. The OLS analysis showed that there is a positive correlation between entrepreneurship, as measured by the Global Entrepreneurship Monitor, and the SPI. Furthermore, ICT, measured by the Networked Readiness Index, also shows a positive correlation with the SPI, suggesting that ICT plays a crucial role in enabling

individuals to achieve their desired quality of life. Table 1 displays some notable studies examining the relationship between the SPI and other indicators.

Table 1: Examples of Studies Examining the Relationship between the SPI and Other Indicators

Study	The relationship	Country	Period	Results
Almatarneh & Emeagwali (2019)	SPI and institutional quality (measured by the World Governance Index)	107 countries	2014-2017	There is a significant positive relationship between the SPI and institutional quality, indicating that countries with strong governance institutions tend to achieve higher social progress.
Fehder et al. (2019)	SPI, GDP and Rule of Law	Global analysis	2005-2014 and 2014-2017	Both GDP per capita and Rule of Law demonstrate a strong positive relationship with the SPI.
Boulton (2021)	SPI and its dimensions on business formation and investment capital	41 countries	2014-2019	The SPI is positively and significantly related to both business formation (measured by new business registration) and the number of IPOs. Also, the relationship is stronger for emerging markets than for developed markets.
Ghazaouni & Emeagwali (2021)	SPI and business regulation (business regulation score)	More than 200 countries	2014-2018	Business regulation has a positive and significant effect on social progress.
Ouamba (2022)	SPI and self-employment	African countries	2014-2019	There is a significant negative relationship between the SPI and self-employment in Africa.
El Ghak & Bakhouche (2023)	SPI and FDI	45 countries in Africa	2011-2019	Social progress is a vital driver for foreign direct investments in Africa, enhancing a positive nexus between social progress and investment.

Source: Author's compilations from previous literature.

2.3.2 Studies on Pro-poor Growth

Numerous studies have been proposed and developed over the years to measure pro-poor growth across the world. Studies have focused on national, regional, and global levels. For instance, in national studies, Ravallion & Chen (2003) explored pro-poor growth in China from 1990 to 1999 by applying the Growth Incidence Curve (GIC) and found that growth rates ranged from 3% for the poorest percentile to 10% for the richest, with pro-poor growth at about 4%. A study by Kakwani & Son (2008) examined pro-poor growth in Brazil during the period of 1995–2005 using a new relative pro-poor growth measure (PEGR) and found that economic growth in Brazil generally favored the poor proportionally more than the non-poor (relative pro-poor growth). Other national studies include McCulloch & Baulch (1999), Grosse et al. (2008), Ichoku et al. (2012), De Silva & Sumarto (2014), Ali et al. (2017), Djossou et al. (2017), and Murjani (2022).

At the regional level, one of the most recent studies was conducted by Harmacek et al. (2017) to investigate the concept of pro-poor growth in five East African nations (Burundi, Kenya, Rwanda, Tanzania, and Uganda), using the latest data from PovcalNet and the World Bank in 2015. The authors utilized four pro-poor growth measures (PEGR, PGC, PPGI, and RPPG) to measure the extent of pro-poor growth in these countries. Their findings indicate that, although the growth observed was not pro-poor in a relative sense in most instances, it nevertheless contributed to a reduction in poverty levels. Specifically, pro-poor growth was observed only in Rwanda, where the poor benefited from growth more than the rich, and Tanzania achieved the largest reduction in poverty. Other studies at the regional level include Kakwani & Pernia (2000), Araar (2012), Malik et al. (2020), and Panek & Zwierzchowski (2022).

Similarly, there have been numerous studies at the global level to assess PPG patterns. One significant example comes from the study conducted by Son & Kakwani (2008), which performed a cross-country PPG analysis in 80 countries (all low- and middle-income) across 237 growth spells during the period 1984–2001. The authors applied a new PPG measurement that accounts for growth rate gains and losses caused by changes in consumption distribution (gains represent pro-poor growth, whereas losses indicate anti-poor growth). They found that out of all 237 growth spells, approximately 45% were pro-poor, suggesting that global growth patterns have not generally benefited the poor. Other studies at the global level include Kraay (2004), Holzmann et al. (2007), and Amini & Bianco (2016). A brief summary of some PPG studies is shown in Table 2 below.

Table 2: Examples of Other Pro-poor Growth Studies

Study	Measures	Country	Period	Results
McCulloch And Baulch (1999)	Poverty Bias of Growth (PBG)	India	1973-1989	Economic growth was pro-poor in Andhra Pradesh, whereas in Uttar Pradesh, growth was unfavorable towards the poor.
Kakwani & Pernia (2000)	PPGI	Laos, Thailand and Korea	1980-1998	Growth in Korea was strongly pro-poor, while in Laos and Thailand, it was weakly pro-poor (trickle-down).
Ichoku et al. (2012)	PGC, GIC, PPGI and PEGR	Nigeria	1996-2004	Generally, income growth in Nigeria was not pro-poor. The non-poor benefited more from economic growth than the poor.
Araar (2012)		Ecuador, Colombia, Peru, Bolivia and Venezuela	2005-2010	Generally, there was a strong statistical evidence that growth in the Andean Latin American countries was both absolutely and relatively pro-poor from 2005 to 2010.
Ali et al. (2017)	PEGR	Pakistan	2001-2012	Urban growth was pro-poor relatively but anti pro-poor absolutely, while rural growth was anti pro-poor in both terms.
Djossou et al. (2017)	GIC and NGIC	Benin	2006-2011	Generally, growth in Benin has been pro-poor, but disparities exist between rural and urban households, and among women and the elderly.
Malik et al. (2020)	GIC, PPGI and PEGR	China and India	2000-2011	Growth in China was pro-poor, while in India, it was anti-poor.
Murjani (2022)	GIC, PGC PPGI	Indonesia (South Kalimantan province)	2010-2020	From 2010 to 2016, there was trickle-down growth, favoring the rich. However, from 2016 to 2020, the growth became pro-poor.
Panek and Zwierzchowski (2022)	PEGR and RPPG	Bulgaria, Croatia, Greece, Romania, Serbia, and Slovenia	2012-2017	Economic growth was pro-poor in Croatia, Romania and Slovenia for all analyzed period. However, growth was anti pro-poor in Greece, Serbia and Bulgaria during certain periods (economic downfall).

Source: Author's compilations from previous literature

Besides the assessment of PPG mentioned above, numerous studies have focused on the determinants of PPG. For instance, Grimm et al. (2007) analyzed the determinants of pro-poor growth in eight nations, focusing on the many aspects such as regional inequality, price and policy reforms, and political economy impacting PPG. Fufa (2021) investigated the determinants of PPG in Ethiopia during 1990–2018, employing a time series regression approach, and found that job creation was significant for pro-poor growth. Other variables, such as human capital, services, and industrial growth, negatively affected the poorest, while positive effects were observed in employment and agricultural growth. Similarly, in the case of Brazil, a study conducted by Amuka et al. (2019) showed that job creation drove pro-poor growth from 1981 to 2014, while an increase in unemployment in 2015 reversed this trend.

Kappel et al. (2005) explored the determinants of PPG in Uganda, which experienced both PPG and anti-PPG, and found that good performance in agriculture significantly contributed to direct PPG in the 1990s, while decreased agricultural performance led to an increase in poverty. They also found that both public spending and taxation had limited contributions to PPG. For a poor country, another important determinant that drives growth and reduces poverty is foreign aid. Kargbo and Sen (2014) investigated the impact of different categories of foreign aid on PPG in Sierra Leone during the period 1970–2007. The authors employed the bounds test approach and cointegration for time series data analysis and found that only aid in the form of grants affects PPG, whereas aid in the form of loans and technical assistance does not have a significant impact on PPG.

In addition to some previous determinants, many studies have also investigated the relationship between PPG and other indicators. For example, Resnick and Birner (2006) explored the relationship between PPG and good governance indicators for a cross-country analysis and found that political stability and rule of law are linked to growth but have inconsistent effects on poverty reduction, whereas transparent political systems, like civil liberties and political freedom, potentially reduce poverty, but their relationship with growth is unclear. In terms of socio-economic and environmental factors, Khan et al. (2019) examined various sectors of PPG in Bolivia during 2007–2013 and revealed that the growth of the industrial and agricultural sectors was not pro-poor because of high income inequality, while the service sector enhanced the likelihood of the poor. Moreover, energy and environmental resources have had a detrimental impact on the quality of life for the poor compared to the non-poor. The authors also conclude that education and health expenditures benefited the poor and then bolstered the concept of PPG. Conversely, GDP per capita and FDI inflows escalated income inequality and

resulted in pro-rich growth. Similarly, Khan et al. (2019) explored the correlation between PPG and the sustainable development framework in Pakistan between 1975 and 2016 and employed the GMM approach. The results showed that higher economic growth reduces poverty via social reforms, whereas deforestation, under-5 mortality, trade openness, carbon emissions, and FDI inflows generally escalate poverty incidence. They also found that fossil fuel use and high population density raise carbon emissions, hindering sustainable development. Thus, implementing policies for cleaner production and increasing social spending to improve the poor's quality of life is essential.

It is also important to note that various studies on measuring PPG have focused on non-income dimensions. Some studies include Harttgen (2007), Klasen et al. (2008), and Cardozo & Grosse (2009), which measured PPG in non-income dimensions such as health and education. Furthermore, Klasen & Reimers (2017) explored PPG from the perspective of agriculture.

2.3.3 Research Gaps: The Connection between Social Progress and Pro-Poor Growth

As we have discussed above, despite extensive research on pro-poor growth and social progress in recent years, the emphasis has primarily been on measuring and analyzing these two components separately. Although numerous studies have investigated the relationship between economic growth and the Social Progress Index (SPI), and many have delved into the determinants of pro-poor growth, they have not taken social progress into account. To the best of our knowledge, no research has yet examined the relationship between social progress and pro-poor growth (PPG). The latter not only relates to economic growth but also focuses more on income distribution within a country, indicating poverty reduction and income inequality. Consequently, this study aims to bridge the existing research gap by examining the connection between social progress (measured by the SPI) and pro-poor growth (measured by the PEGR). This investigation has the potential to reveal crucial insights into whether pro-poor growth enhances social progress. Furthermore, it could offer valuable implications for socio-economic development and policy formulation, specifically in terms of poverty reduction.

