# INCLUSIVE WEALTH REPORT 2024

*Special issue on*

## Social Emotional Capital Accounts

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Mahatma Gandhi Institute of Education for Peace and Sustainable Development


Published in 2024 by the United Nations Educational Scientific and Cultural Organization | Mahatma Gandhi Institute of Education for Peace and Sustainable Development, 35 Ferozshah Road, New Delhi 110001, India



DOI: *https://doi.org/10.56383/QYTB2222*



**Attribution:**
This publication can be cited as follows: UNESCO MGIEP (2024). Inclusive Wealth Report: Special Issue on Social Emotional Capital Accounts. New Delhi: UNESCO MGIEP.

**Cover and Layout design:** Prasun Mazumdar Design | pmdindia.in
**Illustration:** Ayush Singh

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# DIRECTOR'S MESSAGE

**DR. OBIJIOFOR AGINAM**

**The 2030 Agenda for Sustainable Development,** adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart, are the 17 Sustainable Development Goals (SDGs) that puts 'sustainability' at the centre of human and planetary well-being. This has led to an increased focus on new measures that provide estimates of a nation's wealth beyond material possessions and income indicators such as Gross Domestic Product (GDP). For sustainability to be achieved, we need to focus on the stocks of capital assets that we have, to generate a steady flow of income to ensure sustainable wellbeing for society.

The Inclusive Wealth Index (IWI) has gained traction as a measure of well-being and sustainability, after it was first introduced in the inaugural Inclusive Wealth Report, 2012. IWI is a composite index that provides information on the productive base of a country's key capital assets and how these stocks change over time. The key capital assets include produced, natural, and human capital.

The first IWR report revealed that the largest contribution to inclusive wealth of a nation is human capital, which comprises nearly 60% of inclusive wealth. Thus, there is global interest to enhance capital.

The human capital of a nation is currently defined in terms of the level of educational attainment (IWR 2012, 2014). Research from psychology and neurosciences provides strong evidence that the explicit cultivation of social emotional learning (SEL) enhances not just educational attainment but also well-being. SEL refers to the processes through which individuals acquire and apply the knowledge, attitudes and skills necessary to understand and manage their emotions, establish and maintain positive relationships, set and achieve goals, and make responsible decisions. By enabling individuals to manage stress, anxiety, conflict and professional performance, at school and at work, SEL improves performance and enhances well-being.

In keeping with its mandate to build peaceful and sustainable societies as outlined in SDG 4.7, UNESCO MGIEP took on the task of measuring and obtaining preliminary estimates of such SEL skills on human capital. The Special Issue of the Inclusive Wealth Report is an initiative of MGIEP with Kyushu University, Japan to highlight how the human capital for a nation may be enhanced by mainstreaming social emotional learning skills. We refer to this as Social Emotional Capital Accounts (SECA).

I am excited by the preliminary results of this report which indicate the benefits of mainstreaming of SEL in education. I sincerely hope that the results presented in the first SECA report will be read and discussed by member states and will provide strong evidence towards SEL as a 'game changer' in education and its powerful role in building a peaceful and sustainable future.

# FOREWORD

**PARTHA DASGUPTA**
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*SEPTEMBER 2024*

**Attempts to measure human well-being in terms** of the goods and services that shape it can be traced to the economist A. C. Pigou, who in his 1920 book, The Economics of Welfare, identified the required measure as 'real national income', which is the value of a national economy's output of final goods and services. The economic objects that Pigou identified as providing the link between human well-being and the goods and services giving rise to it are 'accounting prices,' which are the contributions that marginal increases in goods and services make to well-being. Pigou showed that holding relative prices constant, real national income (that is, national income when measured in terms of accounting prices) rises in a period if and only if human well-being increases in that same period.

The equivalence between (national) well-being and (national) income that Pigou established holds only for a stationary economy, where relative accounting prices remain constant over time. But because well-being remains constant in a stationary economy, there is no essential distinction between a generation's well-being and the well-being of generations across time. Nor, correspondingly, is there an essential distinction between national income and national wealth; and that's because the former is the period-by-period return on the latter.

Matters are different in a dynamic economy, and the corresponding equivalence can be shown to be between well-being across the generations and the economy's accounting value of wealth. Thus, the move from a stationary economy to a dynamic economy asks us to shift our attention from income (which is a flow) to wealth (which is a stock). It has become customary to add the qualifier 'inclusive' to wealth, to signal that by wealth we are to mean the social value of not only produced capital (roads, ports, buildings, machines, books) and human capital (education, health) but also of natural capital (e.g., ecosystems).

The equivalence theorem in its dynamic form is fundamental to formalising the idea of sustainable development. The famous Brundtland Commission Report of 1987 defined the idea as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The equivalence theorem says that for a development path to be read as sustainable, it must be that inclusive wealth does not decline. Economic growth is desirable, but it should be read as growth in inclusive wealth, not growth in GDP. One problem with GDP (there are many other problems) is that the 'G' in the acronym is 'gross', meaning that the measure does not include the depreciation of assets, including of course, natural capital. An economy could be enjoying growth in GDP but simultaneously be 'mining' its natural capital to the point where inclusive wealth is declining. The national accountants would not know this was happening unless they were to track the economy's capital assets. Inclusive wealth is the corresponding measure of the social worth of the economy's capital assets.

In a pioneering publication of 2012, Anantha Duraiappah, then Director of the International Human Development Programme (IHDP), led a team to

prepare an estimate of changes in the inclusive wealth of nations over the previous years. They found that while inclusive wealth per capita had increased in some countries, it had declined in others. The exercise was repeated with further refinements in technique in the Inclusive Wealth Report 2018, on this occasion by a team led by Shunsuke Managi and Pushpam Kumar at the United Nations Environment Programme. They found a similar, broad pattern of the 2012 Inclusive Wealth Report, but with greater clarity in the pattern of economic transformation the global economy had experienced between 1992 and 2008. They found, for example, that while produced capital per capita had doubled in size during the period and human capital per capita had grown by some 20 percent, natural capital per capita had shrunk by some 40%. It appears that the global economy had grown in GDP by investing in produced capital and human capital and disinvesting in natural capital.

Although the measurement of natural capital has undergone considerable refinement over the years since the inception of inclusive wealth reports, not many changes have been made to the way human capital is measured. Years of schooling has been the bedrock of human capital, an admission those preparing the reports would be the first to make. It is a tribute to the boldness of the authors of the Special Issue on Social Emotional Capital Accounts, to which I am writing this Foreword, that it has placed emphasis on emotional well-being as both an end and a means to economic development. Emotional well-being falls within the category of 'health' and it draws attention to the fact health is both a constituent and determinant of a flourishing life. Readers will find a most informative presentation of what we know today about a most delicate but significant aspect of a person's life, especially so because only a few years ago social scientists would be wary of treading it. This is social science at its most bold and exciting.

# FOREWORD

**RICHARD J. DAVIDSON**
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**This report on Social Emotional Capital Accounts** represents a very important, highly innovative and enormously impactful extension of work on social-emotional learning. There is a growing recognition that the Gross Domestic Product (GDP) as a central index of the success and health of a nation is woefully inadequate. Even a casual inspection of the evidence would convince any reasonable person that the GDP is severely limited as a metric of national wellbeing. For example, a graph of data from the United States of the change in GDP over the past 50 years would reveal a dramatic and steady growth. However, if superimposed upon this was the trend line for changes in wellbeing or life satisfaction over this same period, one would readily see that wellbeing has not changed and if anything, has slightly declined over this period of time. This fact, along with many similar data points, underscores the importance of developing better metrics that take into account human capital. The favored metric adopted in this report is "inclusive wealth." The Inclusive Wealth Index (IWI) is a composite index that reflects a country's key capital assets and how they change over time. There are three categories of capital assets that are reflected in this Index: produced capital; natural capital; and human capital.

This report, from experts in social emotional learning (SEL) and economics, seeks to quantify the economic impact of the effects on the human capital of SEL. The report mostly consists of the extraordinary work emerging from UNESCO's Mahatma Gandhi Institute for Education of Peace and Sustainable Development (MGIEP) in Delhi, India. The basic argument, well supported by a plethora of rigorous studies, is that human capital is enhanced through improvements in SEL. The evidence and reviews in this volume carefully document how the skills acquired in SEL enhance human capital. Other chapters in the volume describe how the economic impact of SEL-produced enhancements of human capital can be quantified. This approach has profound implications for policy and this report will serve as a global guide for how we can rigorously include human capital in our estimates of the economic impact of specific policy decisions and how SEL can impact measures of human capital.

The work of UNESCO MGIEP presented in this report is globally significant and will help make the case for increased investment by nations in SEL. This is a more urgent need today than ever before in human history as the wellbeing of many nations is in rapid decline. SEL is an evidence-based program that, if implemented on a societal scale, has the potential to positively influence the human capital of nations, and through this, improve the IWI. I urge scholars, scientists, policy-makers and educators to pay serious attention to this report as it will surely shape scientific and policy agendas for the foreseeable future.

# ACKNOWLEDGEMENTS

**The Special Issue of the IWR on Social and Emotional Capital Accounts**, 2024 is the outcome of a collaborative effort between UNESCO MGIEP and Kyushu University, Japan. This report has been possible due to the contributions of various authors, reviewers and UNESCO MGIEP staff, both past and present.

**TECHNICAL DIRECTOR**

Special thanks to Dr. Anantha K. Duraiappah, the technical director of this special issue and also inaugural director of UNESCO MGIEP. This report was prepared under his overall guidance.

**AUTHORS**

We would like to gratefully acknowledge all the authors of this report that include: Clive R. Belfield, A. Brooks Bowden, Anya Chakraborty, Shuning Chen, Anantha K. Duraiappah, Barbara M. Fraumeni,, Jai Kamal, Gang Liu, Shunsuke Managi, Julia Oas, Kriti Singh, Nandini Chatterjee Singh, T.M. Vasuprada, Jun Xie for enthusiastically contributing to a special issue of the inclusive wealth report with a special focus on social emotional learning within human capital.

**REVIEWERS**

This special issue benefited greatly from the comments and suggestions provided by the review board comprising Clive R. Belfield, Anantha K. Duraiappah, Mary O'Mahony, and Robert W. Roeser.

**IWR TEAM**

We would like to gratefully acknowledge the contributions of team members both past and present that include Jose-Luis Alvarez-Galvan,Nandini Chatterjee Singh, Jai Kamal, Kriti Singh, T.M.Vasuprada, from the program team and Sana Khan from Communications, for the design and layout of this report. Shuning Chen and Shunsuke Managi from Kyushu University made extensive contributions without which this report would not have been possible.

# ABBREVIATIONS

| | |
|---|---|
| **ASHF** | Art and Science of Human Flourishing |
| **BAU** | Business as usual |
| **BEA** | Bureau of Economic Analysis |
| **BCA** | Benefit–cost analysis |
| **CEO** | Chief executive officer |
| **CGE** | Computable general equilibrium |
| **CO2** | Carbon dioxide |
| **CWON** | World Bank's Changing Wealth of Nations |
| **CEA** | Cost-effectiveness analysis |
| **CER** | Cost-effectiveness ratio |
| **EU** | European Union |
| **EYS** | Expected year of schooling |
| **EYW** | Expected years of work |
| **G20** | Group of 20 |
| **GAO** | General Accounting Office |
| **GDP** | Gross domestic product |
| **GPA** | Grade point average |
| **HC** | Human capital |
| **HDI** | Human Development Index |
| **IHME** | Institute for Health Metrics and Evaluation |
| **IW** | Inclusive wealth |
| **IWI** | Inclusive Wealth Index |
| **IWR** | Inclusive Wealth Report |
| **LFP** | Labor Force Participation |
| **MYS** | Mean years of schooling |
| **NC** | Natural capital |
| **NCERT** | National Council of Educational Research and Training |
| **OECD** | Organisation for Economic Co-operation and Development |
| **PC** | Produced capital |
| **PIM** | Perpetual inventory method |
| **PWT** | Penn World Table |
| **SDGs** | Sustainable development goals |
| **SEEA** | System of Environmental and Economic Accounts |
| **SEL** | Social emotional learning |
| **SNA** | System of National Accounts |
| **SES** | Socio-economic status |
| **TFP** | Total factor productivity |
| **UN** | United Nations |
| **UNDP** | United Nations Development Programme |
| **UNEP** | United Nations Environment Programme |
| **UNICEF** | United Nations Children's Fund |
| **UNESCO** | United Nations Educational, Scientific and Cultural Organization |
| **UNU-IHDP** | United Nations University – International Human Dimensions Programme on Global Environmental Change |
| **WBHCI** | World Bank's Human Capital Index |
| **WHO** | World Health Organization |
| **WEFGHCI** | World Economic Forum's Global Human Capital Index |
| **WSIPP** | Washington State Institute for Public Policy |


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*Special Issue of the*

# INCLUSIVE WEALTH REPORT *on*

# *Human Capital and Social Emotional Learning*

## INTRODUCTION

**As societies and economies mature and in an increasingly** interconnected and technologically driven world, the true measure of a nation's wealth extends beyond material possessions and income indicators such as the Gross National Product (GNP). Moreover, we know that for sustainability to be achieved, we need to focus on the stocks of capital assets we have to generate that sustainable flow of income among other constituents of wellbeing to ensure sustainable wellbeing for society.

The Inclusive Wealth Index (IWI) is a composite index providing information on the stock levels of key capital assets a country owns and how these stocks are changing over time. The economic underpinning of the IWI is that it provides an overview of a country's real progress in the decrease or increase in the overall wellbeing of its present generation as well as for future generations. The index covers three main categories of capital namely produced, natural and human capital. In this special issue, the focus is on human capital.

The economic underpinning of the IWI is that it provides an overview of a country's real progress in terms of the overall wellbeing of its present as well as future generations •

The recognition of human capital as a critical wealth stock of societies was recognized in the first seminal report released at the Rio+20 summit in 2012. In the Inclusive Wealth report 2012, "Measuring progress towards sustainability", human capital was estimated to be approximately 60% of the total wealth for most countries. The same scenario was reported in the 2014 and 2018 reports.

This special issue aims to delve into the intersection of human capital and SEL, highlighting their profound implications for sustainable development •

Human capital as calculated in the inclusive wealth reports take as key the expected years of schooling as the key factor in defining the human capital stock in the country. Wages are then used as the prices used for converting the physical stock into a monetary value. However, as societies strive to foster holistic well-being, education systems and policymakers have turned their attention to nurturing not only academic excellence but also the social emotional skills of individuals. It is within this context that this special issue of the Inclusive Wealth Report focuses Social Emotional Learning and its impact on human capital.

Social Emotional Learning (SEL) refers to the process through which individuals acquire and apply the knowledge, attitudes, and skills necessary to understand and manage their emotions, establish and maintain positive relationships, set and achieve goals, and make responsible decisions. These competencies, which encompass self-awareness, self-management, social awareness, relationship skills, and responsible decision-making, are considered essential for personal and professional success, overall well-being, and the flourishing of societies.

This special issue aims to delve into the intersection of human capital and SEL highlighting their profound implications for sustainable development. We explore how the cultivation of social emotional skills in individuals contributes to the overall development of human capital and its impact on various dimensions of inclusive wealth.

Social and emotional competencies play a vital role in building the human capital of a society due to their far-reaching impact on individuals, communities, and the overall fabric of society. Here are several key reasons why these competencies are essential:

## 1. ENHANCED WELL-BEING:

Social and emotional competencies foster psychological wellbeing by enabling individuals to understand and manage their emotions effectively. They promote self-awareness, self-regulation, and resilience, helping individuals cope with stress, adversity, and mental health challenges. When people are emotionally balanced and mentally healthy, they are better equipped to contribute to society and thrive in their personal and professional lives.

## 2. IMPROVED RELATIONSHIPS:

Strong social and emotional competencies enable individuals to establish and maintain positive relationships with others. These competencies encompass skills such as empathy, communication, teamwork, and conflict resolution. By developing these skills, individuals can form healthy interpersonal connections, collaborate effectively, and navigate diverse social environments. Positive relationships are the foundation of strong communities and contribute to social cohesion and inclusivity.

## 3. ACADEMIC SUCCESS:

Social and emotional competencies have a direct impact on academic achievement. They facilitate better focus, attention, and motivation, leading to improved learning outcomes. When students possess skills like self-discipline, perseverance, and goal-setting, they are more likely to excel academically. Furthermore, these competencies contribute to a positive school climate, fostering a supportive and inclusive learning environment that benefits all students.

## 4.EMPLOYABILITY AND WORKFORCE SUCCESS:

In today's rapidly evolving job market, employers increasingly recognize the importance of social emotional skills in addition to technical expertise. Employability skills such as communication, teamwork, adaptability, and problem-solving are highly valued by employers across industries. Individuals with strong social and emotional competencies are more likely to succeed in the workplace, contribute to productive and harmonious work environments, and adapt to changing job requirements.

## 5. CIVIC ENGAGEMENT AND SOCIAL RESPONSIBILITY:

Social and emotional competencies promote active citizenship and social responsibility. When individuals develop a sense of social awareness, empathy, and ethical decision-making, they become more engaged in their communities. They are motivated to address social issues, promote equity, and contribute positively to society. These competencies nurture responsible and empathetic citizens who actively participate in civic life, advocate for justice, and work towards the betterment of their communities.

We examine the multifaceted benefits of SEL, ranging from improved academic outcomes and higher graduation rates to enhanced mental health, reduced violence, and greater civic engagement. Moreover, we explore how SEL initiatives can promote social equity, addressing disparities in education and empowering marginalized communities.

We examine the multifaceted benefits of SEL, ranging from improved academic outcomes and higher graduation rates to enhanced mental health, reduced violence, and greater civic engagement•

The special issue also sheds light on the methodologies and frameworks used to assess and measure the impact of social emotional learning interventions. By adopting evidence-based approaches, we seek to provide an empirical foundation for the integration of SEL into education systems and policy agendas worldwide.

Furthermore, we investigate the challenges and opportunities in scaling up SEL programs, examining strategies for effective implementation, teacher training, and sustainability. By showcasing successful case studies from diverse contexts, we aim to inspire policymakers, educators, and stakeholders to prioritize the integration of SEL within educational settings.

As we embark on this exploration of Human Capital and Social Emotional Learning, we invite readers to join us on a journey that transcends traditional measures of wealth and prosperity. Together, let us recognize the transformative potential of nurturing individuals' social and emotional competencies, ultimately shaping inclusive societies and sustainable futures.

Throughout this issue, we gather insights from leading scholars, practitioners, and policymakers who have devoted their expertise to advancing the understanding and implementation of SEL initiatives. The first chapter introduces the reader to the inclusive wealth index. The economic model used for the index is presented and a brief description of the three different capitals is provided. Chapter two provides an introduction to the standard approach used in computing human capital. The chapter however also introduces to the traditional approach a special treatment of the gender aspects of human capital and runs simulations for the G20 countries. The third chapter will then introduce the reader to the concept of social and emotional learning and the relevant competencies. The various effects of social and emotional learning on wellbeing are discussed in this chapter. Chapter four then provides some microeconomic case studies on the costs and benefits of Social Emotional learning (SEL) interventions at the classroom level. This chapter provides the rationale for scaling up SEL in the education system with an objective of building human capital. Chapter five then provides the methodology used in scaling up the micro level impacts of SEL interventions and their impact at the macro scale. Estimates of potential human capital are provided based on extrapolation of the micro level studies at the classroom level. Chapter six then offers the treatment advocated in chapter five to a broader group of countries using cluster analysis to compute social and emotional adjusted human capital accounts for about 38 countries. The potential inclusive wealth that could have been acquired through SEL interventions are also provided in this chapter.

Throughout this issue, we gather insights from leading scholars, practitioners, and policymakers who have expertise in advancing the understanding and implementation of SEL initiatives.

**- ANANTHA K. DURAIAPPAH**

CHAPTER

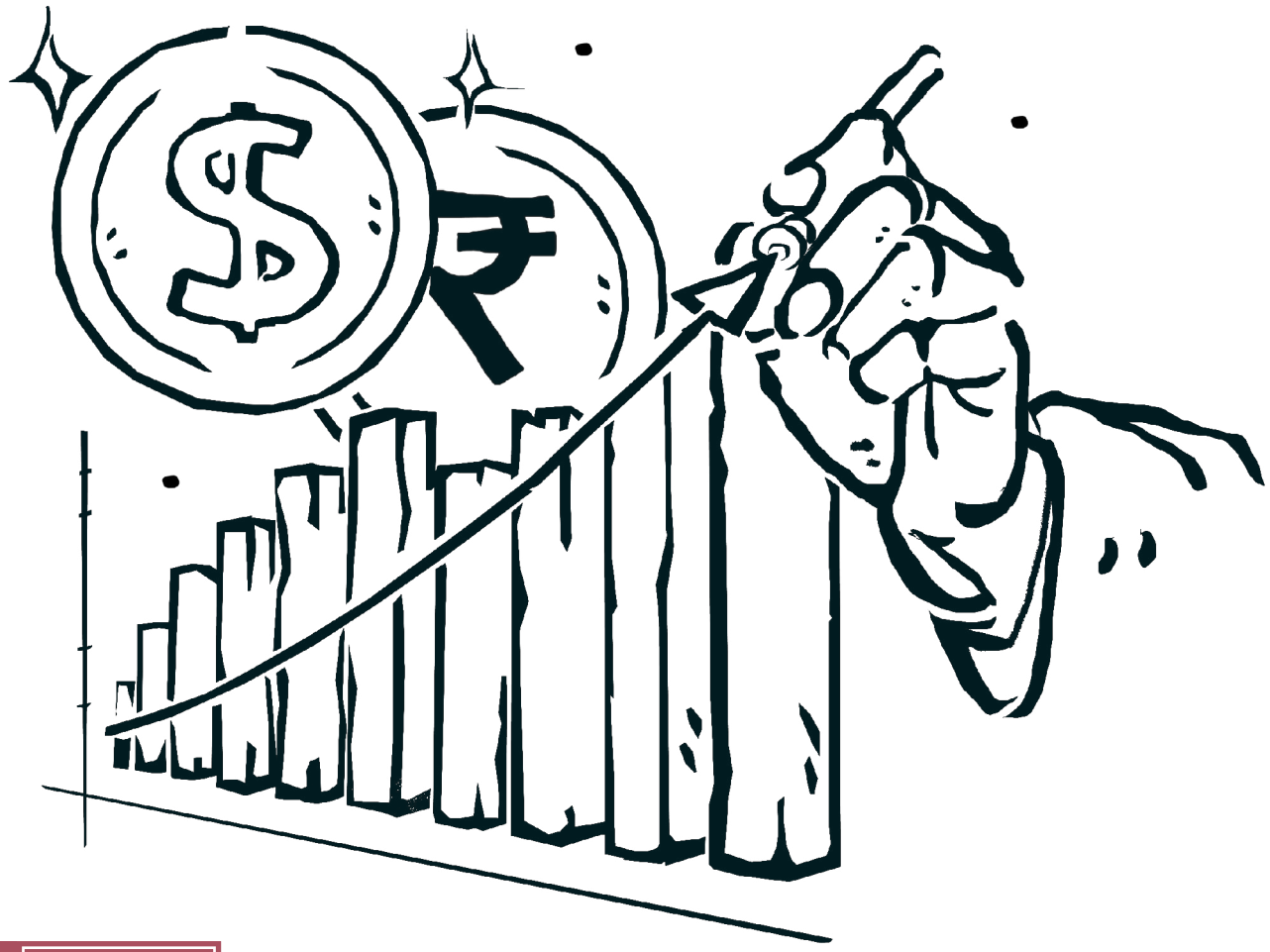
01

# *the* Inclusive Wealth Index

Shunsuke Managi and
Anantha K. Duraiappah

*abstract*

The Inclusive Wealth Index (IWI) provides a framework for assessing national economic growth and development beyond gross domestic product (GDP). It is unique in measuring the societal value of all capital assets (or stocks) as a set of factors for achieving sustainable intergenerational wealth or well-being. This chapter outlines the theoretical basis for measuring inclusive wealth, as well as specifying an accounting framework. It describes future challenges for, and limitations to, constructing inclusive cross-country accounts of wealth.



# 1

## INTRODUCTION

**Gross domestic product (GDP) is no longer considered a useful indicator** for measuring the well-being of a nation. Simon Kuznets, when developing the means to accurately estimate GDP, warned that it should not be used to measure the welfare of a society; rather it should only be used to measure how effectively a country's available resources are being used. Despite this warning, over the years, GDP has become a mainstay for policy-makers around the world seeking to measure progress and improvement in terms of the overall welfare of society. There are a range of reasons for this. First, the lack of alternative indicators. Second, the simple mathematical elegance of GDP is underpinned by rigorous neoclassical economics. Third, money is used as a standard measure of value. Finally, there has been a strong correlation in the past between GDP growth and the monetary well-being of society.

As economies matured, the correlation between GDP growth and wellbeing began to be questioned •

However, as economies have matured, the correlation between GDP growth and well-being began to be questioned (Stiglitz, Sen and Fitoussi, 2009; Raworth, 2017; Wilkinson and Pickett, 2019; Dasgupta, 2021). Moreover, as climate change began to be recognized as a serious threat to the well-being of societies across the world, the realization that GDP growth is closely correlated with greenhouse gas emissions made it clear that using GDP as the key indicator for measuring progress and societal well-being was no longer feasible or even desirable (Stiglitz, Sen and Fitoussi, 2009).

In addition, in 2015, 193 countries agreed on a set of 17 Sustainable Development Goals (SDGs) that aimed to offer a comprehensive framework within which the key developmental challenges facing global society could be addressed (Gisbert, 2012; Colglazier, 2015). These range from eradicating extreme poverty, to reducing inequalities and greenhouse gas emissions. However, there is no indicator that can be used to assess whether the policies that countries are pursuing in order to meet these goals are protecting and promoting sustainable development (Dasgupta, Managi and Kumar, 2022).

Achieving the SDGs requires more than simply assessing GDP growth (Jean-Paul, 2018; Aitken, Watkins and Kemp, 2019). While GDP measures income stream, it cannot assess the excessive capital loss for increasing income (GDP) in the short run. In the long run, capital loss reduces productive capacity, causing irreversible damage to productive potential. While GDP growth is associated with improvements in many SDG targets and indicators, it may also come at the expense of progress on others. Furthermore, some SDG targets and indicators correlate poorly with GDP growth in either direction. Therefore, SDGs should be linked to a wealth management strategy that considers and uses society's natural, human, social and manufactured assets, and exploits their interdependence. These

IWI measures the societal value of all capital assets as a set of factors for achieving sustainable intergenerational wealth or well-being •

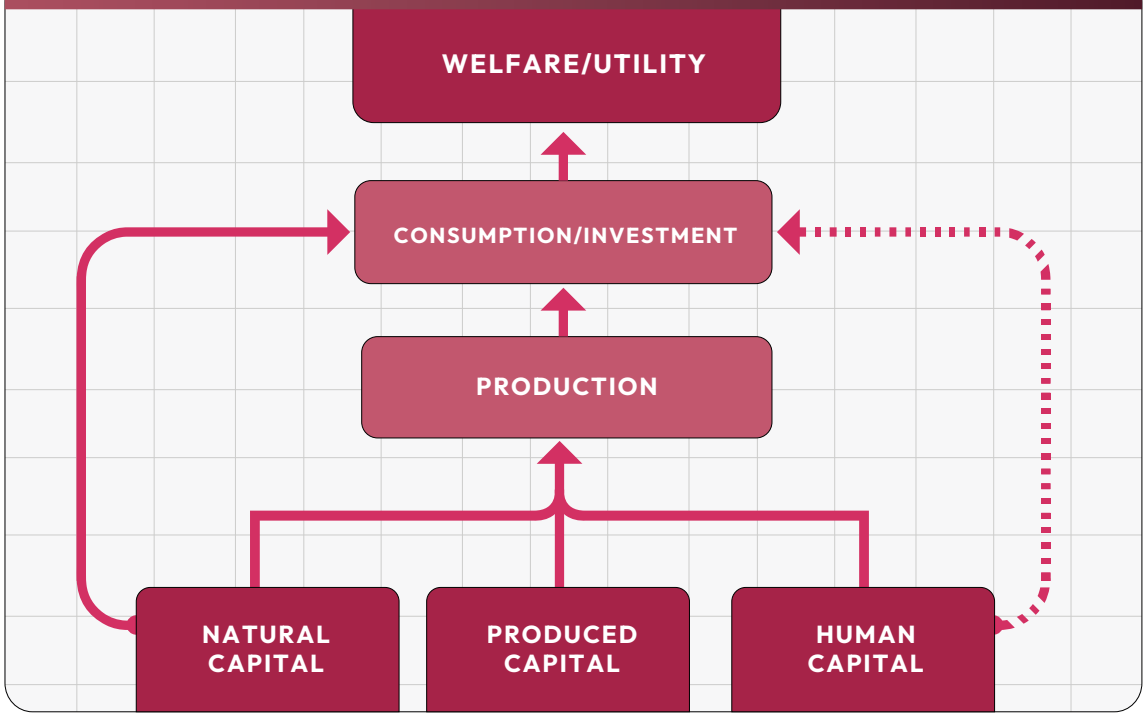
capital assets determine the level of prosperity that can be sustained in the future, known as the inclusive wealth of the economy.

There have been many attempts to provide alternative indicators to GDP to measure and track well-being. Each has its own strengths and weaknesses. In this report, we put forward the Inclusive Wealth Index (IWI) as a measure that takes a very different approach from most existing indicators attempting to measure well-being and sustainability. It does not aim to directly measure the constituents of well-being, instead proposing tracking and measuring the key determinants of well-being. The IWI provides a framework for assessing national economic growth and development beyond GDP. It is a composite measure of a society's productive base based on levels and changes over time, and of human well-being. The IWI is unique in measuring the societal value of all capital assets (or stocks) as a set of factors for achieving sustainable intergenerational wealth or well-being.

In principle, the IWI should include a sufficiently broad and preferably exhaustive, but not redundant, basket of capital assets relevant to current and future human well-being. Classical economics focuses on the input trio of (produced) capital, labour and land, while neoclassical economics deals with capital and labour in the production function. Subsequently, resource economics includes capital and non-renewable resources. In mainstream economics, human capital – the capitalized concept of labour – also plays an essential role in decomposing economic growth (Mankiw, Romer and Weil, 1992).