As mentioned in the literature, there exists a positive and significant relationship between economic growth (measured by GDP per capita) and Social Progress Index (SPI). Consequently, a hypothetical link could exist between pro-poor growth (specifically the PEGR) and Social Progress Index (SPI) and pro-poor growth. The primary rationale is that pro-poor growth represents a nexus of poverty, inequality, and mean income growth (Kakwani & Pernia,

2000; Kakwani & Son, 2008). For example, in instances of pro-poor growth, both poverty and inequality decrease due to growth in the mean income, whereas in anti-poor (non-pro-poor) scenarios growth leads to an increase in poverty and inequality (Kakwani & Pernia, 2000). This is captured by the Poverty equivalent growth rate (PEGR) which considers both the growth rate in the mean income and the distribution or allocation of the benefits from the growth among the poor and non-poor populations (Kakwani & Son, 2008). Consequently, there could be a significant link between pro-poor growth (measured by the PEGR) and social progress (measured by SPI). The PEGR reflects the growth rate in mean income, combined with pro-poor distributional changes and poverty reduction.

Chapter Three

Data and Methodology

As discussed in the previous chapter, despite extensive studies on both PPG and the Social Progress Index (SPI), a notable gap persists in the academic literature regarding their interconnection. This chapter introduces the methodological framework employed to address the primary research question: Does a significant relationship exist between Social Progress Index (SPI) and Pro-Poor Growth (PPG)? Firstly, section 3.1 defines the research sample. Secondly, section 3.2 describes the data as well as the variables used in the study. In section 3.3, the analysis framework is finally presented.

3.1 Sample of Study

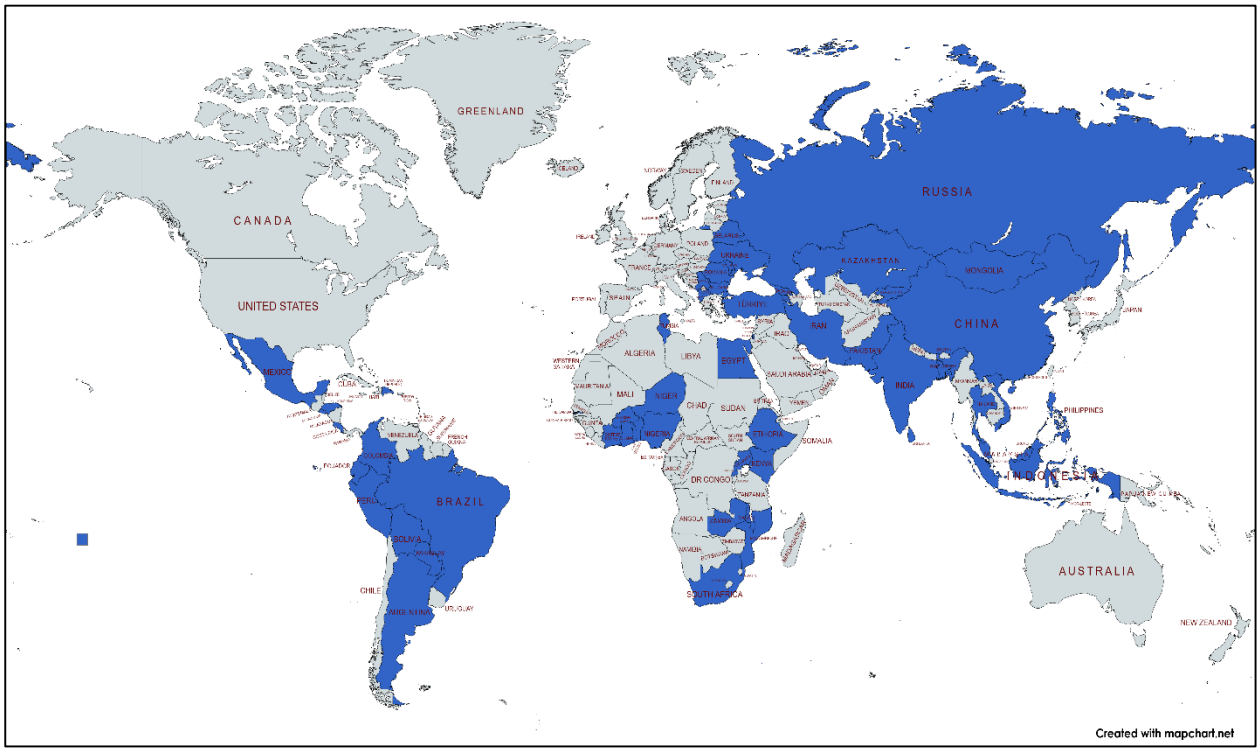
The sample of this research focuses mainly on developing countries, including low-income, lower-middle, and upper-middle-income countries according to the World Bank country classifications. As this study focuses on measuring pro-poor growth, certain developing countries were excluded primarily due to insufficient data on poverty and income distributions, as reported by the Poverty and Inequality Platform (PIP)[7] database developed by the World Bank (2023). Consequently, the study was left with 59 developing countries globally. The selected developing countries are presented in Figure 4.

According to the World Bank's PIP database, China, India, and Indonesia do not have national-level data representation, but data are available separately for rural and urban populations. Therefore, in this study, we use the rural data to represent these three countries as it may provide a better basis for pro-poor growth analysis. The selected developing countries include 9 low-income countries, 23 lower-middle-income countries, and 27 upper-middle-income countries according to the World Bank's country classifications[8] by income level (World Bank, 2022a).

[7] The Poverty and Equity Data Portal, along with PovcalNet, were replaced by the Poverty and Inequality Platform (PIP) in March 2022. The PIP is an interactive computational tool that offers access to the World Bank's data on poverty, inequality, and shared prosperity (World Bank, 2023).

[8] The country's classification was chosen based on the last year in this study, which is 2020, as our study period spans from 2010 to 2020. Therefore, Romania was still classified as an upper-middle-income country and was included in this study.

Figure 4: Countries under Study (Highlighted in Blue)



Source: Author's Computations from www.mapchart.net

3.2 Data

The study utilizes a panel dataset in which growth is examined in terms of 3 to 6-year periods, known as growth spells, during the period of 2010-2020 for 59 developing countries worldwide. However, the majority of the selected countries are observed from 2010 to 2018. This timeframe was primarily chosen due to data availability in the World Bank's PIP database. Although the panel dataset comprises growth spells in every 3 to 6 years, the majority of countries have a four-year growth spell, accounting for nearly 80% of the total growth spells. Out of the total of 59 countries, 45 have two growth spells (mostly 2010-2014 and 2014-2018), with one growth spell representing one observation, while 14 countries have only one growth spell. Consequently, the dataset of this study consists of 104 growth spells (observations) in total.

Furthermore, it should be noted that there are a few countries with two growth spells, and each spell may span different periods of years (ranging from 3 to 6 years). For example, the first growth spell for Nigeria is from 2010 to 2015 (a 5-year period), while the second growth spell is from 2015 to 2018 (a 3-year period). This occurrence is attributed to the availability of data

from the PIP database. The income and distribution data from the World Bank's PIP database, utilized to compute pro-poor growth measures, as well as the Social Progress Index (SPI) variable, are described below.

Income and pro-poor variables

All income and distribution data used in this study were taken from the latest available edition of the World Bank's PIP database. This database is constructed directly from (mostly consumption) surveys conducted at the national household level. It includes data on income distribution as well as the mean income data which are reported in 2017 PPP$ prices[9]. In this study, the PIP's national aggregated distributional data (by percentile) on income and monthly mean income (2017 PPP$) were used for the selected countries and year periods.

To calculate pro-poor growth indices, the data on income distributions were disaggregated to the household level, followed by subsequent calculations. All data processing and analysis were carried out using the Stata Statistical Software 18 (StataCorp, 2023), with the disaggregation procedures and pro-poor estimations executed through the Distributive Analysis Stata Package (DASP) developed by Araar and Duclos (2007).

Rather than employing a single poverty line for all developing countries across all income levels to estimate the PPG measures, we used different poverty lines[10] in 2017 (PPP$) prices for countries in different income groups, following the World Bank's recommendations. The World Bank suggests that the current international poverty line (IPL) only reflects the median of poverty lines in low-income countries (LICs) and might be too low to accurately measure poverty in middle-income economies (World Bank, 2022b). However, in this study, we also use a single poverty line for all selected countries for robustness checks. Regarding the pro-poor measure, the poverty equivalent growth rate (PEGR), proposed by Kakwani and Son (2008) was estimated using the DASP program in Stata for each country in each growth spell.

After generating the pro-poor growth rates (the PEGR) and the growth rates in the mean income for all 104 growth spells in 59 countries, we then annualized these figures by dividing them by the respective growth spell durations, which ranged from 3 to 6 years. This standardization aims to ensure consistency and comparability in measuring (pro-poor) growth rates across all

[9] For the September 2022 update, the World Bank's PIP dataset was expressed in 2017 PPP prices, compared to the 2011 PPP in previous editions, as price levels across the globe had increased (World Bank, 2023).
[10] In this study, we use the $2.15 a day for lower-income countries, the $3.65 a day for lower-middle-income countries, and the $6.85 a day for upper-middle-income countries.

selected developing countries. Additionally, we created a period dummy variable to capture the difference between two periods (2010-2014 and 2014-2018) to identify any significant changes over time.

Social Progress Index (SPI) variable

We use the Social Progress Index (SPI) dataset obtained from the Social Progress Imperative (2024) as the proxy for measuring social progress in all the selected countries under this study during the period of 2010-2020. To measure changes in SPI during growth spells for each selected country, we use the SPI scores ratio of the final year to a start year of a growth spell, rather than comparing the differences between the end year and the start year. After obtaining the SPI dataset from the Social Progress Imperative, we calculate the change in SPI (the ratio) for each growth spell of each country in the sample. For example, the SPI ratio for Costa Rica during the 2010-2014 growth spell is calculated as the SPI score for the end year (2014) divided by the SPI score for the start year (2010). Finally, to assess the SPI ratio on an annualized basis, we divide the SPI ratio by the number of years within each growth spell.

3.3 Analysis Framework

To investigate the relationship between social progress and pro-poor growth, we firstly computed the PPG measures, specifically the PEGR, for each growth spell of each country in the sample. Then, we calculated the SPI ratio accordingly for each growth spell. Once we generate all these variables, we investigate the relationship between the two using the following approaches:

The correlation analysis: in this study, we initially aim to explore the relationship between SPI and PEGR through the correlation analysis. We use the Pearson correlation coefficient (Pearson, 1895) to assess the linear association between the two variables. The Pearson correlation coefficient (r) can range from -1 to 1, where 0 indicates no linear association. The closer the absolute value of r is to 1, the stronger is the correlation between the two variables (Benesty et al., 2009; Schober et al., 2018).

The regression analysis: for the baseline analysis, we employ the Pooled OLS regression approach to investigate the relationship between SPI and PEGR. We use SPI as the dependent variable and PEGR as the independent variable. The main argument is that economic growth

can significantly drive social progress[11], and pro-poor growth could be understood as qualitatively different type of growth (that benefits the poor people). Similarly, we assume that the income growth combined with pro-poor distributional changes and with poverty reduction (all reflected in PEGR) could also have a considerable impact on social progress.