Figure 1 shows how these three capitals lead to the ultimate purpose of the economy (if any): social well-being. The three capitals are the inputs to the production system; thus, they are called the production

*Fig 1.*




*A three-capital model of wealth creation (Source: UNU-IHDP & UNEP, 2015; Managi & Kumar, 2018)*

The economic underpinning of the IWI is that it provides an overview of a country's real progress in the decrease or increase in the overall wellbeing of its present generation as well •

base of the economy. Production capital, such as roads, ports, cables, buildings, machines, equipment and other physical infrastructure, is the easiest to imagine. Human capital includes population (size and composition), knowledge and skills acquired through education, and health (improved quality of life, longevity and productivity). Current accounting for natural capital involves non-renewable subsoil resources, forests and agricultural land, but should ideally include ecosystem services (Millennium Ecosystem Assessment, 2008; United Nations et al., 2014).

Achieving the ambitious SDGs will require mobilizing all societal assets. The IWI can play a key role in supporting this by enabling countries to understand their ability to achieve the SDGs. In addition to the SDGs, the IWI provides support to meet targets for the 2030 Agenda for Sustainable Development, the Paris Climate Agreement and the Beyond GDP movement.

In the next part of this chapter, we discuss the theoretical framework of welfare economics, the basic theory of inclusive wealth and the specifics of empirical cross-national capital accounting, capital composition and consideration of adjustment items.

Welfare maximization requires forecasting consumption, demographic changes, and using natural resources •

## 2. THE BASIC MODEL

The conceptual framework used for the Inclusive Wealth Report (IWR) begins with human welfare. Welfare depends to a large extent on evolving cultural norms and policies. In turn, welfare affects how society uses different forms of its productive base, which is in the form of capital assets. At the same time, goods and services produced using different capital assets feed back into norms and policies before affecting welfare. Therefore, how different capital assets are used depends mainly on the composition of capital and their respective accounting, also called shadow prices. It is critical to measure non-market natural capital, such as ecosystem services, the decline of which subsequently affects how ecosystems are used, primarily influenced by evolving cultural norms and policies.

In this section, we consider intergenerational welfare at any initial point s ≥ 0. Let C(s) denote the consumption flow vector at time t and U(C(s)) denote economy-wide utility flow. Then use V(t) to represent the current and future social welfare at s, which can be expressed as

(1)

$$V(t) = \int_{t=s}^{\infty} \left[ U\left(\underline{C}(s)\right) e^{\delta(s-t)} \right] ds, \delta > 0$$

Equation (1) denotes that maximizing intergenerational welfare V(s) requires forecasting future utility flows and δ indicates the discount rate of the utility flow. In other words, welfare maximization requires forecasting consumption, demographic changes and using natural resources. Nevertheless, forecasting directly by using this information is difficult due to market imperfections such as price distortions and externalities. Thus, considering the counterfactual resource

reallocation mechanism, by mapping from the set of all possible capitals into the set of possible pairs of the utility flow for all t›s, it is possible to forecast intergenerational welfare based on whether the initial capital goods stock inherited at s are different from the current time point. Denote $\underline{K}(t)$ as the initial capital goods stock, assume the resource reallocation mechanism is time autonomous, then V(t) is the function of t and $\underline{K}(t)$.

We have:

(2) $$V(t) = V(\underline{K}(t))$$

Combining Equations (1) and (2) yields

(3) $$V\left((\underline{K}(t)\right) = \int_{t=s}^{\infty} [U\left(\underline{C}(s)\right) e^{\delta(s-t)}] ds, \ \delta > 0$$

Here we discuss the composition of the capital portfolio K(t). There are many ways to classify capital assets. However, the empirical work needs the capital composition to be measurable. In this research, we carefully divide the capital portfolio into three divisions: produced capital (such as buildings, roads, ports, machinery and equipment), human capital (e.g., population, health, education, knowledge skills) and natural capital (e.g., raw materials, ecosystem diversity). These three capitals constitute the production basis of the dynamic system (see Figure 1). Furthermore, social capital (e.g., institutions and practices) confers use-value on the above three capital goods. By denoting produced capital as M, human capital as H, and natural capital as N, we have K={M,H,N}.

Next, we discuss sustainable development according to the principle of the resource allocation mechanism. Ideal resource allocation means maximizing welfare. We write the perturbation at time t as ΔVt and assume that ΔVt is differentiable. Sustainability is expressed as non-declining welfare through intertemporal changes, so sustainability is maintained if

$$\Delta V(t) = \Delta V(K(t)) = V\big(K(t) + \Delta K(t)\big) - V\big(K(t)\big) > 0 \tag{4}$$

According to the combination of intimal capital goods stock $K$, Equation (4) also can be written as:

$$\Delta V(K(t)) = \frac{\partial V}{\partial t} + \left[\frac{\partial V(K(t))}{\partial M}\right]\Delta M(t) + \left[\frac{\partial V(K(t))}{\partial H}\right]\Delta H(t) + \left[\frac{\partial V(K(t))}{\partial N}\right]\Delta N(t) \tag{5}$$

Define

$$p_M(t) = \left[\frac{\partial V(K(t))}{\partial M}\right] \tag{6.a}$$

$$p_H(t) = \left[\frac{\partial V(K(t))}{\partial H}\right] \tag{6.b}$$

$$p_N(t) = \left[\frac{\partial V(K(t))}{\partial N}\right] \tag{6.c}$$

Where $p_i(t)$ is the social value or the shadow price of capital $M(t)$, $H(t)$, and $N(t)$ at time $t$, let $r(t) = \frac{\partial V}{\partial t}$ be the shadow price of time at t. We can now use shadow prices as weights to construct an aggregate index of the economy's stock of capital assets. We use W,M,H,N, and t to indicate inclusive wealth. The following equivalence between inclusive wealth and well-being is expressed as:

$$W(M,H,N,t) = r(t) + p_M(t)M(t) + p_H(t)H(t) + p_N(t)N(t) \quad (7)$$

and the change in each capital is called inclusive investment, presented as

$$Inclusive\ Investment = p_M(t)\Delta M(t) + p_H(t)\Delta H(t) + p_N(t)\Delta N(t) \quad (8)$$

The IWI provides a capital measure for sustainable development. It links the discounted present value of all future consumption possibilities to the weighted sum of the capital asset (or wealth) profile, which is the productive base of the economic outcome. In other words, invoking the equivalence theorem, Equations (4) and (8) suggest that intergenerational well-being is sustainable as long as the growth of the total capital asset base is positive. Capital assets under the inclusive wealth accounting framework are both intertemporal means of production and direct sources of human well-being that meet the consumption needs of the current population.

The linear functional form of the IWI gives the impression that the wealth/welfare equivalence theorem[1] assumes perfect substitution

1. Wealth/well-being equivalence theorem: a perturbation to an economy that increases social well-being raises inclusive wealth. Similarly, a perturbation that decreases social well-being lowers inclusive wealth (Dasgupta, 2019).

Shadow prices are functions determined by the capital stock, reflecting the extent of substitution among various capital goods in production •

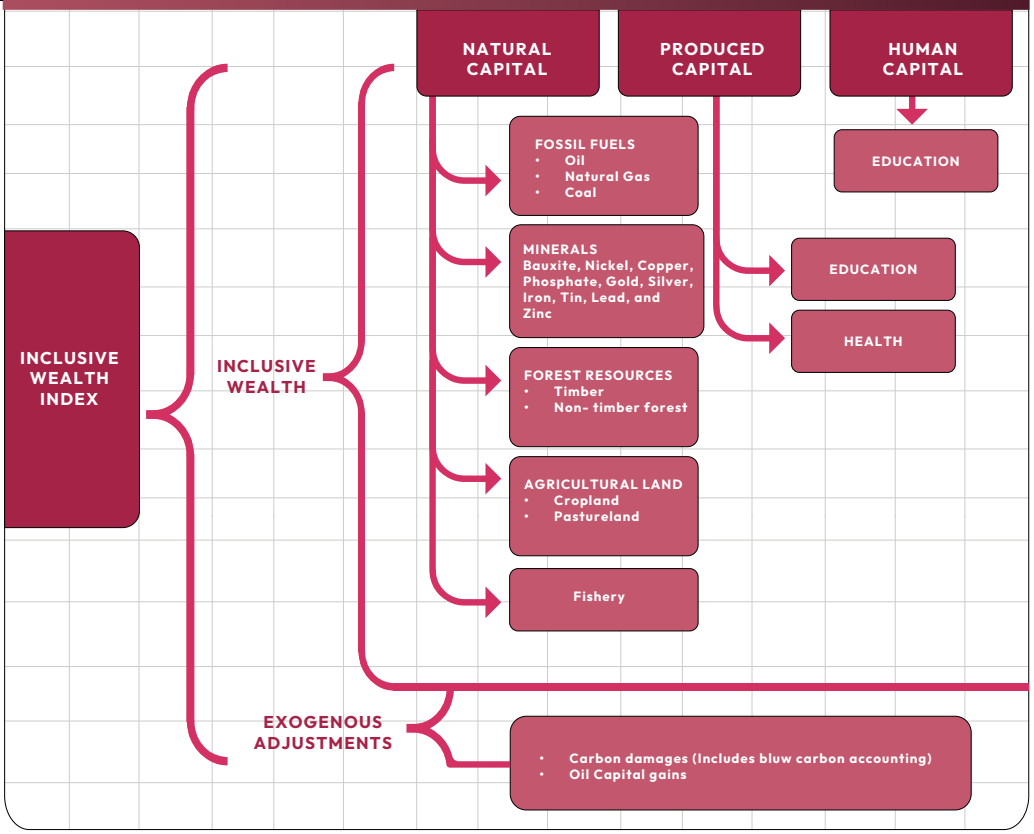
among various capital stocks (Daly, 2007). However, it is worth noting that the derivation of the wealth/welfare equivalence theorem does not explicitly state that one capital good can be completely substituted for by another. The accounting price or shadow prices are themselves functions determined by the capital stock, reflecting the extent of substitution among various capital goods in production. There may be some level of substitution between the primary forms of the three capital bases but it is not absolute.

## 3. SCHEME OF IW ACCOUNTING

Having outlined the theoretical basis for inclusive wealth, we need to consider how to construct the specific content and framework of the national empirical accounting for the IWI. First, an economy needs to measure levels and changes in various capital stocks at the national level and apply shadow prices to each capital. Furthermore, these levels and changes can be aggregated into a unified index to obtain estimates of inclusive wealth and investment aggregates. Figure 2 illustrates the three pillars of capital assets and adjustments included in the cross-country IWI framework. The framework is similar to that adopted in previous IWRs (UNU-IHDP, 2012, 2014; Managi and Kumar, 2018).

Natural capital accounting is carried out by classifying renewable and non-renewable resources. The current renewable natural resources include agricultural land (arable land and pasture), forests (timber and non-market ecosystem values) and marine fish stocks. Non-renewable natural capital includes energy and mineral resources. Of these, energy sources consist of oil, natural gas and coal, and minerals consist of aluminum, nickel, copper, phosphorus, gold, silver, iron, tin, lead and zinc.

*Fig 2.*




*Schematic representation of the Inclusive Wealth Index and the Adjusted Inclusive Wealth Index (Source: Managi & Kumar, 2018)*

An economy needs to measure levels and changes in various capital stocks at the national level and apply shadow prices to each capital •

We calculate human capital using the lifetime income-based method and provide gender-disaggregated human capital statistics. In addition to knowledge and skills, to assess human capital we also need to consider country-specific health and population dynamics. The lags between education investment and returns in developing countries are also transportation equipment, communication equipment and other assets) in capital estimation based on the perpetual inventory method (PIM).

As given in the framework, external adjustments over time need to be considered in addition to the base resource set. We state the consideration of exogenous changes over time in the next section.

We consider three time-varying exogenous adjustments of population change, cross-country externality, and total factor productivity •

## 4. TIME-VARYING EXOGENOUS ADJUSTMENTS

In the Inclusive Wealth of Nations framework, as shown in Equation 7, time is also considered an asset. However, unlike other capitals, time moves at a constant speed, a speed that it sets itself. Here we consider three time-varying exogenous adjustments of $r(t) = \frac{\partial V}{\partial t}$ :population change, cross-country externality and total factor productivity (TFP).

### 4.1 POPULATION CHANGES

Population growth is exogenous to wealth change. The assumption in Equation (3) considers a constant population, which is unrealistic given rapid population growth in the past and considerable uncertainty around future population projections (Barbier and Hochard, 2019; World Health Organization, 2019). Based on dynamic average utilitarianism, intergenerational welfare $V(t)$ can be expressed as

$$V(t) = \frac{\int_{t=s}^{\infty} P(s)[U(c(s))e^{\delta(s-t)}]ds}{\int_{t=s}^{\infty} P(s)e^{\delta(s-t)}]ds} \quad (9)$$

$P(s)$ represents the population at time $s$, and $c(s)$ represents per capita consumption at time $s$. The denominator is a discounted sum of the population from the present to the future. By denoting the vector of per capita capital stocks as $\underline{k}(t)$, rewriting formula (9) to express total welfare as a function of population and per capita capital:

$$V(t) = V(k(t), P(t)) \quad (10)$$

Economic development commonly ignores the exogenous natural capital, thus leading to the unawareness of the adverse health effects of environmental damage •

It can be proved that $\frac{\partial V}{\partial t}=0$ if the welfare changes in Equation (10) are represented only by the capital stock per capita. Thus, development is sustained only if inclusive wealth per capita, valued as constant shadow prices, does not decrease at $t$ (Dasgupta, 2001; Arrow et al., 2012).

Assuming population as the capital input in production, then output increases with population growth. However, in terms of output, increased population affects per capita consumption and welfare. Meanwhile, economic development commonly ignores exogenous natural capital, which means it is difficult to ascertain the adverse health effects of environmental damage (e.g., air pollution, climate change) and the impact of natural capital depletion on wealth. Moreover, in the absence of effective management of private rights and conservation of natural resources, free access to open natural resources is limitless, thereby exacerbating the negative impact of population growth on total wealth, ultimately leading to the tragedy of the commons.

Further, Dasgupta, Mitra and Sorger (2019) demonstrate that, all being equal, the tragedy of the commons occurs if, and only if, total population is sufficiently large relative to natural capital. In developing countries, where little is known about natural capital management and there is high population growth, accumulating human and produced capital to compensate for the depletion of natural capital is difficult, which may lead to inclusive wealth loss, thus exacerbating regional growth inequality (Dasgupta, 2010; Sugiawan and Managi, 2019; Kurniawan, Sugiawan and Managi, 2021). The high depletion rate of natural capital and damage resulting from the interrelationship between population and the environment may affect long-term progress toward achieving local and global SDGs.

## 4.2 TRANSNATIONAL EXTERNALITY

We also discuss the global environmental externalities of climate change. The environmental impact of climate change comes from CO2 emissions. While this effect is independent of the wealth accumulation process, the impact of emissions is global and societal. Let $G(t)$ be the stock of global public goods at $t$, where $G(t)$ is the concentration of CO2 in the atmosphere. Let $k_n(t)$ be the stock of private assets owned by residents of country $n$. Then intergenerational welfare can be expressed as the Equation of $k_n(t)$, $G(t)$, and time $t$:

(11)

$$V_n(t) = V_n(k_n(t), G(t), t)$$

Similar to before, we can get

(12)

$$\frac{dV_n(t)}{dt} = r_n(t) + \frac{q_n(t)dK_n(t)}{dt} + g_n(t)\sum E_n$$

Where $g_n(t) = \frac{\partial V_n(t)}{\partial G(t)}$ is the shadow price of the emission product G, and $\frac{dG_{n(t)}}{dt} = \sum E_n$ is the aggregated emission rate of each country. Equation (12) shows that a country's capital and emissions depend on shared principles and cooperation with the rest of the countries, affecting $r_n(t)$, $q_n(t)$ and $g_n(t)$. Equation (12) hints at the impact of global public externalities on the wealth of countries, which is influenced by the relationship of cooperation between countries and affects sustainable development. For the world, different frameworks have a common future but differentiated responsibilities. On a global scale, reducing the externalities of demographic change and environmental concerns must rely on transnational engagement.