We therefore assume a relationship between the SPI, PEGR, and a set of unknown factors in the function as follows:

$$SPI = F(PEGR, X) \tag{3}$$

Thus, the pooled OLS regression model is expressed as follows:

$$SPIRAT_{it} = \beta_0 + \beta_1\, PEGR_{it} + \beta_2\, PERIOD_t + \beta_3\, SPISTART_{it} + \varepsilon_{it} \tag{4}$$

Where $SPIRAT_{it}$ represents the annual SPI ratio, $PEGR_{it}$ is the annual estimated rate of the PEGR (as a pro-poor growth measure), $PERIOD_t$ represents the dummy variable of the two periods (equals to 0 if the growth spell is in the first period, and equals to 1 if it is the second period), $SPISTART_{it}$ denotes the values of the SPI scores in the initial year of a growth spell, and ε_{it} is the error terms. We use the period dummy variable to control for time-specific effects, while the SPI start year values account for initial differences in the social progress (SPI) across countries.

Since the PEGR equals to the Pro-poor Growth Index (PPGI)[12] multiplied by the growth rate in the mean income, we also employ the pooled OLS regression model to examine the relationship between the SPI and the growth rate in the mean income. The reason for testing the growth rate in mean income is to compare the analysis results with the PEGR, as the two variables are highly correlated. The pooled regression is expressed in the following way:

$$SPIRAT_{it} = \beta_0 + \beta_1\, GROWTH_{it} + \beta_2\, PERIOD_t + \beta_3\, SPISTART_{it} + \varepsilon_{it} \tag{5}$$

Where $GROWTH_{it}$ represents the growth rates in the mean income.

[11] Although the mutually influential causal relationship between economic growth and social development is still debated, several studies have concluded that economic growth leads to social development, especially concerning the Human Development Index (HDI). Some notable studies include Ranis et al. (2000), Abraham & Ahmed (2011), Khan et al. (2019), and Nainggolan et al. (2022).

[12] The PPGI is a relative measure of PPG developed by Kakwani and Pernia (2000), which decomposes poverty changes into the growth effect and inequality effect. They defined relative PPG as the ratio of the growth elasticity of poverty to the neutral relative elasticity of poverty. Thus, growth is considered pro-poor (anti-poor) if the growth elasticity of poverty is larger (smaller) than the neutral relative growth elasticity of poverty (Kakwani & Son, 2008).

Since the pooled OLS model in equations (4) and (5) ignores country-specific effects, we also employ panel models which for controlling those effects. Nevertheless, we use the Breusch-Pagan Lagrange Multiplier (LM) test[13] to determine whether the pooled OLS regression model or panel models is the most appropriate for our analysis.

Application of the categorical assessment of pro-poor growth (PPG) in the regression analysis: The previous analysis only uses the PEGR values without considering whether each growth spell in a country is considered pro-poor or anti-poor. This assessment is done by comparing the PEGR values to the growth rate in the mean income, according to the standardized interpretation shown in Table 3. For example, if the growth rate in mean income is positive and less than PEGR, then there is relative pro-poor growth: the poor benefit from growth relatively more than the non-poor. If the growth rate is positive and greater than PEGR, than there is a trickle-down growth: the poor benefit from growth, but less than the rest of the society. This is a sufficient definition of the absolute pro-poor growth (poor benefit from growth, poverty reduces). Consequently, we created dummy variables to examine the effects of pro-poor growth (both in relative and absolute terms) on SPI.

Table 3: The Standardized Interpretation of the Poverty Equivalent Growth Rare (PEGR)

g>0*		The conditions for statistical significance
PEGR > g	Pro-poor growth	$PEGRlb > gub$*
PEGR < g	Trickle-down growth	$PEGRub < glb$*
PEGR < 0	Immiserizing growth	$PEGRub < 0$
g<0		
PEGR > g	Pro-poor decline[14]	$PEGRlb > gub$
PEGR > 0 > g	Strong pro-poor growth	$PEGRlb > 0 > gub$
PEGR < g	Anti-poor decline[15]	$PEGRub < glb$

Source: Harmáček (2019). *g is the growth rate in the mean income, ub is upper band, lb is lower band.

[13]The LM test determines whether using a random effects regression model or a pooled OLS regression is more appropriate. The null hypothesis (H0) in this test is that variances across entities are zero, indicating no significant difference across units or no panel effect. Thus, failing to reject the null hypothesis (H_0) suggests that pooled OLS is more appropriate (Torres-Reyna, 2007).

[14] Pro-poor decline refers to a situation in which the growth rate of the poor decreases, and poverty therefore increases. However, the incomes of the poor decline less than the incomes of the non-poor, which results in a decline of inequality between the poor and the non-poor.

[15] Anti-poor decline refers to a situation in which the growth rate of the poor decreases, and poverty therefore increases. The poor's income decrease more than that of the non-poor, which means that the inequality between the poor and the non-poor also rises.

After we interpret the PEGR measure in all 104 growth spells in 59 countries according to the above conditions, we generate two categorical variables as the following:

The first PEGR dummy variable is an ordinal variable ranging from 1 to 3. A value of 3 indicates growth spells categorized as pro-poor and strong pro-poor; a value of 2 corresponds to growth spells categorized as trickle down, and a value of 1 corresponds to PEGR in growth spells categorized as pro-poor decline, immiserizing growth, and anti-poor decline. Then, we compare the effects of the category 3 (pro-poor) and category 2 (trickle-down) against category 1 (non-pro-poor) on SPI. The pooled OLS regression model is expressed as:

$$SPIRAT_{it} = \beta_0 + \beta_1\, PEGRdummy3_{it} + \ PEGRdummy2_{it} + \beta_2\, PERIOD_t + \beta_3\, SPISTART_{it} + \varepsilon_{it} \quad (6)$$

Where $PEGRdummy3_{it}$ represents the PEGR dummy variable for the value 3, and $PEGRdummy2_{it}$ is the PEGR dummy variable for the value 2. The reference category represents non-pro-poor growth.

The second categorical variable is related to relative and absolute pro-poor growth. Relative pro-poor refers to cases when PEGR is categorized as pro-poor or strong pro-poor, while absolute pro-poor growth corresponds to cases when PEGR is categorized as pro-poor or strong pro-poor or trickle-down. We then examine both of these dummy variables against non-pro-poor growth, which occurs when PEGR is categorized as pro-poor decline, immiserizing growth, or anti-poor decline.

The pooled OLS regression for the PEGR in relative terms can be expressed as follows:

$$SPIRAT_{it} = \beta_0 + \beta_1\, PEGR\_relative_{it} + \beta_2\, PERIOD_t + \beta_3\, SPISTART_{it} + \varepsilon_{it} \quad (7)$$

Where $PEGR\_relative_{it}$ is the PEGR dummy when PEGR is pro-poor or strong pro-poor

For the PEGR in absolute terms, the pooled OLS model is expressed as follows:

$$SPIRAT_{it} = \beta_0 + \beta_1\, PEGR\_absolute_{it} + \beta_2\, PERIOD_t + \beta_3\, SPISTART_{it} + \varepsilon_{it} \quad (8)$$

Where $PEGR\_absolute_{it}$ represents the PEGR dummy when PEGR is pro-poor or strong pro-poor or trickle down.

Chapter Four

Results and Discussion

4.1 Pro-poor Growth Results

In this study, we only use the Poverty Equivalent Growth Rate (PEGR) as a measure of pro-poor growth. Firstly, it is a relative pro-poor growth measure, wherein growth is considered pro-poor when the benefits to the poor are relatively greater than the non-poor. In contrast, the absolute pro-poor growth measures, specifically the Rate of Pro-poor Growth (RPPG), do not compare the distribution of benefits from growth between the poor and the non-poor. Secondly, the PEGR not only takes into account the growth rate in the mean income but also considers the distribution of benefits from growth between the poor and the non-poor.

During the period from 2010 to 2020, across 104 growth spells in 59 developing countries, the average poverty equivalent growth rate (PEGR) stood at approximately 13.5%, or roughly 3.5% annually. The growth rate in the mean income was about 10.7%, or around 2.8% annually. We further analyzed the PEGR and growth rate in the mean income over two periods in the study as follows.

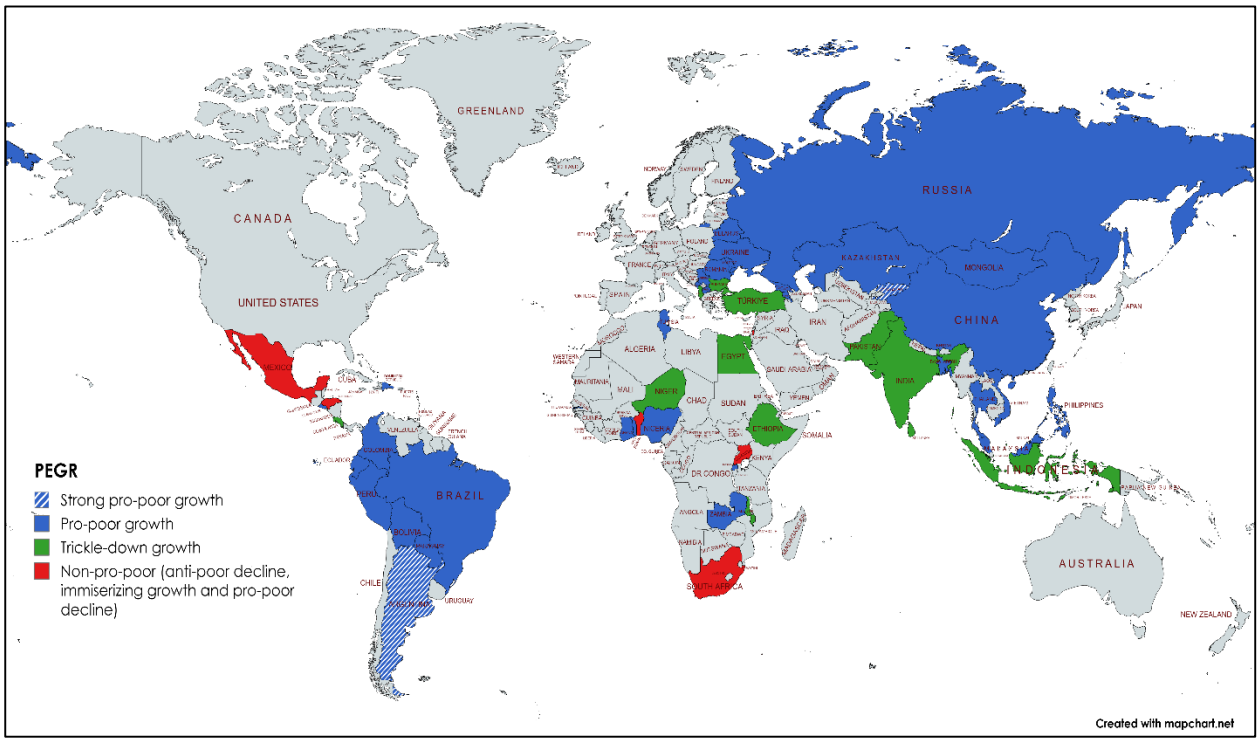
During the study's first period from 2010 to 2016, there were 53 growth spells identified. Approximately 70% of these growth spells occurred during 2010-2014. On average, the poverty equivalent growth rate (PEGR) was around 15.2% during the first growth spells (around 3.7% yearly). The highest observed rate was 72.1%, observed in rural China during 2010-2014, while the lowest was around (-10.5%), observed in Palestine during 2010-2016. In terms of the growth rate in the mean income, it was around 11.8% in the first period, equivalent to about 2.8% per year. Similarly, the highest growth rate, approximately 57.1%, was observed in rural China, while the lowest rate occurred in Honduras (-12.3%) during the same period.