## 4.3 TOTAL FACTOR PRODUCTIVITY

Technological progress is a time-varying exogenous positive factor that also varies by country. Sustainability can be enabled by increasing productivity, even with declining wealth or an increasing population. Here we denote TFP as $A(t)$, output as $Y(t)$, and capital input as $F(K(t))$, assuming that $F(K(t))$ is constant return to the scale under the steady state:

(13) $$C(t) = Y(t) = A(t)F(K(t))$$

Here, we express the intergenerational welfare $V(t)$ as a function of $C(t)$ and $t$, the differential of $V(t)$ is

(14) $$\Delta V(A(t), K(t)) = \left(\frac{dV(A(t),K(t))}{dA(t)}\right)\left(\frac{dA(t)}{dt}\right) + \sum_i \frac{\partial V(K_i(t),A(t))}{\partial K_i(t)} \Delta K_i(t)$$

Let $q_{A(t)} = \frac{dV(A(t),K(t))}{dA(t)}$ represent the shadow price of TFP, and the annual TFP change rate is denoted as $\gamma = dA(t)/dt/A(t)$. The shadow price of welfare at $t$ with consideration of TFP is

(15) $$\frac{\partial V}{\partial t} = A(t)/\left[\sum_i p_i K_i(t)\right]$$

In practice, TFP is calculated as a residue of the production function and here considers natural capital as a primary input to eliminate the impact of natural capital input on TFP. In contrast, natural capital is commonly not considered in general economic accounting.

Human capital is the knowledge, skills, competencies, and attributes embodied by an individual that contributes to creating personal, social, and economic well-being •

## 5. THE COMPONENTS OF INCLUSIVE WEALTH

The theoretical model of an IWI and the cross-country accounting framework are explained above. This section summarizes the empirical accounting for various capital goods and determining their shadow prices, which is complex, requiring time and effort. Below we discuss the capital components and empirical accounting issues in the inclusive wealth cross-country accounting framework.

### 5.1 HUMAN CAPITAL

Human capital is the knowledge, skills, competencies and attributes (e.g., health) embodied in an individual who contributes to creating personal, social and economic well-being (Schultz, 1961; Becker, 2007). These features are usually slow-moving and remain stable once acquired. Neoclassical economics admits human capital as an essential production element in economic growth; it is also a key determinant of sustainable and inclusive growth. Human capital is expressed primarily through health and education channels, which correspond to SDG 3 (good health and well-being) and SDG 4 (quality education).

We measure human capital by employing an output/income-based approach, also known as a lifelong income-based approach advocated by Jorgenson and Fraumeni (1989, 1992). This measure adds the discounted value of all individuals' expected lifetime income streams. A lifetime income stream is the labour market return an individual expects from an investment in education. The human capital stock (H) is calculated using the following formula:

(16)

$$H = e^{\delta * Edu} P_{5+edu}$$

Where δ is the rate of return to education, Edu is the educational attainment, and $P_{5+edu}$ is the total educated population in the economy. The revenue-based approach focuses on the expected return on investment; therefore, this is a forward-looking measure. This approach relies on the basic assumption that labour wages are paid based on the marginal productivity of a person's human capital.

The revenue-based approach relies on the basic assumption that labour wages are paid based on the marginal productivity of his/her human capital •

In this special issue report focusing on human capital and the role of social emotional learning, we apply a lifetime income approach to combine health and education factors, using cohort demographic information from the United Nations Population Division. Our calculations of human capital are based on life expectancy by stages. First, we utilize the EYS by gender to define education attainment. We consider the stage before completing average schooling as childhood because all investment in education occurs in childhood. Second, training and work experience are assumed as age-specific properties. Third, an average education is considered to be completed by an

The shadow price of educational capital equals the sum of the compensated present value of the average expected number of years of service •

adult population and, consequently, the total human capital stock. For adults, we estimate expected years of work (EYW) and years out of the job market based on employment and mortality rates. Finally, the shadow price of human capital is measured in terms of the average unit price of the regular human capital cycle and EYW.

The updated inclusive human capital accounts combine coherent age information about education, population dynamics, health and labour. They measure the economic return on human capital, considering the impact of health, education, gender and economic and social factors. They provide a measure related to sustainability.

The shadow price of human capital is measured in terms of EYW. The logic of this calculation is that, for individuals engaged in employment activities, the remaining years of receiving compensation for education depend on the labour market and the state of health. For the population, the shadow price of educational capital equals the sum of the compensated present value (rental rate) of the average expected number of years of service. We assume the rental rate is constant as an average over the observation period

In addition, parameters for education, health and labour markets information are applied in the cohort modelling. These parameters are critical for the next step in policy analysis. By selecting dynamic population projections and various influencing factors, long-term and short-term human capital changes, such as health losses due to air pollution or educational degradation due to school dropout, can be discussed within this framework.

## 5.2 PRODUCED CAPITAL

Produced capital is the most familiar and understandable component

Produced capital refers to infrastructure: premises, machinery and equipment, and information and communication technology •

within the wealth framework. It refers to infrastructure: premises, machinery and equipment, and information and communication technology. It includes energy infrastructure, from coal-fired power plants to solar farms, water treatment facilities and distribution networks, and transportation systems, including public transport, roads, ports and airports. It includes factories, machines, computers and office buildings for businesses. For communities, it includes hospitals, social housing and public buildings. Since accounting standards already exist for assessing and measuring changes in the produced capital stock, it is the capital most easily included in wealth accounts at the national or firm level.

Produced capital remains the cornerstone of development and is central to achieving the SDGs. Well-designed infrastructure investments can support goals related to climate change, energy, water, transport, and information and communications technology. However, there may also be significant trade-offs, especially where poorly designed investments lock in carbon-intensive infrastructure for decades. Infrastructure impacts all 17 SDGs and is directly or indirectly related to 72% of them (Thacker et al., 2019). The most significant immediate impacts are SDG 6 (clean water and sanitation) and SDG 7 (affordable and clean energy).

Many strategies exist for measuring and valuing produced capital assets. Direct surveys, insurance data and analysis of company accounts can all yield important information on the stock and value of capital assets. However, these data are only readily available in some countries. Moreover, where they are available, they can be of variable quality and are expensive and time-consuming to compile. Therefore, most studies on produced capital use PIM, which requires only data on the net investment in produced capital (including expenditures and depreciation patterns) and the useful life of assets (Lange, Wodon

PIM estimates total share capital by accumulating past purchased assets over their estimated useful lives •

and Carey, 2018). PIM calculates a balance sheet based on related investment flows. It estimates total share capital by accumulating past purchased assets over their estimated useful lives. The primary input data sources for PIM are capital investment, data about the asset's useful life and the depreciation function that describes the asset.

Considering the net produced capital owned by the country at time t denoted as $K_t$, and $K_t$,can be regarded as the net production capital of the previous period plus the capital investment It of the current period and minus the consumption of capital $D_t$ in the current period, then the expression is as follows:
PIM is a model that calculates a balance sheet based on related investment flows. It estimates total share capital by accumulating past purchased assets over their estimated useful lives. The primary input data sources for PIM are capital investment, data about the asset's useful life, and the depreciation function that describes the asset. Consider the net produced capital owned by the country at the time to be denoted as $I_t$ and $t$ can be regarded as the net production capital of the previous period plus the capital investment of the current period and minus the consumption of capital in the current period, then the expression is as follows:

(17)

$$K_t = K_{t-1} + I_{t-1} - D_{t-1}$$

However, accurate capital stock calculations require a complete time series of past investments. Such extensive data requirements may be unattainable for many countries. Furthermore, considering depreciation over time, the proportion of old capital in the current net capital stock will lose value and be zero. Therefore, we assume that old funds still impact current funds within a certain period and use the

We consider four types of capital produced: structures (residential and non-residential), transport equipment, communication equipment, and others •

earliest time as the initial investment time. Calculating the productive capital stock at this point reduces to solving (i) the initial capital stock information at the beginning of the time series, (ii) the investment data time series and (iii) the capital depreciation rate equation.

Previous studies have accumulated much literature on calculating production capital based on PIM. To calculate the initial capital K, we use the steady-state method of Herberger (1978). The practice of this approach can be found in King and Levine (1994) and, more recently, Penn World Tables (Feenstra et al., 2015). We calculate the initial capital stock:

$$K_{t-1} = \frac{I_t}{(\delta+\gamma)} \quad (18)$$

Where $\delta$ is the capital depreciation rate, $\gamma$ is the GDP growth rate that is equal to the investment growth rate and

$$\frac{K_t - K_{t-1}}{K_t} = \frac{I_t}{K_{t-1}} - \delta \quad (19)$$

We use variable capital depreciation rates by country and year to calculate produced capital. These time- and country-varying depreciation rates are obtained by considering a specific capital investment structure. Here we consider four types of capital produced: structures (residential and non-residential); transport equipment; communication equipment; and others. The investment ratios for different capitals are derived from the Pennsylvania World Table (PWT) developed by UC Davis (Feenstra, Inklaar and Timmer, 2015). The table

Natural capital refers to the stock of environmental assets that benefit people through welfare-enhancing environmental goods and services •

measures and compares real and constant GDP across countries. The capital asset depreciation rate refers to the US Bureau of Economic Analysis (BEA) (Fraumeni, 1997). It is worth noting that we use the same set of GDP data to calculate both produced and human capital, and the GDP and investment data refer to the national statistics data of the United Nations Statistics Division (2019).

The latest dataset provides a time series of produced capital stocks in 2015 US dollars for 206 countries and territories from 1990 to 2020. Initial capital estimates were made from 1970 to minimize errors during the study period (for a few countries, we estimate the initial capital stock from the 1990s).

## 5.3 NATURAL CAPITAL

Natural capital refers to the stock of environmental assets that benefit people through welfare-enhancing environmental goods and services. Stocks include fish, timber, mineral and fossil fuel deposits, and stable climates in oceans and rivers. Ecosystems should also be included in natural capital assets, which contain and combine multiple forms of capital (water, timber, biodiversity and culture).

Natural capital provides an organized intellectual framework for viewing nature through an economist's lens and offers an opportunity to bring the tools of economics to bear on the challenges of conservation and the achievement of multiple sustainable development goals. Incorporating biodiversity and ecosystem values as wealth into natural capital accounting provides a fundamental understanding of the role of nature in human societies: humans are embodied in the biosphere and supported by ecosystems. The importance of ecosystems prompts the assessment and management of this natural capital to be integrated into governments' economic

The shadow price of the capital is assumed to be its rental value, since we assume that the value of a resource is complete externally and depends on resource usage •

investment policy frameworks (Barbier and Hochard, 2018; Dasgupta, 2021; Dasgupta, 2022).

The primary motivation for thinking about natural capital rather than the 'environment' is to apply our understanding of capital theory, capital valuation, net investment management and utilization of capital services to create human well-being (Binner, Smith and Agarwala, 2017). Natural capital accounting for inclusive wealth includes non-renewable resources (fossil fuels and minerals) and renewable resources (agricultural land, forests and fisheries) as natural capital. For non-renewable resources, the stock change is simply the negative of the amount consumed (extracted) during the period, based on the latest stock estimates. The shadow price of the capital is assumed to be its rental value based on the assumption that the value of a resource is complete externally and depends on resource usage.

For renewable resources, we calculate their market and non-market values. Consistent with previous IWRs (UNU-IHDP, 2014; Managi and Kumar, 2018), the ecosystem service values of forests were updated from the Ecosystem Service Assessment database (Van der Ploeg, de Groot and Wang, 2010), and we estimate fishery capital stocks as part of renewable natural capital. Furthermore, estimating fishery stocks simplifies matters by assuming that the fish stocks belong to the country where fishing and stocking occurs. Additionally, in this latest update, we also consider the value of coastal marine ecosystems, which we calculate as carbon storage values and consider an essential component of national wealth.

## 5.4 ADJUSTMENT

For population change, we measure wealth per capita change to

Carbon damage, oil capital gain, and total factor productivity are three time varying factors that are considered as "adjustments" in the IWI methodology •

exclude the impact of time variants. In addition, there are three time-varying factors affecting wealth and social well-being that are not covered by familiar capital assets. These are carbon damage, oil capital gain and total factor productivity. These are calculated and considered 'adjustments' in the IWI methodology. For these adjustments, we first calculate the impact of greenhouse gas emissions as the global externality of climate change. The cost of global greenhouse gas emissions is estimated in the unit of $CO_2$ damage. Accounting for greenhouse gasses includes two types: (1) carbon emissions from fossil energy sources; and (2) increased emissions from deforestation. We then follow Nordhaus's method to allocate carbon emissions to countries based on the country's or region's GDP proportion of global GDP (Nordhaus, 2011). In particular, we introduce the effect of blue carbon (i.e., carbon stored in coastal and marine ecosystems) on carbon damage. However, since there is only a year of blue carbon accounting data, this aspect is not reflected in the analysis of the results.

We follow the non-parametric approach introduced by Olley and Pakes (1992) and Levinsohn and Petrin (2003) by using proxy variables to construct a trans log production function in which natural capital is treated as a free variable for production inputs, as is human capital. This estimate separates the contribution of natural capital from production from technological innovation, the role of creativity in production, and other implicit capital that has not yet been considered in building a nation's inclusive wealth.

Finally, we consider the capital gains of oil exporters on depletable resource inventories and the corresponding losses of oil importers. In a closed economy, price increases for an exhaustible resource are negligible because prices balance gains and losses for producers and consumers. However, in a group of interconnected open economies, exporters can expect higher prices (and thus have greater control over

We describe specific future challenges for constructing inclusive cross-country accounts of wealth, including practical considerations and limitations •

future goods), and importers suffer accordingly. Conversely, importing countries may have fewer investment opportunities due to higher oil prices, so oil capital losses are distributed to consuming countries.

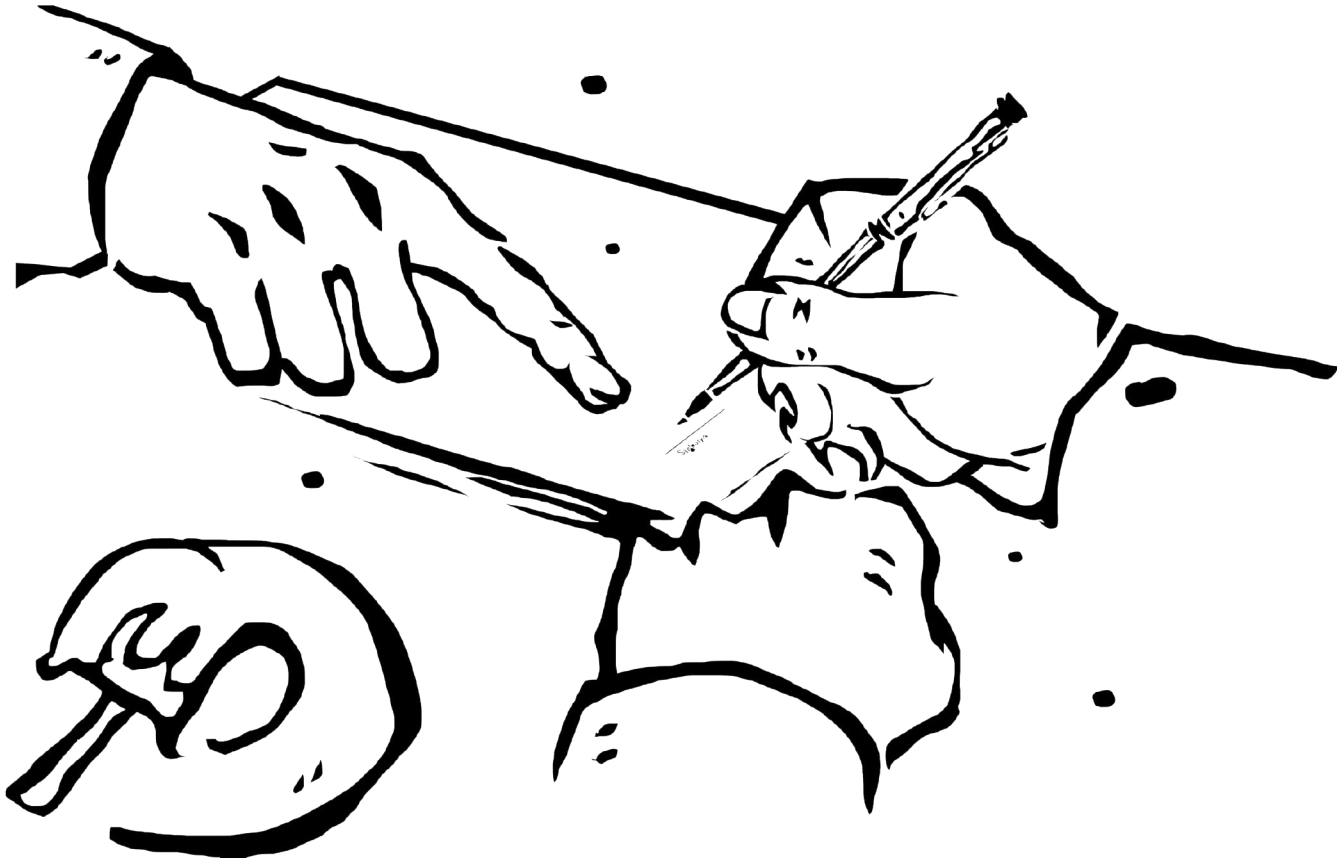
## 6. CHALLENGES

In this section, we describe specific future challenges for constructing inclusive cross-country accounts of wealth, including practical considerations and limitations that should be considered along with the findings.

The lack of current data forces us to leave out values of some key natural capital ecosystem services. Moreover, while reporting on the mining (or production) process of minerals is ubiquitous, estimates of mineral reserves need to be further completed. Global water accounts also need further refinement and we need to begin including the value of marine ecosystems.

Another area of concern for future reports is the dichotomy between production- and consumption-based accounts. Production-based accounts record the depletion of resources within a country's borders within a year, regardless of where those resources are ultimately consumed. Consumption-based accounts capture the depletion of resources reflected in a country's demand for consumption goods and services, regardless of where these depletions occur (Lenzen et al., 2013). Examining both sets of accounts together provides a complete picture of an economy's contribution to national and global sustainability (United Nations et al., 2014). Insight into dependencies on domestic versus global resource stocks is critical to understanding resource security issues.

Among other things, our estimates of human capital lack information



Expanding the scope of inclusive wealth accounts requires us to refine the data further and evaluate inclusive wealth from a more comprehensive perspective •

on differences in human capital compensation between male and female populations. Therefore, the shadow price of human capital cannot fully reflect the differences in social values of different gender groups.

In the case of produced capital, we use the latest PWT database (from 2020) capital structure for production capital estimates. However, due to the intertemporal baskets of consumer goods and services, they may have different prices. Therefore, purchasing power parity or inflation index adjustments have been implemented across countries, which improves comparability across countries but mitigates the real potential difference from the purchase side.

Other valuation issues may also arise when using wealth measures at the level of an intertemporal framework. For example, in terms of natural capital, the interpretation of the values used in the non-timber forest accounts relies on the estimated benefits per unit of forest based on global averages. This approach may not fully capture the rising value of these resources due to depletion. Moreover, forest stocks are valued using period-specific marginal prices, ignoring the changes in willingness to pay overtime, especially in situations where

The IWI can be an appropriate composite indicator to be used in conjunction with the many existing goal specific indicators used to monitor the SDGs to ensure overall sustainability for societies across the world •

there is resource depletion. Additionally, using global averages may not be accurately representative of all countries. These questions might lead to misleading conclusions when comparing wealth or per capita wealth changes over time.

In short, expanding the scope of inclusive wealth accounts requires us to refine the data further and evaluate inclusive wealth from a more comprehensive perspective. Despite these limitations, the trends we observe across a wide range of capital assets and their analysis provide essential insights and knowledge for discussing sustainable development outcomes and trajectories for the future.

## 7. CONCLUSION

There is no doubt that the wealth of countries is changing, and the composition of that wealth, in terms of capital stocks, is also changing – and not necessarily on a sustainable path for many countries. We recommend that decision-makers are cognizant of the changes in the productive base of their societies and act accordingly to ensure that the welfare of future generations is as high or higher than that of the present generation.

By showing how countries around the world use inclusive wealth accounting in policy formulation and target setting, policy assessment and monitoring, and economic modelling and analysis, this report demonstrates the need for more detailed and broader information to support national capital accounting.

Estimating each capital requires multiple database entries, and integrating all IWI data into a unified country time series is critical for inclusive wealth accounting. In this report, we present IWI country time-series data for 38 countries, acknowledging that they

are incomplete. The IWI can therefore be considered an appropriate composite indicator to be used in conjunction with the many existing goal-specific indicators used to monitor the SDGs to ensure overall sustainability for societies around the world.

Finally, we assert that experience has shown that the ability to mobilize assets is critical to addressing shared global challenges. Public investment can provide the foundation to support a sustainable, inclusive, resilient and prosperous recovery worldwide if capital assets can be managed in concert and allocated effectively.

## KEY MESSAGES

**Gross Domestic Product (GDP) is no longer a useful indicator** for measuring the well-being of a nation.

**The Inclusive Wealth Index (IWI) provides a framework** for assessing national economic growth and development beyond GDP. It is a composite measure of a society's productive base based on levels and changes over time and human well-being.

**This chapter discusses each of the capital components** of the inclusive wealth cross-country accounting framework individually, as well as associated empirical accounting issues.

**This chapter describes specific future challenges and limitations** ffor constructing inclusive cross-country accounts of wealth.

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CHAPTER

02

# Human Capital by Gender - a G20 and *selected geographies perspective*

**Barbara M. Fraumeni, Gang Liu, and Shunsuke Managi**

*abstract*

This chapter aims to identify the sources of human capital growth over the period 1990–2020 by region, gender and various other determinants, such as age, population, labour compensation and expected years of school. It focuses on gender in five important country groups – Asia, Africa, Latin America, the G20 and the European Union – and highlights the differences between them. The results suggest that human capital per capita varies significantly across countries in each group. Moreover, education and human capital are unevenly distributed among males and females, although both total and per capita human capital have grown over time in almost all countries. The results suggest that attention must be paid to what has happened to the world's gender-disaggregated levels of education and human capital per capita over time. The future sustainability of nations and the well-being of individuals within these nations depend on the continuation of historical progress.

# 1

## INTRODUCTION

The United Nations' Inclusive Wealth Report[1] documents how human capital is the predominant wealth in most countries worldwide. Moreover, human capital benefits both individuals and their countries. This chapter focuses on four major elements of human capital by gender from 1990 to 2020: expected years of schooling (EYS), per capita human capital, contributions to human capital growth and human capital Gini coefficients. These are presented and discussed for Africa, Asia, Latin America, the European Union (EU)

1. 'The Inclusive Wealth Report (IWR) is a biennial effort led by the United Nations Environment Programme (UNEP) to evaluate national capacities and performance in terms of measuring economic sustainability and well-being. Existing national statistical systems use Systems of Environmental and Economic Accounts, which are geared towards measuring the flow of income. These flows critically depend upon the health and resilience of capital assets like manufactured capital, human capital and natural capital' (UNEP, 2023).

This chapter focuses on four major elements of human capital by gender from 1990 to 2020: EYS, per capita human capital, contributions to human capital growth and human capital Gini coefficients •

and the G20, which includes some countries in the previous groups, and others such as Australia and the United States.[2] Taken together, the countries included in these groups account for 97% of the world's population both in 1990 and 2020.[3] Both the absolute level of the three major elements across the five country groups and the relative levels within the groups show distinctive gender differences and trends. Human capital per capita rankings are shown in Appendix B for 1990 and 2020 for all 166 countries covered by the IWR.

Human capital can differ significantly by gender for several reasons. These include, for example, education, occupation, years worked, hours worked and wages paid. EYS, number of educated individuals who have completed the average EYS, number of working years remaining by gender, and average wages paid from 1990 to 2020, as well as lifetime earnings, all impact the contributions to IWR human capital economic growth. Using EYS and lifetime earnings, the IWR takes a forward-looking approach to highlight the sustainability of a country's economic growth.

## 2. MEASUREMENT APPROACHES

There are two major approaches for measuring human capital: monetary measures and indicator-based measures. There are two major monetary measures and four major indicator-based measures that use the two different approaches[4]. The IWR and the World

2. Latin America includes countries in Central and South America where Romance languages, which are derived from Latin, are predominantly spoken. The region also includes some Caribbean countries. A listing of the countries included in each of the five groups and the world is in the appendices: Appendix A covers Africa, Asia, Latin America, the EU and the G20 and Appendix B covers the 166 world countries.

3. There are 249 countries listed in United Nations population data sets. Those not included in this study are mostly very small countries and include a number in the Caribbean, Melanesia, Micronesia and Polynesia, and a few elsewhere, such as Antarctica, Jersey and Monaco.

4. All six major measures are described in Fraumeni (2021). The introduction to this book gives an overall summary of each measure; six of the chapters cover each of the measures in more detail.

There are two major approaches for measuring human capital: monetary measures and indicator-based measure •

Bank's Changing Wealth of Nations (CWON) series are the two major monetary measures, and both are lifetime income measures. The IWR methodology, which is largely based on a model by Arrow et al. (2012), is described later in this chapter. The CWON adopts the Jorgenson-Fraumeni methodology (1989, 1992a, 1992b) for measuring human capital based on the World Bank's extensive private database[5] whereas the IWR depends on publicly available data. The Jorgenson-Fraumeni methodology calculates the lifetime market income of an individual as the sum of future expected labour income discounted to the present, but which is allowed to grow over time at a specified rate. Since Fraumeni (2021), the latest comprehensive monetary versions to have been published are CWON 2021 (World Bank, 2021a) and the 2018 IWR (UNEP, 2023).

The four major indicator-based measures using the indicator-based approach are the Institute for Health Metrics and Evaluation Human Capital Index (IHME), the United Nations Human Development Index (HDI), the World Economic Forum's Global Human Capital Index (WEFGHCI) and the World Bank's Human Capital Index (WBHCI). There are some similarities between the first three approaches as they all incorporate education and health components, with the HDI also having a standard of living component. The WEFGHCI differs markedly from the others as it emphasizes both education and employment. It also draws upon LinkedIn's membership information. The World Economic Forum's Executive Opinion Survey constructs a Herfindahl–Hirschman index of concentration among broad fields of study. Its four dimensions are capacity, deployment, development and know-how. All major indicator-based measures equally weight their main top-level components.[6,7] Since Fraumeni (2021), the HDI has published new comprehensive estimates (United Nations Development Programme, 2022). All the

5. Before its 2018 report (Lange, Wodon and Carey, 2018), the CWON series relied upon a residual approach to measure human capital.

6. A major issue with indexes is how to weight components.

7. See Fraumeni (2021) for further information on all six major measures.

six major measures (monetary and indicators) are for a large number of countries, more than 100 each, and all of the latest comprehensive versions depend on the methodology presented in Fraumeni (2021).

EYS is determined by the enrolment, labour force participation and survival rates of those aged 5 to 24 •

## 3. EXPECTED YEARS OF SCHOOLING

In the 2022 IWR (UNEP, 2023), EYS replaced years of school completed, a measure that had been applied for human capital estimation in all previous IWRs (Managi and Kumar, 2018). EYS is a well-accepted measure; for example, it is a component of the Human Development Index (UNDP, 2019). EYS estimates are based on population education enrolment rates and are calculated using school life tables (Stockwell and Nam, 1963).

IWR EYS is determined by the enrolment, labour force participation and survival rates of those aged five to 24.[8] Compared to Barro and Lee's (2013, 2018) measure of school years currently completed, it is forward-looking because it considers how many years of school will eventually be completed. For example, a 15-year-old included in the Barro-Lee data set for current years of school completed may complete more years of education in the future.

Figure 1 presents the average EYS by gender every five years over the period 1990–2020 for the world and the five country groups.[9] The group average is a weighted average of each country's EYS using the number of individuals aged zero to four in each constituent country in

8. EYS is given by $e_x^i = \frac{T_x^i}{l_x}$, where $e_x^i$ indicates the length of life expectancy, the first stage ($i = 1$) represents the period of childhood during which one receives education, with the upper age limit for this stage assumed to be 24 years. The second stage ($i = 2$) represents the adult population generally engaging in the work stage. Educational attainment, training or work skills in adulthood are assumed to be age-specific properties rather than a product of public education. The term $T_x^i = \sum_x^\infty s_x^i * L_x^n$ represents the number of person-years spent alive and enrolled in education or work at age x or older; $s_x^i$ denotes the school enrolment rate in childhood if i = 1 and the labour participation rate in adulthood if i = 2. $L_x^n$ indicates the cohort's number of years lived within the indicated age interval (x, x + n). Term $l_x$ represents the age-specific survival rate, indicating the number of individuals alive at the beginning of the age interval.

9. The authors calculated the aggregates presented in all of the figures and tables in this chapter.

*Fig 1.*


*Expected years of schooling (EYS) by gender, every five years, 1990-2020**

** There is one more country in Asia in this figure than in figures and tables which include human capital as Palestine EYS is estimated, but Palestine human capital is not estimated.*

Compared to Barro and Lee's measure of school years currently completed, EYS is forward-looking since it considers how many years of school will eventually be completed •

a group or the world as the weight.[10,11] (Table 2, which will be discussed later, presents the groups' share of the total covered country groups

10. The population data for those aged zero to four come from the United Nations Department of Economic and Social Affairs, Population Division (2019), and include population data through 2020.*

11. The 'world' in this chapter includes 166 countries, which account for almost 99% of the population of all countries in the world.

Figure 1 shows a consistent pattern between EYS in the three regions and those of the EU and the G20 •

population and world population for males, females and both genders aged zero to four in 1990 and 2020.)