It is notable that, on average, the poverty equivalent growth rate (PEGR) exceeded the growth rate in mean income during the study's first period. Each growth spell in each country needs to be individually assessed to determine whether the growth in each particular spell can be considered pro-poor.

Out of the 53 growth spells identified in 53 developing countries during the first period, 33 were considered pro-poor growth, indicating that the poor benefited from growth relatively more than the non-poor. Some countries exhibiting pro-poor growth include Brazil, Malaysia,

Peru, Ghana, and Montenegro (see Figure 5). Only two countries (two growth spells) experienced strong pro-poor growth (Argentina and Kyrgyzstan) during 2010-2014. Trickle-down growth was observed in 12 growth spells, meaning that the poor benefited from growth, but to a lesser extent than the rest of society. Some countries exhibiting trickle-down growth include Albania, Costa Rica, rural Indonesia, and Ethiopia. Only six growth spells were considered as anti-poor or non-pro-poor, which include instances of pro-poor decline, immiserizing growth, and anti-poor decline.

Figure 5: The PEGR Results for the First Period (for 53 countries)



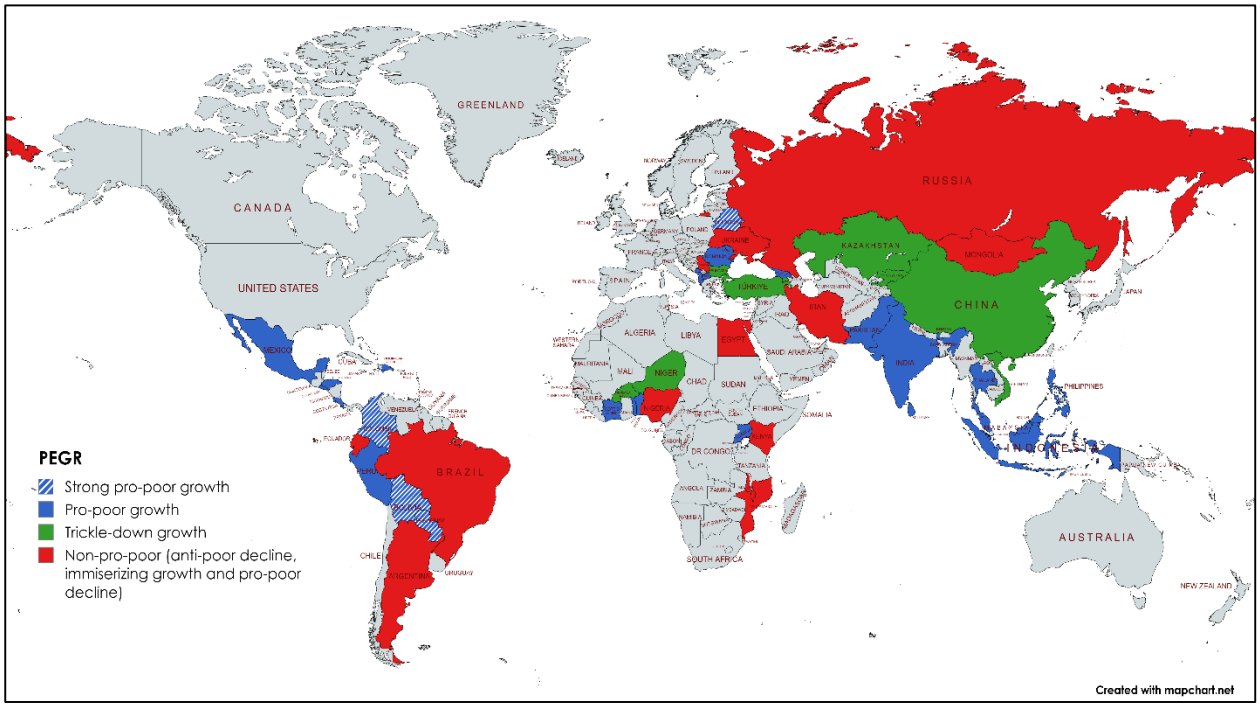
Source: Author's computations from www.mapchart.net

Regarding the second period from 2014 to 2020, 51 growth spells were identified and approximately 70% of these growth spells occurred during 2014-2018. On average, the PEGR was approximately 11.8% during the second period (about 3.4% annually), which was slightly lower than in the first period. The highest observed rate, 87%, was in Romania during 2010-2014, while the lowest was in Mozambique (-21.5%) during 2014-2019. Regarding the growth rate in the mean income, it averaged around 9.4% in the second period, equivalent to around 2.9% per year. The highest growth rate of 73.3% was observed also in Romania, and the lowest rate occurred in Mozambique (-26.7%). Similarly, on average, the PEGR was higher than the growth rate in mean income during the second period.

Out of the 51 growth spells identified in 51 developing countries during the second period, the majority of those growth spells were considered pro-poor growth, accounting for 23 countries (see Figure 6). This indicates that the poor benefited from growth relatively more than the non-poor. Five countries experienced strong pro-poor growth during 2014-2020. This figure is higher than in the first period. Trickle-down growth was observed in 9 countries, meaning that the poor benefited from growth, but less than the rest of society. Lastly, 14 countries experienced non-pro-poor growth, and this number increased considerably compared to the first period.

In addition, it is important to note that the PEGR interpretation may significantly change across growth spells for an individual country For instance, economic growth in China was considered pro-poor in the first growth spell (2010-2014), but during the second growth spell (2014-2018), trickle-down growth was observed. Similarly, economic growth in Argentina showed strong pro-poor characteristics in the first period, but exhibited an anti-poor decline in the second. Detailed results for selected countries on PEGR, growth rate in the mean income, and the pro-poor growth interpretation for each growth spell are provided in the Appendix B.

Figure 6: The PEGR Results for the Second Period (for 51 Countries)



Source: Author's computations from www.mapchart.net

4.2 Analyzing the Relationship between Social Progress Index (SPI) and Pro-poor Growth (PPG)

In this study, we first explore the relationship between SPI and pro-poor growth (as measured by the PEGR) through a correlation analysis. The descriptive statistics of the variables used in the analysis are presented in Appendix A. The Pearson correlation coefficients (*r*) for all variables are shown in Table 4. The correlation between the annualized SPI ratio and the annualized estimated rate of PEGR is 0.249, indicating a positive correlation between the two. This implies that as PEGR increases, SPI tends to increase as well (and vice versa). Moreover, the correlation is statistically significant at the 1% level. Additionally, we observe a high correlation (around 0.93) between PEGR and growth rate in mean income. This is however not surprising, since the PEGR is calculated based on the growth rate.

Table 4: Correlation Matrix

Variables	SPI	PEGR	GROWTH	SPISTART	PERIOD
SPIRAT	1.000				
PEGR	**0.249*****	1.000			
GROWTH	0.196**	0.928***	1.000		
SPISTART	0.001	0.054	0.005	1.000	

Note: SPIRAT denotes the annualized ratio of the SPI, PEGR is the annualized estimated rate of pro-poor growth, GROWTH represents the annualized rate of the growth in the mean income, SPISTART is the SPI scores of in the initial year of a growth spell; **, and *** indicate significance at 5% and 1% levels, respectively.

Source: Author's calculation. (See the Appendix C).

In addition to the simple correlation analysis, we delve into the relationship between SPI and PEGR through regression approaches. Before selecting the most appropriate regression model, we initially apply the Breusch-Pagan Lagrange multiplier (LM) test to determine whether the pooled OLS model or panel models such as random effects and fixed effects are the most appropriate for our analysis. The results of the LM test reveal that we cannot reject the null hypothesis (see the Appendix). This indicates that there is no significant difference across units or no panel effect; thus, the pooled OLS model is preferred over the panel models (Torres-Reyna, 2007). Table 5 presents the estimates of the pooled OLS regression model, aiming to examine the relationship further.

The results of the pooled OLS regression indicate a positive relationship between the annualized estimated rate of the poverty equivalent growth rate (PEGR) and the annualized SPI

ratio. This association is statistically significant at the 1% level, suggesting that as the annualized rate of PEGR increases, the annualized SPI ratio tends to increase as well. Thus, this association implies that higher pro-poor growth (as measured by PEGR) is linked to improvements in social progress (as measured by SPI). These results suggest that there is a significant relationship between these two aspects. However, determining a causal effect remains unclear, as both SPI and pro-poor growth could potentially exhibit a mutual causal relationship.

The period dummy variable demonstrates a significant positive association with the SPI ratio, meaning that the annualized SPI ratio tends to be higher in the second period compared to the first period. This indicates that there is a time-specific effect for assessing changes in the SPI. Lastly, SPI scores in the initial year of a growth spell exhibit a negative relationship with the annual SPI ratio, which could mean that countries with initially higher SPI score increased SPI less in the subsequent growth spell. However, the association is not statistically significant.

In diagnostic tests, we also investigate the presence of heteroskedasticity and multicollinearity. The results indicate the absence of both heteroskedasticity and multicollinearity issues in the regression models (see the Appendix C).

Table 5: Results of Pooled OLS Regression for the Relationship between the SPI and PEGR

Dependent variable: SPIRAT				
Variable	Coefficient	Std. Error	t-Statistics	P-value
PEGR	0.2178***	0.0763	2.85	0.006
PERIOD	0.0245***	0.0076	3.24	0.002
SPISTART	-0.0002	0.0004	-0.51	0.615
Constant	0.2567***	0.0234	10.96	0.000
R-squared (R^2)	0.1554			
F-statistics	6.14***			
Nº of obs.	104			

Note: SPIRAT is the annualized SPI ratio, PEGR is the annualized estimated rate of pro-poor growth, PERIOD is the dummy variable for the periods (first period = 0, second period =1) and SPISTART is the SPI scores in the initial year of a growth spell; *** indicate significance at 1% level; standard errors are adjusted for 59 clusters in country (robust standard errors).