Figure 1 shows a consistent pattern between EYS in the three regions and those of the EU and the G20. The geographic aggregates across all such aggregates, for female and male EYS respectively, rise from a low of 5.7 and 7.4 for Africa in 1990 to a high of 11.7 and 12.2 in 2020 for Latin America. The lowest values and the highest values rise for individual geographic aggregates in each region; the only case in which the 1990 EYS is higher than the 2020 EYS is for males in Latin America. EYS has increased because of the strong correlation between education and income earned, and female EYS has increased relative to male EYS. Even though females' access to education may have improved over time, given societal norms, disproportionate care responsibilities and gender discrimination, females may have to achieve a higher level of education to achieve the same level of labour market outcomes as males (Carvalho and Evans, 2022). Female EYS in Africa is always less than that for males, Asian female EYS catches up to that of males and surpasses it, and female Latin American EYS is always greater than that of males, except in 1990 when it is slightly less. In regions or countries with relatively high levels of female labour force participation, such as Latin America, the EU and China, female EYS by region is higher than that of males by the end of the period or sooner. EYS in the EU is higher than EYS in the G20, and there is a higher population share of high-income countries in the EU than in the G20 in large part because China and India are middle-income countries. There is a strong association between a country's level of income and its level of average education, because high-income countries can afford better education infrastructure and individuals with higher education have the ability to earn higher incomes. EU female EYS is always higher than EU male EYS. In 2010, G20 female EYS is greater than that of G20 male EYS. For the purposes of comparison, we present the world EYS, which looks very

*Table 1.*

| | | | Africa | | Asia* | | Latin America | |
|---|---|---|---|---|---|---|---|---|
| | | | Country | Value | Country | Value | Country | Value |
| 1990 | Male | Lowest | Mali | 2.6 | Afghanistan | 3.7 | Haiti | 2.3 |
| | | Highest | Gabon | 11.8 | Korea, Republic | 14.0 | Argentina | 14.2 |
| | Female | Lowest | Niger | 1.4 | Yemen | 1.4 | Haiti | 2.9 |
| | | Highest | S. Africa | 11.5 | Saudi Arabia | 14.5 | Argentina | 15.7 |
| | Both | Lowest | Niger | 2.0 | Afghanistan | 2.8 | Haiti | 2.6 |
| | | Highest | Gabon | 11.5 | Saudi Arabia | 14.0 | Argentina | 14.9 |
| 2020 | Male | Lowest | Somalia | 1.6 | Korea, Democratic People's Republic of | 8.2 | Haiti | 3.0 |
| | | Highest | Gabon | 11.8 | Turkey | 16.9 | Chile | 16.4 |
| | Female | Lowest | Somalia | 0.9 | Iraq | 6.9 | Haiti | 3.9 |
| | | Highest | Mauritius | 15.3 | Hong Kong | 17.0 | Argentina | 17.5 |
| | Both | Lowest | Somalia | 1.3 | Iraq | 7.9 | Haiti | 3.5 |
| | | Highest | Mauritius | 14.9 | Turkey | 16.8 | Chile | 16.7 |
| | | | | | | | | |
| | | | G20 | | EU | | World | |
| | | | Country | Value | Country | Value | Country | Value |
| 1990 | Male | Lowest | Cyprus | 9.1 | Cyprus | 9.1 | Haiti | 2.3 |
| | | Highest | Canada | 15.9 | Germany | 14.6 | Canada | 15.9 |
| | Female | Lowest | India | 6.6 | Cyprus | 9.3 | Niger | 1.4 |
| | | Highest | Canada | 17.0 | Finland | 15.2 | Canada | 17.0 |
| | Both | Lowest | India | 8.2 | Cyprus | 9.2 | Mali | 1.1 |
| | | Highest | Canada | 16.4 | Finland | 14.6 | Canada | 16.4 |
| 2020 | Male | Lowest | India | 11.1 | Luxembourg | 13.8 | Somalia | 1.6 |
| | | Highest | Australia | 18.4 | Greece | 17.7 | Australia | 18.4 |
| | Female | Lowest | India | 11.7 | Luxembourg | 14.0 | Somalia | 0.9 |
| | | Highest | Denmark | 19.3 | Denmark | 19.3 | Denmark | 19.3 |
| | Both | Lowest | India | 11.4 | Luxembourg | 13.9 | Somalia | 1.3 |
| | | Highest | Australia | 18.5 | Ireland | 18.0 | Australia | 18.5 |

*Lowest and highest values for expected years of school by gender, 1990 and 2020*

** There is one more country in Asia in this figure than in figures and tables which include human capital as Palestine EYS is estimated, but Palestine human capital is not estimated.*

There is a strong association between a country's level of income and its level of average education •

similar to that of Asia because the two most populous countries in the world, China and India, are in Asia. The 1990 world male EYS is almost identical to that of Asia, but the 1990 world female EYS is higher than the female EYS for Asia. Subsequently, Asia EYS for both males and females rises somewhat faster than that of the world.

Table 1 shows that there is a high level of diversity among the groups. In all five groups except Latin America, EYS gradually increases from

*Table 2.*

| | 1990 | | 2020 | | 1990 | 2020 | Number of countries |
|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Total | Total | |
| | % the population* | | % of population* | | % of population* | | |
| Africa | 16.3 | 16.8 | 28.3 | 29.3 | 16.6 | 28.8 | 46 |
| Asia** | 64.9 | 64.1 | 55.2 | 54.1 | 64.5 | 54.7 | 48** |
| Latin America | 8.8 | 9.0 | 7.7 | 7.8 | 8.9 | 7.8 | 22 |
| G20 | 63.9 | 63.1 | 51.1 | 50 | 63.5 | 50.6 | 43 |
| EU | 4.0 | 4.0 | 3.2 | 3.2 | 4.0 | 3.2 | 27 |
| | % of world | | % of world | | % of world | | |
| | 97.0 | 97.1 | 97.9 | 97.9 | 97.1 | 97.9 | 167 |

*Share of population aged zero to four in the world and country groups by gender (%), 1990 and 2020*

**The shares do not add up to one as all EU countries are in the G20 and some Africa, Asia, or Latin America countries are in the G20.*

***There is one more Asia country in this table, table 1, and figure 1, than in subsequent tables and figures as an estimate for Palestine EYS was constructed, but not an estimate for human capital.*

lowest to highest. In Latin America, Haiti's EYS is significantly below that of the next lowest country's EYS, which is either Guatemala or Honduras, ranging from a difference of about 3.5 to 8 during the period 1990–2020. The lowest and highest world EYS is always included in one of the featured groups covered in this report.

The substantial relative growth in Africa and the decrease in the relative shares in all other groups for the population aged zero to four are documented in Table 2. While there have been widespread birth rate increases in Africa, the decrease in the birth rate in China is the primary reason for the decrease in the Asia share. The percentage decline in the birth rate as evidenced by those aged zero to four in Latin America is about half that for the G20 and the EU.

Human capital per capita is the best measure of a country's relative human capital since it indicates how an individual is faring on average •

The year 2020 is the only year in which the difference between the male and female percentage in absolute value is greater than or equal to 1 percentage point. In 2020, the percentage difference between African males versus females is –1.0 percentage point, and the corresponding Asia and G20 percentage point difference is 1.1 percentage points. In Asia and the G20, the percentage of the male population aged zero to four is higher than that of females, but in Africa, the reverse is the case. In the EU, the percentage of the population aged zero to four is equal for males and females; in Latin America, the percentages differ slightly.

## 4. HUMAN CAPITAL PER CAPITA

As a headline indicator, human capital per capita is calculated as human capital divided by the total population. Human capital per capita is the best measure of a country's relative human capital as it indicates how an individual is faring on average rather than a country's total human capital, determined by the workforce size. The size of the educated population and the total population is a component of the methodology used to construct human capital per capita.

Human capital per capita is the best measure of a country's relative human capital as it indicates how an individual is faring on average.

(1)

IWR human capital in a country, HC, is estimated by using the following formula:

$$HC = \underbrace{e^{\rho \cdot Edu}}_{Term_1} \cdot \underbrace{P_{5+Edu}}_{Term_2} \cdot \underbrace{\int_0^T w \cdot e^{-\delta\tau} d\tau}_{Term_3},$$

where $\rho$ is the return to years of schooling, Edu is the average expected years of schooling, $P_{5+edu}$ is the number of individuals who are old enough to have finished the average number of years of education, $T$ is an employee's expected remained working years, $w$ is the average annual labor compensation, and $\delta$ is the discount rate.

Term 1 captures return to schooling, Term 2 is the number of individuals who have completed the average number of years of education and who might be working, while Term 3 is labour compensation received by an individual over their lifetime, discounted to the present. Following the underlying model developed by Arrow et al. (2012), by country, w is held constant over the whole period, 1990–2020, and because of data limitations, w is the same for males and females.[12] As suggested by Klenow and Rodriguez-Clare (1997),

12. It is difficult to obtain publicly available wage rates by gender for a large number of countries. The World Bank, in its Changing Wealth of Nations series (World Bank, 2021), may have annual labour compensation by gender, but not necessarily hours worked in order to compute the hourly wage rate. Montenegro and Patrinos (2014) estimate Mincer equations which show that return to schooling (see Figure 2, p. 8) is higher for females than for males.

Fig 2.


*Human capital per capita by gender, every five years, 1990-2020 (thousands, 2015 US dollars)**

** There is one more country in Asia in this figure than in figures and tables which include human capital as Palestine EYS is estimated, but Palestine human capital is not estimated.*

Figure 2 presents the average human capital per capita by gender every five years from 1990 to 2020 for the world and the country groups •

the rate of return to education is set at 8.5%, as is the discount rate. Human capital is deflated using country-level purchasing power parities.

Figure 2 presents the average human capital per capita by gender every five years from 1990 to 2020 for the world and the country groups. The y-axis scales for Africa, Asia, Latin America and the world are identical to facilitate comparison; those for the G20 and the EU

The average annual labour compensation rate per country is held constant over the whole period •

differ as these groups' human capital per capita is so much higher than that of the others. There is a consistent pattern among the five country groups, as human capital per capita rises between Africa and Asia, Asia and Latin America, Latin America and the G20, and the G20 and the EU. Even the 2020 figures are lower than the following shown male or female aggregate 1990 figure; for example, human capital per capita in Africa in 2020 is less than human capital per capita in Asia in 1990; human capital per capita in Asia in 2020 is less than human capital per capita in Latin America in 1990, and so forth. In Figure 1, we see that male and female human capital per capita differ less than expected. There are two reasons for this, as previously noted: the average annual labour compensation rate per country is held constant over the whole period and the male and female average annual labour compensation rates, because of the lack of publicly available data, are the same. In Africa, Asia and Latin America, female human capital per capita is less than that of males in each of the years shown, with the 2020 difference between male and female human capital per capita being about US$1,500 for Africa, just over US$2,000 for Asia and US$1,000 for Latin America.[13] Of these three, Latin American female human capital per capita demonstrates the greatest catch-up to males between 1990 and 2020, as the percentage of female human capital of male human capital per capita rose 13.9 percentage points compared to 10.4 percentage points for Africa and 5.6 percentage points for Asia. Other factors besides EYS impact Latin America human capital per capita, as female human capital per capita is always less than that of males even though female EYS is always greater than male EYS. Some of these factors are explored in the decomposition section of this chapter, which outlines each of the three terms' contribution to growth in human capital. Brazil (first) and Mexico (second) are the two largest countries in their region in terms of population, accounting for over 50% of the total population in Latin America. The overall human capital ranking dropped slightly

13. Dollar amounts are 2015 US dollars.

In general, female human capital per capita is greater than male human capital per capital in high income countries •

between 1990 and 2020 in both countries, from 60th to 57th for Brazil and from 71st to 68th for Mexico. In Africa, where human capital per capita is very low, the second largest country by population, Ethiopia, has the lowest average human capital per capita of all 166 countries in 1990; in 2020 it ranks next to last.[14] Nigeria, the largest country in this region by population, is in the bottom 10 average human capital per capita countries in both years. The level of Asian human capital per capita is primarily due to that in China and India. Specifically, it is India's human capital per capita that results in a second lowest by region figure as its average human capital ranks 133rd in both 1990 and 2020. China's average human capital ranks 95th in 1990 and 85th in 2020. For the years shown, G20 female human capital per capita is always above that of males; world female human capital per capita is above that of males from 1995. The EU is the only group in which there is a clear crossing point between female and male human capital per capita. After 2000, female human capital per capita is always greater than male human capital per capita. Just over half of the G20 countries are high-income countries, but the two G20 countries that are the most populous in the world, China and India, are not high-income countries.[15] Only two of the 27 EU countries – Bulgaria and Greece – are not high-income countries. In general, it is in high-income countries, particularly G20 high-income countries, where female human capital per capita is greater than male human capital per capita. The world figures are all above those for Africa, Asia and Latin

America, and the EU figures are above those for the G20, as would be expected given the relative EYS level.

14. See Table 4 and its discussion later in this report for the lowest and highest country human capital per capita by gender and overall in 1990 and 2020, and Appendix B for a listing of rankings by gender.

15. See https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups for a listing of high-income countries.

*Table 3.*

| | 1990 | | 2020 | | 1990 | 2020 | Number of countries |
|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Total | Total | |
| | % the population* | | % of population* | | % of population* | | |
| **Africa** | 11.3 | 11.6 | 16.4 | 16.7 | 11.4 | 16.5 | 46 |
| **Asia**** | 63.1 | 61.3 | 61.8 | 60.1 | 62.2 | 61.0 | 47 |
| **Latin America** | 8.3 | 8.6 | 8.3 | 8.8 | 8.5 | 8.5 | 22 |
| **G20** | 71.9 | 71.7 | 65.0 | 64.5 | 71.8 | 64.7 | 43 |
| **EU** | 7.9 | 8.4 | 5.7 | 6.1 | 8.2 | 5.9 | 27 |
| | % of world | | % of world | | % of world | | |
| | 97.9 | 97.7 | 98.5 | 98.3 | 97.8 | 98.4 | 166 |

*Share of the covered total population in the World and by aggregates and gender (%)*

**The shares do not add up to one as all EU countries are in the G20 and some Africa, Asia, or Latin America countries are in the G20.*

***There is one less Asia country in this table, subsequent tables, figure 2, and subsequent figures, than in tables 1 and 2, and figure 1, as an estimate for Palestine EYS was constructed, but not one for human capital.*

Comparing Table 2 to Table 3 (and Table 5), the present and future impacts of higher and rising birth rates in Africa are evident. The 1990 African countries' share drops from around 16% for the population aged zero to four to about 11% for the total population; in 2020, the drop is from 28–29% to 16% respectively. Table 3 shows that Asia is the only region in which the male percentage of the total population remains at least 1 percentage point greater than that for females in 2020; there is no group in which females have at least a 1-percentage-point larger share than males. Comparing Table 3 to Table 2, the shares for the G20 are much higher than those in Table 2, and the EU Table 3 shares are about double those of Table 2, which suggests that the G20 and the EU on average have older populations than Africa, Asia or Latin America.

Often a country which has the lowest (or highest) EYS is also the country with the lowest (or highest) human capital per capita •

Within the human capital per capita aggregates, as with EYS, there is a high level of diversity. The countries in the lowest or highest EYS or human capital per capita categories are frequently the same (Table 4). More than 50% of the time in the case of Africa, Asia and Latin America, when a country has the lowest or highest EYS, it also has the lowest or highest human capital per capita. This is most common among those countries with the lowest value in both categories. Haiti appears in all of Latin America's lowest categories. For the G20 in all categories, India always ranks lowest and Luxembourg always ranks

*Table 4.*

| | | | Africa | | Asia* | | Latin America | |
|---|---|---|---|---|---|---|---|---|
| | | | Country | Value | Country | Value | Country | Value |
| 1990 | Male | Lowest | Ethiopia | 1.2 | Nepal | 2.9 | Haiti | 6.8 |
| | | Highest | Gabon | 63.4 | Singapore | 305.1 | Argentina | 69.6 |
| | Female | Lowest | Niger | 0.9 | Iraq | 1.6 | Haiti | 6.5 |
| | | Highest | Gabon | 61.8 | Saudi Arabia | 267.8 | Uruguay | 71.9 |
| | Both | Lowest | Ethiopia | 1.1 | Nepal | 2.6 | Haiti | 6.6 |
| | | Highest | Gabon | 62.6 | Singapore | 286.6 | Uruguay | 70.3 |
| 2020 | Male | Lowest | Somalia | 1.3 | Korea, Democratic People's Republic of | 3.5 | Haiti | 7.7 |
| | | Highest | Mauritius | 58.5 | United Arab Emirates | 388.2 | Chile | 109.4 |
| | Female | Lowest | Somalia | 0.8 | Iraq | 1.9 | Haiti | 8.0 |
| | | Highest | Mauritius | 56.9 | Macao | 364.6 | Chile | 108.2 |
| | Both | Lowest | Somalia | 1.1 | Iraq | 3.4 | Haiti | 7.9 |
| | | Highest | Mauritius | 57.7 | Macao | 357.7 | Chile | 108.8 |
| | | | | | | | | |
| | | | G20 | | EU | | World | |
| | | | Country | Value | Country | Value | Country | Value |
| 1990 | Male | Lowest | India | 6.7 | India | 8.7 | Ethiopia | 1.2 |
| | | Highest | Luxembourg | 786.8 | Luxembourg | 786.8 | Luxembourg | 786.8 |
| | Female | Lowest | India | 4.4 | Bulgaria | 33.2 | Niger | 0.9 |
| | | Highest | Luxembourg | 699 | Luxembourg | 699.0 | Luxembourg | 699.0 |
| | Both | Lowest | India | 5.6 | Bulgaria | 33.0 | Ethiopia | 1.1 |
| | | Highest | Luxembourg | 742.0 | Luxembourg | 742.0 | Luxembourg | 742.0 |
| 2020 | Male | Lowest | India | 8.7 | Bulgaria | 43.6 | Somalia | 1.3 |
| | | Highest | Luxembourg | 1014.9 | Luxembourg | 1014.9 | Luxembourg | 1014.9 |
| | Female | Lowest | India | 5.5 | Bulgaria | 46.4 | Somalia | 0.8 |
| | | Highest | Luxembourg | 1008 | Luxembourg | 1008.0 | Luxembourg | 1008.0 |
| | Both | Lowest | India | 7.2 | Bulgaria | 45.0 | Somalia | 1.1 |
| | | Highest | Luxembourg | 1011.5 | Luxembourg | 1011.5 | Luxembourg | 1011.5 |

*Lowest and highest values for human capital per capita by gender, 1990 and 2020**

** There is one less Asian country in this table as an estimate for Palestine human capital was not constructed.*

There are several human capital per capita jumps within each aggregate •

highest. For all world categories, there are two consistent country appearances in the lowest category – Ethiopia and Somalia – and in the highest category it is always Luxembourg.

In most cases, except for Africa and Latin America, there are several human capital per capita jumps within each group. All countries' human capital per capita within their group are ranked to examine this phenomenon. The increase is considered significant if the difference

*Table 5.*

| | 1990 | | 2020 | | 1990 | 2020 | Number of countries |
|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Total | Total | |
| | % the population** | | % of population** | | % of population** | | |
| Africa | 10.4 | 11.0 | 14.1 | 14.9 | 10.7 | 14.5 | 46 |
| Asia** | 62.9 | 61.3 | 63.4 | 61.2 | 62.1 | 62.3 | 47 |
| Latin America* | 8.0 | 8.0 | 8.1 | 8.5 | 8.0 | 8.3 | 22 |
| G20 | 73.9 | 73.2 | 67.7 | 66.7 | 73.6 | 67.2 | 43 |
| EU | 8.8 | 9.2 | 6.3 | 6.7 | 9.0 | 6.5 | 27 |
| | % of world | | % of world | | % of world | | |
| | 97.9 | 97.7 | 98.6 | 98.4 | 97.8 | 98.5 | 166 |

*Table 5. Share of educated population in the world and country groups by gender (%), 1990 and 2020**

** Educated population refers to individuals who have completed the average number of EYS completed in their country.*

*** The shares do not add up to one as all EU countries are in the G20 and some African, Asian or Latin American countries are in the G20.*

**** There is one less Asian country in this table as an estimate for Palestine human capital was not constructed.*

between adjacent ranked countries in 2015 US dollars is US$20,000 or more. The only time there is such a significant difference in Africa is between males' and females' highest and next highest country human capital per capita level in 1990. The only time such a significant difference occurs for Latin America is between the countries ranked 18th and 19th: Venezuela and Uruguay, respectively, in female human capital per capita in 1990. The jumps in human capital per capita for Asia, the G20 and the EU typically start in the last third of countries, ranked from lowest to highest. The exception is the EU in 2020 for males and females; significant differences in ranked human capital per capita figures begin much earlier for males and females. Since the world group includes many more countries than any of the other groups, it is not surprising that jumps occur rarely; in fact, almost all occur for countries that are ranked low. Subsequent differences in human capital per capita almost always occur between all countries ranked 161 or higher.

Table 5 presents the share of educated population in different country groups •

The last population factor that directly impacts human capital is the number of individuals who have completed the average EYS, that is, the educated population. Table 5, which presents the share of the educated population, is much more similar to Table 3, the total

Luxembourg, Switzerland, and Norway are countries with the top rankings for male and female human capital per capita in 1990 and 2020 •

population table, than to Table 1, the population aged zero to four. In 1990, the African, Asian and Latin American educated population shares in Table 5, except for Asian females, are lower than the shares in Table 3. In both years, the G20 and the EU educated population shares are significantly higher than the corresponding total population shares. In 2020, the African educated population shares are about 2 percentage points lower than the total population shares, but the Asian educated population shares are higher than the total population shares. In 2020, the Latin American shares are reasonably similar in the two tables.

Appendix B lists the human capital per capita 1990 and 2020 rankings for all 166 countries by gender. Appendix Table B1 includes the male rankings and the changes in rankings between the two years; Appendix B2 includes the female rankings and the changes in rankings between the two years. The top three countries for males and females in 1990 and 2020 are Luxembourg, Switzerland and Norway. Denmark and the United States are ranked either fourth or fifth in both years. There is a fair amount of movement up or down among the next five countries in the ranking list between 1990 and 2020. In 1990, male human capital for Canada and Germany were ranked among the next five, but not in 2020. Instead in 2020, Austria, Belgium, France, The Netherlands and the United Arab Emirates are ranked among the next five for male human capital. In 1990, female human capital for Canada, Finland, France, and Germany were ranked among the next five, but not in 2020. Instead in 2020, Austria, Belgium, Iceland and The Netherlands are ranked among the next five for female human capital. Ethiopia, Niger and Somalia are continually ranked among the bottom three for both males and females in both 1990 and 2020. The bottom 10th-ranked countries for male human capital per capita are always in Africa; for females, there are a couple of exceptions: Afghanistan and Iraq in 1990 and only Iraq in 2020. Changes of 10 or

Contributions to human capital growth are analysed using a decomposition approach •

more up or down are considered large changes and there are almost three times as many large changes in rankings for females than for males. In addition, female large changes on average are much greater than male large changes. With one exception, male large changes are in the middle third of the rankings, with only one male large change for a country in the top 25 in 2020. Female large changes are much more widely distributed than male large changes. The greatest male upward movement is Bhutan and Turkey at 12; the greatest downward male movement is Gabon at 15. Half of the eight male large changes are in Asian countries; all but one of the other four changes are in an African country. Similarly, half of the 22 female large changes are in Asian countries; almost half of the remaining female large changes are in African countries. The greatest female upward movement is Iran at 28; the greatest downward movement is Gabon at 25.

Appendix Table B3 shows how much male rankings have changed between 1990 and 2020 compared to female rankings for all 166 countries. The difference columns subtract the female human capital per capita ranking from that of males. The change in the difference column indicates if the male/female rank difference has increased between 1990 and 2020 (a positive number) or declined (a negative number). The change in the difference column does not indicate if the rank of either males or females has improved; that can be ascertained by looking at Appendix B1 or B2 or by comparing the rank columns in Appendix B3. There are 12 large change differences (differences greater than 10). Two-thirds of the large rank changes between 1990 and 2020 show that the differences in ranks between males and females have narrowed. Half of the significant rank changes are for Asian countries, and one-third is for African countries. Within Asia, four of the significant rank changes are for countries in the Middle East, except in the case of Yemen, where the difference between the male and female human capital per capita ranks narrows, and the

Figure 3 shows the decompositions for Africa, Asia, Latin America, the G20 and the EU for the time period from 1990 to 2020 •

female rank improves between 1990 and 2020.

## 5. DECOMPOSITIONS

The contributions to human capital growth are analysed using a decomposition approach. The framework was first employed in the previous IWR (UNEP, 2023; Liu, 2021). Since human capital of a country k in an aggregate consisting of K countries is estimated separately for males and females (gender being indexed by j, j = 1, 2), one has:

(2) $$HC_{jk} = \prod_i Term_{ijk}, \quad i = 1,2,3; \; j=1\;2; k=1\;2,,\ldots K,$$

and the total aggregate human capital, $HC^R$ will be:

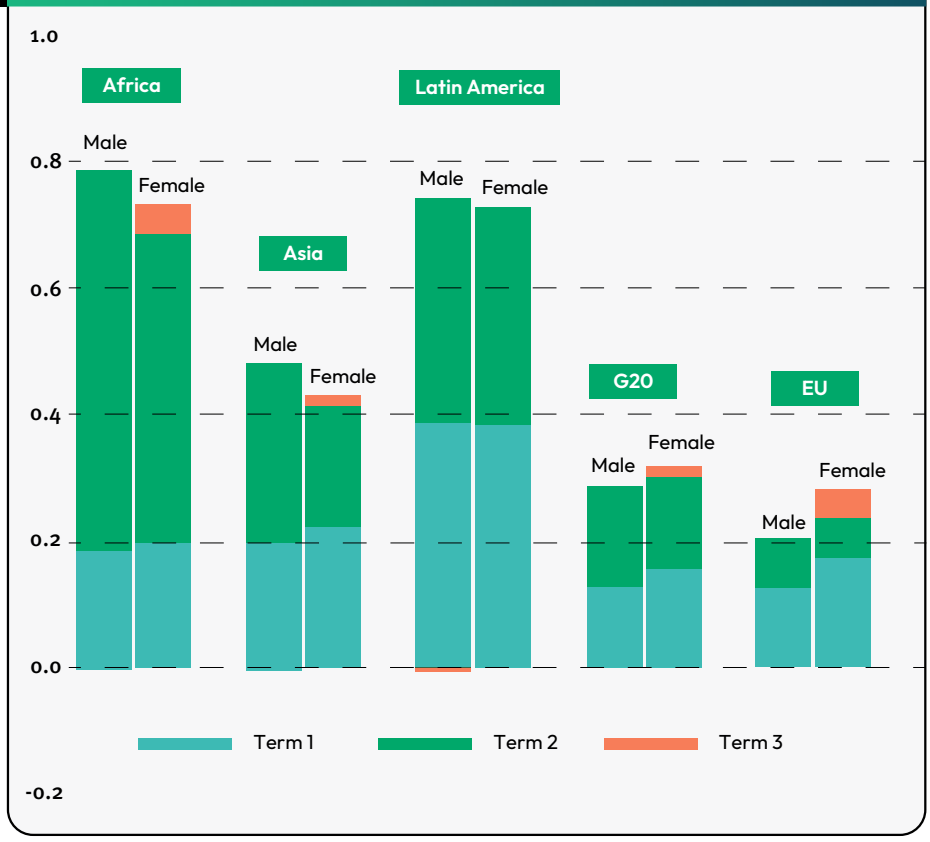
(3) $$HC^R = \sum_{jk} HC_{jk} = \sum_{jk} \left(\prod_i Term_{ijk}\right), \quad i = 1,2,3; \; j=1,2; k=1,2,\ldots K,$$

Term i, when i=1 is the return to schooling, when i=2 is the number of individuals who have finished the average number of years of education and might be working, and when i=3 is the labor compensation received by an individual over their lifetime. By using the logarithmic mean function as weights, the (percentage) growth of aggregate human capital defined in equation (3) can be decomposed as:

(4) $$\frac{\Delta HC^R}{HC^R} = \frac{\sum_{jk} \Delta HC_{jk}}{HC^R} = \left(\sum_i \sum_{jk} \frac{\Delta HC_{jk}}{\Delta(lnHC_{jk})} \Delta lnTerm_{ijk}\right) / HC^R, \quad i = 1,2,3; \; j=1,2; k=1,2,\ldots K,$$

where Δ stands for the change of variable between two time points.

*Fig 3.*




*Contributions to human capital growth by country groups and by gender, 1990–2020**

** There is one less Asian country in this figure as an estimate for Palestine human capital was not constructed.*

The largest contributor to human capital growth is term two which represents the number of individuals who have finished the average number of years of education •

(5)

Formally, the contribution by each factor indexed by Term i, gender j, and country k to the regional human capital growth is defined as:

$$Contribution\ (i, j, k) = \left(\frac{\Delta HC_{jk}}{(ln_{HC_{jk}})}\Delta lnTerm_{ijk}\right)/HC^{R},\ i = 1, 2, 3;\ j = 1, 2;\ k = 1, 2, \ldots K.$$

Figure 3 shows the 1990–2020 decompositions for Africa, Asia, Latin America, the G20 and the EU.[16] It is not surprising given the population growth in Africa that the largest contribution to its human capital growth is term 2, the number of individuals who have finished the average number of EYS and who might be working. The Africa term 2 contribution is also the largest term 2 contribution of any of the

16. In IWR 2022 (UNEP, 2023) the 1990–2020 decompositions are shown in Appendix 5 for all of the countries covered.

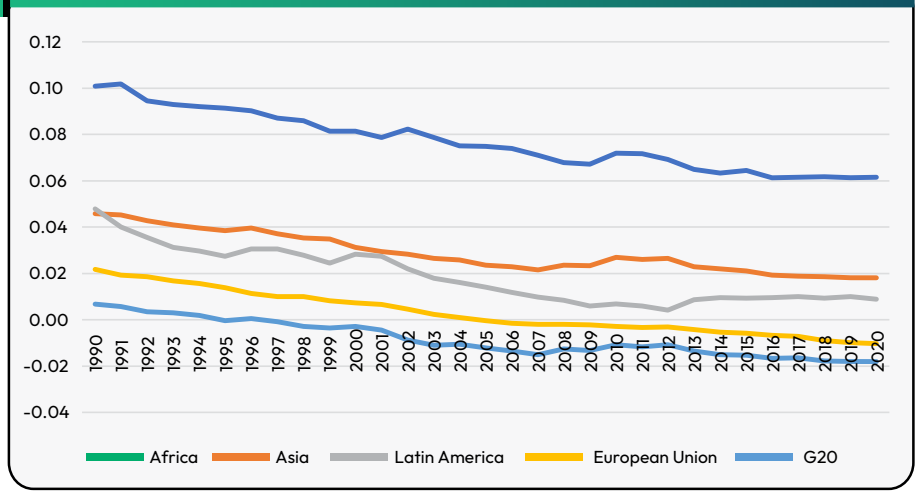
five groups. The Africa and Asia male term 2 contributions are larger than their corresponding female term 2 contributions. Latin America, the G20 and the EU term 2 male and female contributions are about equal. The Latin America term 1 contribution, the return to schooling contribution term, is the largest of any of the five groups, although it is only a few percentage points larger than its term 2 contribution. The G20 and EU contributions are the smallest of any of the five groups. Both male and female EU term 1 contributions are larger than their term 2 contributions. In the case of the G20, the female term 1 contribution is larger than the male contribution, but for males, the reverse is the case. As expected, term 3, labour compensation received by an individual over a lifetime, typically is quite small and even negative; however, for Latin American females it is 9.3%. The size of term 3 reflects the limitation of the current methodology applied by the IWR project for human capital estimation, in which no difference is allowed for labour compensation between genders and over years, leading to term 3 being practically determined solely by expected remaining working years. Finally, note that total African and Asian male contribution to human capital growth is greater than that for females, but for Latin America, the G20 and the EU the reverse is the case.