Source: Author's calculation. The regression results are presented in the Appendix C.

As discussed in Section 3.3, we also aim to examine the relationship between SPI and the growth rate in the mean income. Then, we can compare these results with those obtained from the PEGR analysis, given its calculation is based on the growth rate. The main reason is that

we aim to explore the effects of solely the growth rate in mean income compared to the PEGR, which considers both the growth rate in mean income and the distribution of growth between the poor and non-poor. The results of the pooled OLS are presented in Table 6.

The results of the pooled OLS regression reveal a significant positive relationship between the annual growth rates in the mean income and the annualized SPI ratio, and the association is significant at the 5% level. This indicates a link between higher growth rates in the mean income and improvements in social progress. However, it is important to note that the coefficient of the growth rate in the mean income is slightly lower than the coefficient of the growth rate of the PEGR. This shows that the PEGR has a stronger effect on the SPI compared to the growth rate in the mean income.

This finding underscores the significance for developing countries to prioritize maximizing the PEGR over solely focusing on the growth rate in mean income. This is because the PEGR accounts for both the growth rate and the distribution of its benefits among the poor and non-poor populations, which takes into account the poverty and inequality components. Therefore, if developing countries aim to improve social progress, it is beneficial to focus on enhancing the PEGR as well. In terms of poverty reduction, Kakwani & Son (2008) suggested that to achieve maximum poverty reduction, it is important to improve both growth and the distribution of benefits from growth between the poor and the non-poor.

Table 6: Results of Pooled OLS Regression for the Relationship between the SPI and the Growth Rate in the Mean Income

Dependent variable: SPIRAT				
Variable	Coefficient	Std. Error[a]	t-Statistics	P-value
GROWTH	0.1844**	0.0884	2.09	0.041
PERIOD	0.0241***	0.0077	3.14	0.003
SPISTART	-0.0002	0.0004	-0.36	0.723
Constant	0.2564***	0.0234	10.95	0.000
R-squared (R^2)	0.1285			
F-statistics	5.56***			
Nº of obs.	104			

Note: GROWTH is the annualized rate of the growth in the mean income; **, and *** indicate significance at 5% and 1% levels, respectively; standard errors are adjusted for 59 clusters in country.

Source: Author's calculation. (See the Appendix C).

4.3 Pro-poor Growth Assessment and its Relationship with SPI

The analytical approaches in the previous section only use PEGR values without considering whether each growth spell in a country is categorized as pro-poor or non-pro-poor. Consequently, we lack insight into how pro-poor growth affects SPI compared to non-pro-poor growth. As discussed in the analytical framework section (section 3.3), we examine the impacts of growth classified as pro-poor on SPI using two categorical variables.

The first categorical variable generally compares pro-poor growth to trickle-down growth and non-pro-poor growth. The pooled OLS results for this analysis are presented in Table 7. The findings indicate that growth considered pro-poor in relative terms is associated with a higher annualized SPI ratio compared to non-pro-poor growth, and this result is significant at the 5% level. This suggests that countries experiencing relative pro-poor growth tend to have a higher SPI dynamics compared to those with non-pro-poor growth.

Furthermore, the results also indicate that there is no significant difference in the SPI ratio between trickle-down growth (i.e., weak absolute pro-poor growth) and non-pro-poor changes. Similarly, no significant difference in the SPI ratio was found between relative pro-poor growth and weak absolute (trickle-down) growth (see the Appendix). This suggests that relative pro-poor growth is associated with higher dynamics in social progress, emphasizing its importance for improving societal well-being, specifically in developing countries.

Table 7: Results of Pooled OLS Regression for the First (Pro-poor) Categorical Variable on SPI

Variable	Coefficient	Std. Error	t-Statistics	Prob.
PPG_dummy3	0.0213**	0.0102	2.08	0.042
PPG_dummy2	0.0115	0.0115	1.00	0.323
PERIOD	0.0269***	0.0077	3.51	0.001
SPISTART	-0.0003	0.0004	-0.68	0.499
Constant	0.2529***	0.0257	9.84	0.000
R-squared (R^2)	0.1282			
F-statistics	4.09***			
Nº of obs.	104			

Note: PPG_dummy3 represents growth spells categorized as pro-poor and strong pro-poor, PPG_dummy2 denotes the growth spells categorized as trickle-down, and the reference group (PPG_dummy1) denotes the growth spells categorized as non-pro-poor (which includes anti-poor decline, immiserizing growth and pro-poor decline); **, and *** indicate significance at 5% and 1% levels, respectively; standard errors are adjusted for 59 clusters in country (robust standard errors).

Source: Author's calculation. (See the Appendix C).

In the second analysis, we aim to compare the effects of the relative pro-poor growth, and the absolute pro-poor growth against non-pro-poor growth on the annualized SPI ratio. The results of the pooled OLS regression for the relative and absolute pro-poor growth are presented in Table 8 and Table 9, respectively.

Regarding the relative pro-poor growth, the pooled OLS regression reveals a positive association between the pro-poor growth dummy and the SPI ratio. This means that relative pro-poor growth is associated with a higher annualized SPI ratio when compared to non-relative pro-poor growth (including trickle-down growth and non-pro-poor growth). This association is statistically significant at the 10% level and it suggests that countries with relative pro-poor growth have higher social progress dynamics, as measured by the annualized SPI ratio.

Table 8: Results of Pooled OLS Regression for the Relative PEGR Pro-poor Growth on the SPI

Variable	Coefficient	Std. Error	t-Statistics	P-value
PEGR_relative	0.0152*	0.0079	1.92	0.060
PERIOD	0.0257***	0.0081	3.19	0.002
SPISTART	-0.0003	0.0004	-0.65	0.515
Constant	0.2593***	0.0247	10.49	0.000
R-squared (R^2)	0.1202			
F-statistics	3.56**			
Nº of obs.	104			

Note: PEGR_relative represents the PEGR dummy when PEGR is pro-poor or strong pro-poor.

*, **, and *** indicate significance at 10%, 5% and 1% levels, respectively; standard errors are adjusted for 59 clusters in country (robust standard errors).

Source: Author's calculation. (See the Appendix C).

Regarding the absolute pro-poor growth, the pooled OLS regression indicates that absolute pro-poor growth (which includes pro-poor growth, strong pro-poor growth, and trickle-down growth) is associated with a higher annualized SPI ratio compared to non-pro-poor growth (pro-poor decline, immiserizing growth, and anti-poor decline). This association is statistically significant at the 10% level (p-value = 0.061), suggesting that countries with absolute pro-poor growth have higher social progress dynamics, as measured by the annualized SPI ratio (when compared to countries with non-pro-poor growth).

Table 9: Results of the Pooled OLS Regression for the Absolute PEGR Pro-poor Growth on the SPI

Variable	Coefficient	Std. Error	t-Statistics	P-value
PEGR_absolute	0.0187*	0.0097	1.91	0.061
PERIOD	0.0269***	0.0077	3.48	0.001
SPISTART	-0.0002	0.0004	-0.56	0.579
Constant	0.2499***	0.0251	9.94	0.000
R-squared (R^2)	0.1193			
F-statistics	5.02**			
Nº of obs.	104			

Note: PEGR_absolute denotes the PEGR dummy when PEGR is pro-poor or strong pro-poor or trickle-down; *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively; standard errors are adjusted for 59 clusters in country (robust standard errors).

Source: Author's calculation. (See the Appendix C).

Our results suggest that both relative and absolute pro-poor growth are associated with a higher annual SPI ratio compared to non-pro-poor growth. Therefore, it is more important and beneficial for developing countries to prioritize pro-poor growth since not only it results in higher income growth but also simultaneously reduces poverty and inequality between the poor and non-poor. More importantly, it seems that countries experiencing pro-poor growth, both in relative and absolute terms, are also socially progressing at a faster pace compared to countries with non-pro-poor growth.

4.4 Robustness Checks

Although we suggest that there is a statistical association between the SPI dynamics and PEGR from the baseline analysis, in this section, we also employ a single poverty line ($3.65 poverty line[16] per day) for all selected developing countries, regardless of income levels, to estimate the PEGR as a pro-poor growth measure. This approach is taken because PEGR values vary with different poverty lines. The primary purpose of this robustness check is to test whether the main results, specifically the relationship between SPI and PEGR, remain unchanged if we use a single poverty line for all countries to calculate pro-poor growth measures, instead of using different poverty lines for different income groups.

[16] The poverty line of $3.65 per day was used for the PEGR calculation in this study's robustness checks because the global poverty line of $2.15 per day is too low for most of the upper middle-income countries, while $6.85 per day is too high for the low-income countries.

Correlation results: Similar to the main (baseline) correlation result, the Pearson correlation between the annualized SPI ratio and the annualized estimated rate of PEGR remains positive (0.255) and remains statistically significant at the 1% level (see the Appendix).

Regression results: Similar results are obtained even when we use a single poverty line for all countries. The results of the pooled OLS regression for the relationship between the annualized SPI ratio and annualized rate of PEGR is shown in Table 8. The results indicate that PEGR remains positively associated with SPI, although the coefficient is slightly lower, but it remains highly significant at the 1% level. This suggests that there is a significant positive relationship between the SPI ratio and PEGR, i.e., as PEGR increases, SPI tends to increase more as well.

Pro-poor Growth assessment and its relationship with SPI: Although a positive relationship between SPI and PEGR is confirmed, comparing the effects of pro-poor growth versus non-pro-poor growth on SPI reveals different findings. The results indicate that while the coefficients of the two categorical variables remain positive when a single poverty line is used for all countries, they become statistically insignificant (see Appendix D). This suggests that there is no significant difference between the effects of pro-poor growth and non-pro-poor growth on social progress when a single poverty line is applied across all developing countries.

Table 10: Results of Pooled OLS Regression for the Relationship between SPI and PEGR (for the Robustness Check)

Dependent variable: SPIRAT				
Variable	Coefficient	Std. Error	t-Statistics	P-value
PEGR	0.2142***	0.0756	2.83	0.006
PERIOD	0.0246***	0.0075	3.25	0.002
SPISTART	-0.0002	0.0004	-0.47	0.643
Constant	0.2558***	0.0233	10.95	0.000
R-squared (R^2)	0.1588			
F-statistics	5.85***			
Nº of obs.	104			

Note: SPIRAT is the annualized SPI ratio, PEGR is the annualized estimated rate of pro-poor growth, PERIOD is the dummy variable for the periods (first period = 0, second period =1) and SPISTART is the SPI scores in the initial year of a growth spell; *** indicate significance at 1% level; standard errors are adjusted for 59 clusters in country (robust standard errors).

Source: Author's calculation. (See the Appendix D).

Chapter Five

Conclusion

To answer our research question of examining the relationship between social progress and pro-poor growth in developing countries from 2010 to 2020, we analyzed and calculated one relative pro-poor growth measure called the Poverty equivalent growth rate (PEGR) across 59 developing countries globally. Different poverty lines, as recommended by the World Bank for various country income groups, were used in this calculation, serving as the baseline for the study's analysis. Subsequently, the study examined the relationship between the SPI and PEGR through a regression analysis technique.

According to the PEGR standardized interpretation, the results showed that the majority of the growth spells analyzed (56 out of 104 growth spells, around 54%) were considered pro-poor. This suggests that the poor benefited from the growth relatively more than the non-poor. Trickle-down growth accounted for around 20% of all 104 growth spells analyzed, while approximately 26% of the growth spells exhibited non-pro-poor growth, which include instances of pro-poor decline, immiserizing growth, and anti-poor decline.

The baseline empirical findings revealed a positive relationship between social progress (as measured by the annualized SPI ratio) and pro-poor growth (as measured by the annualized PEGR). This association was statistically significant at the 1% level, suggesting that as the annualized rate of PEGR increases, the annualized SPI ratio tends to rise as well. Notably, the finding indicated that a one percentage point increase in the PEGR annualized rate was associated with a 0.22 unit increase in the annualized SPI ratio. Thus, this study suggested a significant relationship between the two components, as greater pro-poor growth (measured by PEGR) correlates with enhancement in social progress (measured by SPI).

Furthermore, this research found that growth classified as pro-poor was linked to a higher SPI growth (when compared to non-pro-poor growth), and this association was statistically significant at the 5% level. Similarly, when comparing the impacts on the SPI ratio of growth classified solely as relative pro-poor or absolute pro-poor (against non-pro-poor growth), the findings revealed that both types of pro-poor growth were associated with higher SPI ratio. This study suggested and recommended that prioritizing pro-poor growth in developing countries may lead to enhancements and improvements in social progress.

The positive relationship between the PEGR and SPI remained highly significant even when using a single poverty line for all countries in our robustness check analysis. Consequently,

this study confirmed a significantly positive relationship between pro-poor growth and social progress in the case of developing countries. However, the relationship was only confirmed in terms of association; the causal effect remains unclear since both SPI and pro-poor growth could potentially exhibit a mutual causal relationship.

Despite these significant findings, this study has several limitations. First, many developing countries, particularly in Africa and Asia, were excluded from the analysis due to data unavailability in the World Bank's PIP database. Therefore, future studies should also confirm the main findings of this research by including a broader range of countries, which could provide deeper insights into the connection between social progress and pro-poor growth. Second, this study solely relies on the PEGR as a measure of pro-poor growth. Thus, it is recommended for future research to explore other pro-poor growth measures to assess their impacts on social progress. Lastly, as this is the first study to examine the relationship between social progress and pro-poor growth, it would be valuable to investigate the causal relationship between these two dimensions using other advanced econometric approaches such as time series analysis and Granger causality tests.

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Appendix.

Appendix A.

Descriptive Statistics of Variables Used in the Study

	SPIRAT	PEGR	GROWTH	SPISATRT
Nº observations	104	104	104	104
Mean	0.26	0.03	0.027	59.9
Median	0.25	0.03	0.022	63.85
Std. deviation	0.04	0.04	0.044	10.53
Variance	0.002	0.002	0.002	110.95
Maximum	0.36	-0.04	0.222	75.53
Minimum	0.17	0.23	-0.057	37.79
Skewness	0.71	1.98	1.878	-0.77
Kurtosis	3.87	8.36	8.27	2.37

Note: SPIRAT is the annualized SPI ratio, PEGR is the annualized estimated rate of pro-poor growth, GROWTH is the annualized rate of the growth in the mean income, and SPISTART is the SPI score in the initial year of a growth spell

Appendix B.

Pro-poor growth measure (PEGR), Mean Income Growth, and SPI per Country per Growth Spell

Country	Start Year	End Year	Year Diff	Poverty Line	Growth	Growth (annual)	PEGR	PEGR (Interpretation)	PEGR (annual)	SPI (start year)	SPI (end year)	SPIRAT	SPIRAT (annual)
Albania	2012	2016	4	6.85	0.318	0.079	0.187	Trickle-down	0.047	65.69	68.93	1.049	0.262
	2016	2020	4	6.85	0.113	0.028	0.240	Pro-poor growth	0.060	68.93	70.68	1.025	0.256
Argentina	2010	2014	4	6.85	-0.009	-0.002	0.099	Strong pro-poor	0.025	73.81	75.53	1.023	0.256
	2014	2018	4	6.85	-0.006	-0.001	-0.027	Anti-poor decline	-0.007	75.53	76.09	1.007	0.252
Armenia	2010	2014	4	6.85	0.125	0.031	0.137	Pro-poor growth	0.034	65.70	68.91	1.049	0.262
	2014	2018	4	6.85	0.098	0.024	0.033	Trickle-down	0.008	68.91	72.40	1.051	0.263
Bangladesh	2010	2016	6	3.65	0.096	0.016	0.099	Pro-poor growth	0.016	45.49	51.28	1.127	0.188
Belarus	2010	2014	4	6.85	0.332	0.083	0.369	Pro-poor growth	0.092	67.37	70.18	1.042	0.260
	2014	2018	4	6.85	-0.041	-0.010	0.069	Strong pro-poor	0.017	70.18	73.08	1.041	0.260
Benin	2011	2015	4	3.65	0.003	0.001	-0.015	Immiserizing	-0.004	46.51	47.74	1.026	0.257
	2015	2018	3	3.65	0.551	0.184	0.626	Pro-poor growth	0.209	47.74	48.57	1.017	0.339
Bolivia	2011	2015	4	3.65	0.094	0.023	0.125	Pro-poor growth	0.031	59.29	62.40	1.052	0.263
	2015	2019	4	3.65	-0.011	-0.003	0.295	Strong pro-poor	0.074	62.40	63.36	1.015	0.254
Brazil	2011	2015	4	6.85	0.108	0.027	0.146	Pro-poor growth	0.036	69.07	70.50	1.021	0.255
	2015	2019	4	6.85	0.038	0.009	-0.032	Immiserizing	-0.008	70.50	68.72	0.975	0.244
Bulgaria	2010	2014	4	6.85	0.159	0.040	0.152	Trickle-down	0.038	72.06	72.81	1.010	0.253
	2014	2018	4	6.85	0.316	0.079	0.258	Trickle-down	0.064	72.81	75.43	1.036	0.259
Burkina Faso	2014	2018	4	2.15	0.307	0.077	0.124	Trickle-down	0.031	42.20	46.46	1.101	0.275
China	2010	2014	4	6.85	0.571	0.143	0.721	Pro-poor growth	0.180	58.28	61.61	1.057	0.264
	2014	2018	4	6.85	0.327	0.082	0.328	Trickle-down	0.082	61.61	64.80	1.052	0.263
Colombia	2010	2014	4	6.85	0.157	0.039	0.222	Pro-poor growth	0.055	64.85	67.56	1.042	0.260
Colombia	2014	2018	4	6.85	-0.026	-0.007	0.035	Strong pro-poor	0.009	67.56	68.59	1.015	0.254
	2010	2014	4	6.85	0.073	0.018	0.018	Trickle-down	0.005	73.51	76.33	1.038	0.260

Country	Start Year	End Year	Year Diff	Poverty Line	Growth	Growth (annual)	PEGR	PEGR (Interpretation)	PEGR (annual)	SPI (start year)	SPI (end year)	SPIRAT	SPIRAT (annual)
Costa Rica	2014	2018	4	6.85	0.031	0.008	0.051	Pro-poor growth	0.013	76.33	77.72	1.018	0.255
Côte d'Ivoire	2015	2018	3	3.65	0.440	0.147	0.516	Pro-poor growth	0.172	45.95	48.02	1.045	0.348
Dominican Republic	2010	2014	4	6.85	0.087	0.022	0.192	Pro-poor growth	0.048	62.78	64.03	1.020	0.255
	2014	2018	4	6.85	0.222	0.055	0.307	Pro-poor growth	0.077	64.03	65.91	1.029	0.257
Ecuador	2010	2014	4	6.85	0.152	0.038	0.273	Pro-poor growth	0.068	64.79	68.04	1.050	0.263
	2014	2018	4	6.85	0.012	0.003	-0.007	Immiserizing	-0.002	68.04	70.30	1.033	0.258
Egypt	2012	2015	3	3.65	0.084	0.028	0.010	Trickle-down	0.003	55.11	54.86	0.995	0.332
	2015	2019	4	3.65	-0.068	-0.017	-0.078	Anti-poor decline	-0.020	54.86	58.25	1.062	0.265
El Salvador	2010	2014	4	3.65	0.088	0.022	0.197	Pro-poor growth	0.049	59.78	62.11	1.039	0.260
	2014	2018	4	3.65	0.120	0.030	0.178	Pro-poor growth	0.045	62.11	63.05	1.015	0.254
Ethiopia	2010	2015	5	2.15	0.105	0.021	0.056	Trickle-down	0.011	35.13	39.92	1.136	0.227
Gambia	2010	2015	5	2.15	0.153	0.031	0.344	Pro-poor growth	0.069	41.55	44.30	1.066	0.213
	2015	2020	5	2.15	-0.003	-0.001	-0.105	Anti-poor decline	-0.021	44.30	50.42	1.138	0.228
Georgia	2010	2014	4	6.85	0.275	0.069	0.286	Pro-poor growth	0.071	65.52	68.90	1.052	0.263
	2014	2018	4	6.85	0.027	0.007	0.049	Pro-poor growth	0.012	68.90	72.11	1.047	0.262
Ghana	2012	2016	4	3.65	0.051	0.013	0.058	Pro-poor growth	0.014	54.13	56.71	1.048	0.262
Honduras	2010	2014	4	3.65	-0.123	-0.031	-0.030	Pro-poor decline	-0.007	55.29	56.19	1.016	0.254
	2014	2018	4	3.65	0.023	0.006	0.055	Pro-poor growth	0.014	56.19	58.52	1.041	0.260
India	2011	2015	4	3.65	0.059	0.015	0.051	Trickle-down	0.013	50.30	54.11	1.076	0.269
	2015	2019	4	3.65	0.215	0.054	0.264	Pro-poor growth	0.066	54.11	57.62	1.065	0.266
Indonesia	2010	2014	4	3.65	0.231	0.058	0.227	Trickle-down	0.057	59.32	62.32	1.051	0.263
	2014	2018	4	3.65	0.250	0.063	0.254	Pro-poor growth	0.064	62.32	65.53	1.052	0.263
Iran	2014	2018	4	3.65	0.063	0.016	-0.009	Immiserizing	-0.002	59.71	61.97	1.038	0.259
Kazakhstan	2010	2014	4	6.85	0.237	0.059	0.255	Pro-poor growth	0.064	64.17	66.27	1.033	0.258
	2014	2018	4	6.85	0.012	0.003	0.008	Trickle-down	0.002	66.27	68.49	1.033	0.258
Kenya	2015	2020	5	3.65	-0.175	-0.035	-0.157	Pro-poor growth	-0.031	50.93	53.33	1.047	0.209

Country	Start Year	End Year	Year Diff	Poverty Line	Growth	Growth (annual)	PEGR	PEGR (Interpretation)	PEGR (annual)	SPI (start year)	SPI (end year)	SPIRAT	SPIRAT (annual)
Kyrgyzstan	2010	2014	4	3.65	-0.008	-0.002	0.065	Strong pro-poor	0.016	61.54	64.23	1.044	0.261
	2014	2018	4	3.65	0.079	0.020	0.068	Trickle-down	0.017	64.23	67.44	1.050	0.262
Malawi	2010	2016	6	2.15	0.099	0.017	0.054	Trickle-down	0.009	42.51	46.12	1.085	0.181
	2016	2019	3	2.15	-0.172	-0.057	-0.075	Pro-poor decline	-0.025	46.12	47.74	1.035	0.345
Malaysia	2011	2015	4	6.85	0.267	0.067	0.359	Pro-poor growth	0.090	68.32	68.56	1.004	0.251
	2015	2018	3	6.85	0.117	0.039	0.118	Pro-poor growth	0.039	68.56	72.37	1.056	0.352
Maldives	2016	2019	3	6.85	-0.039	-0.013	0.094	Strong pro-poor	0.031	62.33	67.93	1.090	0.363
Mexico	2010	2014	4	6.85	0.030	0.007	-0.004	Immiserizing	-0.001	64.77	66.38	1.025	0.256
	2014	2018	4	6.85	0.094	0.023	0.141	Pro-poor growth	0.035	66.38	68.48	1.032	0.258
Moldova	2010	2014	4	6.85	0.045	0.011	0.149	Pro-poor growth	0.037	65.01	68.56	1.055	0.264
	2014	2018	4	6.85	0.042	0.011	0.082	Pro-poor growth	0.020	68.56	69.76	1.018	0.254
Mongolia	2010	2014	4	3.65	0.320	0.080	0.347	Pro-poor growth	0.087	61.66	64.12	1.040	0.260
	2014	2018	4	3.65	-0.120	-0.030	-0.133	Anti-poor decline	-0.033	64.12	66.07	1.030	0.258
Montenegro	2012	2015	3	6.85	0.041	0.014	0.149	Pro-poor growth	0.050	70.76	72.09	1.019	0.340
	2015	2018	3	6.85	0.047	0.016	0.122	Pro-poor growth	0.041	72.09	72.86	1.011	0.337
Mozambique	2014	2019	5	2.15	-0.267	-0.053	-0.216	Pro-poor decline	-0.043	42.95	45.02	1.048	0.210
Niger	2011	2014	3	2.15	0.101	0.034	0.097	Trickle-down	0.032	37.79	38.25	1.012	0.337
	2014	2018	4	2.15	0.117	0.029	0.049	Trickle-down	0.012	38.25	39.01	1.020	0.255
Nigeria	2010	2015	5	3.65	0.051	0.010	0.052	Pro-poor growth	0.010	38.71	43.45	1.122	0.224
	2015	2018	3	3.65	-0.006	-0.002	-0.003	Pro-poor decline	-0.001	43.45	45.82	1.055	0.352
North Macedonia	2010	2014	4	6.85	0.107	0.027	0.193	Pro-poor growth	0.048	65.94	67.11	1.018	0.254
	2014	2018	4	6.85	0.182	0.046	0.232	Pro-poor growth	0.058	67.11	69.59	1.037	0.259
Pakistan	2010	2015	5	3.65	0.192	0.038	0.146	Trickle-down	0.029	42.33	44.44	1.050	0.210
	2015	2018	3	3.65	-0.027	-0.009	0.002	Pro-poor growth	0.001	44.44	48.30	1.087	0.362
Palestine	2010	2016	6	3.65	-0.033	-0.006	-0.105	Anti-poor decline	-0.017	60.55	63.24	1.044	0.174
Paraguay	2010	2014	4	6.85	0.304	0.076	0.334	Pro-poor growth	0.083	62.17	64.12	1.031	0.258

Country	Start Year	End Year	Year Diff	Poverty Line	Growth	Growth (annual)	PEGR	PEGR (Interpretation)	PEGR (annual)	SPI (start year)	SPI (end year)	SPIRAT	SPIRAT (annual)
	2014	2018	4	6.85	-0.044	-0.011	0.103	Strong pro-poor	0.026	64.12	67.16	1.047	0.262
Peru	2010	2014	4	6.85	0.107	0.027	0.167	Pro-poor growth	0.042	63.16	66.30	1.050	0.262
	2014	2018	4	6.85	0.055	0.014	0.075	Pro-poor growth	0.019	66.30	68.59	1.035	0.259
Philippines	2012	2015	3	3.65	0.088	0.029	0.156	Pro-poor growth	0.052	63.68	65.36	1.026	0.342
	2015	2018	3	3.65	0.103	0.034	0.181	Pro-poor growth	0.060	65.36	66.45	1.017	0.339
Romania	2010	2014	4	6.85	-0.014	-0.004	0.000	Pro-poor growth	0.000	71.52	73.00	1.021	0.255
	2014	2018	4	6.85	0.733	0.183	0.870	Pro-poor growth	0.217	73.00	74.79	1.025	0.256
Russia	2010	2014	4	6.85	0.097	0.024	0.131	Pro-poor growth	0.033	65.41	67.65	1.034	0.259
	2014	2018	4	6.85	-0.092	-0.023	-0.009	Pro-poor decline	-0.002	67.65	69.68	1.030	0.258
Rwanda	2010	2016	6	2.15	0.061	0.010	0.134	Pro-poor growth	0.022	42.30	47.48	1.122	0.187
Serbia	2010	2015	5	6.85	0.118	0.024	0.155	Pro-poor growth	0.031	68.64	72.18	1.052	0.210
	2015	2019	4	6.85	0.017	0.004	-0.070	Immiserizing	-0.018	72.18	74.88	1.037	0.259
South Africa	2010	2014	4	6.85	-0.059	-0.015	-0.025	Pro-poor decline	-0.006	60.06	64.05	1.066	0.267
Sri Lanka	2012	2016	4	3.65	0.152	0.038	0.131	Trickle-down	0.033	61.91	66.89	1.080	0.270
	2016	2019	3	3.65	0.020	0.007	0.056	Pro-poor growth	0.019	66.89	68.65	1.026	0.342
Thailand	2010	2014	4	6.85	0.110	0.027	0.168	Pro-poor growth	0.042	66.10	67.05	1.014	0.254
	2014	2018	4	6.85	0.047	0.012	0.068	Pro-poor growth	0.017	67.05	68.06	1.015	0.254
Togo	2011	2015	4	2.15	0.025	0.006	0.111	Pro-poor growth	0.028	40.43	44.33	1.096	0.274
	2015	2018	3	2.15	0.666	0.222	0.702	Pro-poor growth	0.234	44.33	47.09	1.062	0.354
Tunisia	2010	2016	6	3.65	0.181	0.030	0.345	Pro-poor growth	0.057	60.67	66.25	1.092	0.182
Turkiye	2010	2014	4	6.85	0.235	0.059	0.224	Trickle-down	0.056	64.85	67.41	1.039	0.260
	2014	2018	4	6.85	0.092	0.023	0.061	Trickle-down	0.015	67.41	66.79	0.991	0.248
Uganda	2012	2016	4	2.15	-0.038	-0.010	-0.075	Anti-poor decline	-0.019	41.61	42.87	1.030	0.258
	2016	2019	3	2.15	-0.008	-0.003	0.009	Pro-poor growth	0.003	42.87	44.52	1.038	0.346
Ukraine	2010	2014	4	3.65	0.100	0.025	0.119	Pro-poor growth	0.030	66.16	66.65	1.007	0.252
	2014	2018	4	3.65	0.047	0.012	-0.013	Immiserizing	-0.003	66.65	69.86	1.048	0.262
Vietnam	2010	2014	4	3.65	0.089	0.022	0.165	Pro-poor growth	0.041	61.09	64.20	1.051	0.263

Country	Start Year	End Year	Year Diff	Poverty Line	Growth	Growth (annual)	PEGR	PEGR (Interpretation)	PEGR (annual)	SPI (start year)	SPI (end year)	SPIRAT	SPIRAT (annual)
Vietnam	2014	2018	4	3.65	0.285	0.071	0.229	Trickle-down	0.057	64.20	67.53	1.052	0.263
Zambia	2010	2015	5	3.65	0.110	0.022	0.111	Pro-poor growth	0.019	41.67	46.36	1.113	0.223

Note: "Growth" represents the growth rate in mean income, "PEGR" is the annualized estimated rate of a relative pro-poor growth measure, "PEGR (Interpretation)" represents the standardized interpretation of PEGR, "SPI (start year)" is the SPI score in the initial year of a growth spell, and "SPI (end year)" is the SPI score in the last year of a growth spell. "SPIRAT" denotes the annualized ratio of the SPI; the (annual) variables were calculated by dividing each corresponding variable by the number of years in a growth spell (or the year difference).

Appendix C.

Stata Outputs (for the Baseline Analysis)

Figure C1. *The correlation matrix*

```
. pwcorr SPIRAT PEGR GROWTH SPISTART, sig
```

	SPIRAT	PEGR	GROWTH	SPISTART
SPIRAT	1.0000			
PEGR	0.2494	1.0000		
	0.0107			
GROWTH	0.1958	0.9281	1.0000	
	0.0464	0.0000		
SPISTART	0.0007	0.0539	0.0052	1.0000
	0.9943	0.5870	0.9585	

Note: the figure under the Pearson coefficient represents the p-value

Figure C2: *Pooled OLS output (for the relationship between SPI and PEGR)*

```
. regress SPIRAT PEGR PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       6.14
                                                Prob > F          =     0.0011
                                                R-squared         =     0.1554
                                                Root MSE          =     .03736

                                  (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        PEGR |   .2178265   .0763569     2.85   0.006     .0649816    .3706714
      PERIOD |   .0245102   .0075614     3.24   0.002     .0093745     .039646
    SPISTART |  -.0001882   .0003722    -0.51   0.615    -.0009333    .0005569
       _cons |   .2567114   .0234168    10.96   0.000     .2098376    .3035852
------------------------------------------------------------------------------
```

Figure C3: *Heterokedasticity test for Pooled OLS model*

```
. estat hettest

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of SPIRAT

H0: Constant variance

    chi2(1) =   0.15
Prob > chi2 = 0.6969
```

Figure C4: *Multicollinearity*

```
. estat vif
```

Variable	VIF	1/VIF
SPISTART	1.02	0.982889
PERIOD	1.02	0.984761
PEGR	1.00	0.995633
Mean VIF	1.01	

Note: According to Vittinghoff et al. (2005), a common guideline is to consider a VIF greater than 10 as indicative of a problematic level of multicollinearity.

Figure C5: *Random Effects output (for the relationship between SPI and PEGR)*

```
. xtreg SPIRAT PEGR SPISTART, re

Random-effects GLS regression                   Number of obs     =       104
Group variable: cntry                           Number of groups  =        59

R-squared:                                      Obs per group:
     Within  = 0.0190                                         min =         1
     Between = 0.1558                                         avg =       1.8
     Overall = 0.0591                                         max =         2

                                                Wald chi2(2)      =      5.93
corr(u_i, X) = 0 (assumed)                      Prob > chi2       =    0.0517
```

SPIRAT	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
PEGR	.1896176	.0794593	2.39	0.017	.0338803	.345355
SPISTART	.0001596	.0004242	0.38	0.707	-.0006718	.000991
_cons	.2480941	.0256734	9.66	0.000	.1977752	.2984131
sigma_u	.02257021					
sigma_e	.03321007					
rho	.31595056	(fraction of variance due to u_i)				

Figure C6: *Figure C6: The Breusch-Pagan Lagrange Multiplier Test for Panel Effects, conducted immediately following the random effects model regression.*

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        SPIRAT[cntry,t] = Xb + u[cntry] + e[cntry,t]

        Estimated results:
                     |       Var     SD = sqrt(Var)
             ---------+-----------------------------
               SPIRAT |    .0016043       .0400541
                    e |    .0011029       .0332101
                    u |    .0005094       .0225702

        Test: Var(u) = 0
                                 chibar2(01) =     0.18
                              Prob > chibar2 =   0.3373
```

Figure C7: *Pooled OLS output (for the relationship between SPI and growth rate in the mean income)*

```
. regress SPIRAT GROWTH PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       5.56
                                                Prob > F          =     0.0020
                                                R-squared         =     0.1285
                                                Root MSE          =     .03795

                                    (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      GROWTH |   .1844331   .0883919     2.09   0.041     .0074975    .3613688
      PERIOD |   .0241166   .0076769     3.14   0.003     .0087497    .0394836
    SPISTART |  -.0001364   .0003824    -0.36   0.723    -.0009017     .000629
       _cons |   .2563649    .023407    10.95   0.000     .2095107    .3032192
------------------------------------------------------------------------------
```

Figure C8: *Pooled OLS output for the first (pro-poor) categorical variable on SPI (comparing pro-poor growth against trickle-down growth and non-pro-poor growth)*

- Comparing pro-poor growth against non-pro-poor growth; and trickle-down growth against non-pro-poor growth (ppg_dummy1 is the reference group).

```
. reg SPIRAT ppg_dummy3 ppg_dummy2 PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(4, 58)          =       4.09
                                                Prob > F          =     0.0055
                                                R-squared         =     0.1282
                                                Root MSE          =     .03815

                                    (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  ppg_dummy3 |   .0212682   .0102247     2.08   0.042     .0008012    .0417352
  ppg_dummy2 |   .0115144    .011547     1.00   0.323    -.0115995    .0346283
      PERIOD |   .0269967   .0076899     3.51   0.001     .0116037    .0423898
    SPISTART |  -.0002711   .0003986    -0.68   0.499    -.0010691    .0005268
       _cons |   .2529536   .0257079     9.84   0.000     .2014937    .3044136
------------------------------------------------------------------------------
```

- Comparing pro-poor growth against trickle-down growth (ppg_dummy2 is the reference group)

```
. reg SPIRAT ppg_dummy3 ppg_dummy1 PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(4, 58)          =       4.09
                                                Prob > F          =     0.0055
                                                R-squared         =     0.1282
                                                Root MSE          =     .03815

                                    (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  ppg_dummy3 |   .0097538   .0093264     1.05   0.300    -.0089151    .0284227
  ppg_dummy1 |  -.0115144    .011547    -1.00   0.323    -.0346283    .0115995
      PERIOD |   .0269967   .0076899     3.51   0.001     .0116037    .0423898
    SPISTART |  -.0002711   .0003986    -0.68   0.499    -.0010691    .0005268
       _cons |    .264468    .024316    10.88   0.000     .2157942    .3131418
------------------------------------------------------------------------------
```

Figure C9: *Pooled OLS output for the second (pro-poor) categorical variable on SPI (relative pro-poor growth against non-pro-poor growth on SPI)*

```
. reg SPIRAT PEGR_relative PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       3.56
                                                Prob > F          =     0.0196
                                                R-squared         =     0.1202
                                                Root MSE          =     .03813

                                    (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
PEGR_relative |   .0152049   .0079341     1.92   0.060    -.0006769    .0310867
      PERIOD |   .0257344    .008069     3.19   0.002     .0095825    .0418863
    SPISTART |  -.0002662   .0004065    -0.65   0.515    -.0010799    .0005474
       _cons |   .2592768   .0247069    10.49   0.000     .2098206    .3087329
------------------------------------------------------------------------------
```

Figure C10: *Pooled OLS output for the second (pro-poor) categorical variable on SPI (absolute pro-poor growth against non-pro-poor growth on SPI)*

```
. reg SPIRAT PEGR_absolute PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       5.02
                                                Prob > F          =     0.0037
                                                R-squared         =     0.1193
                                                Root MSE          =     .03815

                                    (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |      Coef.   Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
PEGR_absolute |   .0186718   .0097746     1.91   0.061    -.0008943    .0382379
      PERIOD |   .0269322   .0077486     3.48   0.001     .0114217    .0424427
    SPISTART |  -.0002172   .0003894    -0.56   0.579    -.0009967    .0005623
       _cons |   .2498806   .0251281     9.94   0.000     .1995811      .30018
------------------------------------------------------------------------------
```

Appendix D.

Stata Outputs (for the Robustness Checks)

Figure D1. *The correlation matrix*

```
. pwcorr SPIRAT PEGR GROWTH SPISTART, sig
```

	SPIRAT	PEGR	GROWTH	SPISTART
SPIRAT	1.0000			
PEGR	0.2555	1.0000		
	0.0089			
GROWTH	0.1958	0.8967	1.0000	
	0.0464	0.0000		
SPISTART	0.0007	0.0386	0.0052	1.0000
	0.9943	0.6975	0.9585	

Note: the figure under the Pearson coefficient represents the p-value

Figure D2: *Pooled OLS output (for the relationship between SPI and PEGR)*

```
. regress SPIRAT PEGR PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       5.85
                                                Prob > F          =     0.0015
                                                R-squared         =     0.1588
                                                Root MSE          =     .03728

                                   (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        PEGR |   .2141675   .0756324     2.83   0.006     .0627728    .3655622
      PERIOD |   .0245624   .0075657     3.25   0.002     .0094181    .0397068
    SPISTART |  -.0001742   .0003735    -0.47   0.643    -.0009219    .0005736
       _cons |   .2557721   .0233476    10.95   0.000     .2090368    .3025074
------------------------------------------------------------------------------
```

Figure D3: *Pooled OLS output for the first (pro-poor) categorical variable on SPI (comparing pro-poor growth against trickle-down growth and non-pro-poor growth)*

- Comparing pro-poor growth against non-pro-poor growth; and trickle-down growth against non-pro-poor growth (ppg_dummy1 is the reference group)

```
. reg SPIRAT ppg_dummy3 ppg_dummy2 PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(4, 58)          =       3.16
                                                Prob > F          =     0.0202
                                                R-squared         =     0.1042
                                                Root MSE          =     .03867

                                   (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |   Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  ppg_dummy3 |   .0135731    .010217     1.33   0.189    -.0068784    .0340247
  ppg_dummy2 |   .0107008   .0129824     0.82   0.413    -.0152864     .036688
      PERIOD |   .0260479   .0078662     3.31   0.002     .0103019    .0417938
   SPISTART  |  -.0002013   .0004062    -0.50   0.622    -.0010144    .0006117
       _cons |   .2543247   .0270227     9.41   0.000     .2002328    .3084165
------------------------------------------------------------------------------
```

- Comparing pro-poor growth against trickle-down growth (ppg_dummy2 is the reference group)

```
. reg SPIRAT ppg_dummy3 ppg_dummy1 PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(4, 58)          =       3.16
                                                Prob > F          =     0.0202
                                                R-squared         =     0.1042
                                                Root MSE          =     .03867

                                   (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT |   Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
  ppg_dummy3 |   .0028723   .0106695     0.27   0.789     -.018485    .0242296
  ppg_dummy1 |  -.0107008   .0129824    -0.82   0.413     -.036688    .0152864
      PERIOD |   .0260479   .0078662     3.31   0.002     .0103019    .0417938
   SPISTART  |  -.0002013   .0004062    -0.50   0.622    -.0010144    .0006117
       _cons |   .2650255   .0244117    10.86   0.000     .2161602    .3138907
------------------------------------------------------------------------------
```

Figure D4: *Pooled OLS output for the second (pro-poor) categorical variable on SPI (relative pro-poor growth against non-pro-poor growth on SPI)*

```
. reg SPIRAT PEGR_relative PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       3.37
                                                Prob > F          =     0.0244
                                                R-squared         =     0.0969
                                                Root MSE          =     .03863

                                   (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
PEGR_relative |   .0081969   .0081519     1.01   0.319    -.0081209    .0245147
      PERIOD |    .025112    .008019     3.13   0.003     .0090603    .0411638
    SPISTART |   -.0001999   .0004112    -0.49   0.629     -.001023    .0006232
       _cons |    .2600101   .0248995    10.44   0.000     .2101684    .3098518
------------------------------------------------------------------------------
```

Figure D5: *Pooled OLS output for the second (pro-poor) categorical variable on SPI (absolute pro-poor growth against non-pro-poor growth on SPI)*

```
. reg SPIRAT PEGR_absolute PERIOD SPISTART, vce(cluster country)

Linear regression                               Number of obs     =        104
                                                F(3, 58)          =       4.25
                                                Prob > F          =     0.0088
                                                R-squared         =     0.1034
                                                Root MSE          =     .03849

                                   (Std. err. adjusted for 59 clusters in country)
------------------------------------------------------------------------------
             |               Robust
      SPIRAT | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
PEGR_absolute |   .0127701   .0099262     1.29   0.203    -.0070992    .0326395
      PERIOD |   .0259128   .0077486     3.34   0.001     .0104023    .0414232
    SPISTART |   -.0001859   .0003946    -0.47   0.639    -.0009758    .0006039
       _cons |    .2535208   .0263678     9.61   0.000       .20074    .3063016
------------------------------------------------------------------------------
```