## 6. GINI GENDER COEFFICIENT

A Gini gender coefficient is computed to examine the gender distribution of human capital among educated people, to determine whether it is relatively equal or unequal. A positive estimated Gini gender coefficient value indicates that educated males generate or own more human capital than educated females, while a negative value suggests the opposite. The larger the absolute value, the more unevenly human capital is distributed between genders, and a value of zero implies that human capital is equally distributed among educated males and females.

A Gini gender coefficient is computed to examine the gender distribution of human capital among educated people •

*Fig 4.*




*Gini gender coefficient, 1990–2020**

This chapter highlights differences between five country groups by gender: Asia, Africa, Latin America, the G20 and the EU •

Figure 4 shows the Gini gender coefficient for each of the five aggregates from 1990 to 2020. The highest coefficient is for Africa; Asia and Latin America have fairly similar coefficients as do the EU and the G20. The coefficients generally decrease over time, indicating that the extent to which educated males generate/own more human capital than females lessens over time. The EU and the G20 are the only groups in which educated females generate/own more human capital than males at some point. This occurs for the EU beginning in 2006 and the G20 starting in 1997.

## 7. CONCLUSION

To understand levels and trends in human capital and human capital per capita, it is essential to analyse components of human capital by gender. This chapter focuses on five essential country groups by gender: Asia, Africa, Latin America, the G20 and the EU, to highlight differences between them.

The order of the groups in Figures 1–3 is intentional and clearly shows how EYS, human capital per capita, decomposition contributions and the Gini gender coefficient change from one group to the next. The human capital per capita of countries within each total differs significantly; the diversity within each is highlighted by showing the lowest and the highest EYS and human capital per capita value within each group. Contributions by terms and Gini gender coefficients summarize the impact that education and human capital have had on individuals in countries over time.

Changes in relative birth rates are evidenced by the shares of those aged zero to four, the total population and the educated population. Particular attention should be paid to Africa because it is the region with the highest population growth rates. Even though Asia zero to four and total population shares have been declining, Asia still represents the majority of the world's population in all of the three population measures. Notably, the Asia educated world population percentage rises slightly between 1990 and 2020. The population shares for the G20, a collection of powerful countries, are all decreasing, even considering both China and India are members of the G20. All of the EU population shares, even though historically Europe is a region that has shaped the world, are declining. Of all the country groups, population shares in Latin America display minor changes relative to their starting values.

It is essential to observe changes in the levels of education and human capital per capita by gender in the world over time. This will assist government officials and researchers in formulating future policies. The future sustainability of countries and the welfare of individuals within countries may depend on historical progress continuing.

## KEY MESSAGES

**This chapter aims to identify the sources of human capital growth** for the observation period 1990-2020 by region, gender and various determinants, such as age, population, labour compensation and EYS.

**The study focuses on five important aggregates by gender** – Asia, Africa, Latin America, the G20 and the EU – to highlight the differences between them. Human capital per capita varies significantly across countries in each group.

**Education and human capital is unevenly distributed among males and females,** although both total and per capita human capital have grown over time in almost all countries.

**Attention must be paid** to what has happened to the world's gender-disaggregated levels of education and human capital per capita over time. The future sustainability of nations and the well-being of individuals within nations depend on the continuation of historical progress.

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# APPENDIX A

## COUNTRIES IN THE FIVE GROUPS

**Africa (46):** Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Capo Verdi, Cameroon, Central African Republic, Chad, Congo, Congo (Democratic Republic of), Côte d'Ivoire, Djibouti, Egypt, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome & Principe, Senegal, Sierra Leone, Somalia, South Africa, Tanzania (United Republic of), Togo, Tunisia, Uganda, Zambia, Zimbabwe.

**Asia (47 or 48):** Afghanistan, Armenia, Azerbaijan, Bahrain, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Cyprus, Georgia, Hong Kong, India, Indonesia, Iran, Iraq (Islamic Republic of), Israel, Japan, Jordan, Kazakhstan, Korea (Democratic People's Republic of), Korea (Republic of), Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Macao, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syrian Arab Republic, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Viet Nam. Palestine is in the EYS section only.

**Latin America (22):** Argentina, Bolivia (Plurinational State of), Brazil, Belize, Chile, Columbia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela (the Bolivarian Republic of).

**European Union (27):** Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

**G20 (43):** All of the members of the EU listed above, plus Argentina, Australia, Brazil, Canada, China, India, Indonesia, Japan, Korea (Republic of), Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom, United States.

# APPENDIX B1

## COUNTRY RANKINGS FOR MALE HUMAN CAPITAL PER CAPITA

*Table B1.*

| 1990 | | 2020 | | |
|---|---|---|---|---|
| Country | Rank | Country | Rank | Difference |
| Luxembourg | 1 | Luxembourg | 1 | |
| Switzerland | 2 | Switzerland | 2 | |
| Norway | 3 | Norway | 3 | |
| United States | 4 | Denmark | 4 | 1 |
| Denmark | 5 | United States | 5 | –1 |
| Germany | 6 | Belgium | 6 | 3 |
| France | 7 | Netherlands | 7 | 4 |
| Austria | 8 | Austria | 8 | |
| Belgium | 9 | United Arab Emirates | 9 | 7 |
| Canada | 10 | France | 10 | –3 |
| Netherlands | 11 | Germany | 11 | –5 |
| Singapore | 12 | Sweden | 12 | 1 |
| Sweden | 13 | United Kingdom | 13 | 1 |
| United Kingdom | 14 | Finland | 14 | 1 |
| Finland | 15 | Australia | 15 | 3 |
| United Arab Emirates | 16 | Ireland | 16 | 5 |
| Iceland | 17 | Iceland | 17 | |
| Australia | 18 | Macao | 18 | 1 |
| Macao | 19 | Canada | 19 | –9 |
| Israel | 20 | Hong Kong | 20 | 3 |
| Ireland | 21 | Japan | 21 | 3 |
| Italy | 22 | Italy | 22 | |
| Hong Kong | 23 | Singapore | 23 | –11 |
| Japan | 24 | Israel | 24 | –4 |
| Brunei Darussalam | 25 | Spain | 25 | 1 |
| Spain | 26 | Brunei Darussalam | 26 | –1 |
| New Zealand | 27 | New Zealand | 27 | |
| Bahamas | 28 | Malta | 28 | 2 |
| Qatar | 29 | Slovenia | 29 | 2 |
| Malta | 30 | Korea, Republic of | 30 | 2 |
| Slovenia | 31 | Portugal | 31 | 2 |
| Korea, Republic of | 32 | Bahamas | 32 | –4 |
| Portugal | 33 | Qatar | 33 | –4 |
| Bahrain | 34 | Greece | 34 | 1 |
| Greece | 35 | Cyprus | 35 | 2 |

| | | | | |
|---|---|---|---|---|
| Saudi Arabia | 36 | Saudi Arabia | 36 | |
| Cyprus | 37 | Bahrain | 37 | –3 |
| Estonia | 38 | Oman | 38 | 6 |
| Barbados | 39 | Czechia | 39 | 1 |
| Czechia | 40 | Croatia | 40 | 1 |
| Croatia | 41 | Hungary | 41 | 2 |
| Kuwait | 42 | Estonia | 42 | –4 |
| Hungary | 43 | Chile | 43 | 5 |
| Oman | 44 | Barbados | 44 | –5 |
| Argentina | 45 | Kuwait | 45 | –3 |
| Slovakia | 46 | Costa Rica | 46 | 6 |
| Uruguay | 47 | Slovakia | 47 | –1 |
| Chile | 48 | Trinidad & Tobago | 48 | 1 |
| Trinidad & Tobago | 49 | Latvia | 49 | 2 |
| Gabon | 50 | Uruguay | 50 | –3 |
| Latvia | 51 | Argentina | 51 | –6 |
| Costa Rica | 52 | Lithuania | 52 | 1 |
| Lithuania | 53 | Poland | 53 | 1 |
| Poland | 54 | Maldives | 54 | 8 |
| Suriname | 55 | Venezuela | 55 | 3 |
| Russia | 56 | Russia | 56 | |
| Panama | 57 | Brazil | 57 | 2 |
| Venezuela | 58 | Malaysia | 58 | 3 |
| Brazil | 59 | Panama | 59 | –2 |
| Belarus | 60 | Turkey | 60 | 12 |
| Malaysia | 61 | Belarus | 61 | –1 |
| Maldives | 62 | Suriname | 62 | –7 |
| Azerbaijan | 63 | Mauritius | 63 | 5 |
| South Africa | 64 | Azerbaijan | 64 | –1 |
| Romania | 65 | Gabon | 65 | –15 |
| Jordan | 66 | Romania | 66 | –1 |
| Cuba | 67 | Mexico | 67 | 3 |
| Mauritius | 68 | South Africa | 68 | –4 |
| Jamaica | 69 | Cuba | 69 | –2 |
| Mexico | 70 | Jordan | 70 | –4 |
| Kazakhstan | 71 | Kazakhstan | 71 | |
| Turkey | 72 | Bulgaria | 72 | 2 |
| Bosnia & Herzegovina | 73 | Jamaica | 73 | –4 |
| Bulgaria | 74 | Bosnia & Herzegovina | 74 | –1 |
| Serbia | 75 | Belize | 75 | 1 |
| Belize | 76 | Serbia | 76 | –1 |

| | | | | |
|---|---|---|---|---|
| Namibia | 77 | North Macedonia | 77 | 5 |
| Turkmenistan | 78 | Dominican Republic | 78 | 2 |
| Guyana | 79 | Namibia | 79 | –2 |
| Dominican Republic | 80 | Colombia | 80 | 4 |
| Samoa | 81 | Bhutan | 81 | 12 |
| North Macedonia | 82 | Guyana | 82 | –3 |
| Fiji | 83 | Iran | 83 | 9 |
| Colombia | 84 | Turkmenistan | 84 | –6 |
| Guatemala | 85 | Samoa | 85 | –4 |
| Angola | 86 | Guatemala | 86 | –1 |
| Sri Lanka | 87 | Fiji | 87 | –4 |
| Eswatini | 88 | Eswatini | 88 | |
| El Salvador | 89 | Paraguay | 89 | 1 |
| Paraguay | 90 | Angola | 90 | –4 |
| Tunisia | 91 | China | 91 | 5 |
| Iran | 92 | Sri Lanka | 92 | –5 |
| Bhutan | 93 | Tunisia | 93 | –2 |
| Botswana | 94 | El Salvador | 94 | –5 |
| Albania | 95 | Thailand | 95 | 5 |
| China | 96 | Botswana | 96 | –2 |
| Ecuador | 97 | Albania | 97 | –2 |
| Armenia | 98 | Algeria | 98 | 1 |
| Algeria | 99 | Peru | 99 | 10 |
| Thailand | 100 | Morocco | 100 | 10 |
| Egypt | 101 | Djibouti | 101 | 4 |
| Honduras | 102 | Cabo Verde | 102 | 10 |
| Yemen | 103 | Ecuador | 103 | –6 |
| Congo | 104 | Armenia | 104 | –6 |
| Djibouti | 105 | Honduras | 105 | –3 |
| Ukraine | 106 | Ukraine | 106 | |
| Vanuatu | 107 | Egypt | 107 | –6 |
| Bolivia | 108 | Syria | 108 | 5 |
| Peru | 109 | Bolivia | 109 | –1 |
| Morocco | 110 | Mauritania | 110 | 1 |
| Mauritania | 111 | Vanuatu | 111 | –4 |
| Cabo Verde | 112 | Yemen | 112 | –9 |
| Syria | 113 | Uzbekistan | 113 | 1 |
| Uzbekistan | 114 | Congo | 114 | –10 |
| Moldova | 115 | Indonesia | 115 | 2 |
| Pakistan | 116 | Pakistan | 116 | |
| Indonesia | 117 | Viet Nam | 117 | 2 |

| | | | | |
|---|---|---|---|---|
| Georgia | 118 | Mongolia | 118 | 4 |
| Viet Nam | 119 | Nicaragua | 119 | 2 |
| Sao Tome & Principe | 120 | Georgia | 120 | –2 |
| Nicaragua | 121 | Moldova | 121 | –6 |
| Mongolia | 122 | Sao Tome & Principe | 122 | –2 |
| Papua New Guinea | 123 | Papua New Guinea | 123 | |
| Philippines | 124 | Ghana | 124 | 1 |
| Ghana | 125 | Philippines | 125 | –1 |
| Cameroon | 126 | Laos | 126 | 3 |
| Côte d'Ivoire | 127 | Cameroon | 127 | –1 |
| Kenya | 128 | India | 128 | 4 |
| Laos | 129 | Kenya | 129 | –1 |
| Zambia | 130 | Côte d'Ivoire | 130 | –3 |
| Haiti | 131 | Bangladesh | 131 | 5 |
| India | 132 | Haiti | 132 | –1 |
| Zimbabwe | 133 | Lesotho | 133 | 4 |
| Kyrgyzstan | 134 | Zambia | 134 | –4 |
| Gambia | 135 | Afghanistan | 135 | 9 |
| Bangladesh | 136 | Kyrgyzstan | 136 | –2 |
| Lesotho | 137 | Benin | 137 | 2 |
| Guinea | 138 | Zimbabwe | 138 | –5 |
| Benin | 139 | Guinea | 139 | –1 |
| Iraq | 140 | Myanmar | 140 | 3 |
| Chad | 141 | Gambia | 141 | –6 |
| Senegal | 142 | Chad | 142 | –1 |
| Myanmar | 143 | Senegal | 143 | –1 |
| Afghanistan | 144 | Cambodia | 144 | 3 |
| Tajikistan | 145 | Iraq | 145 | –5 |
| Korea, Democratic People's Republic of | 146 | Mali | 146 | 4 |
| Cambodia | 147 | Sierra Leone | 147 | 5 |
| Central African Republic | 148 | Togo | 148 | 1 |
| Togo | 149 | Tajikistan | 149 | –4 |
| Mali | 150 | Central African Republic | 150 | –2 |
| Congo, Democratic Republic of | 151 | Eritrea | 151 | 2 |
| Sierra Leone | 152 | Nepal | 152 | 3 |
| Eritrea | 153 | Congo, Democratic Republic of | 153 | –2 |
| Uganda | 154 | Korea, Democratic People's Republic of | 154 | –8 |
| Nepal | 155 | Uganda | 155 | –1 |

| | | | | |
|---|---|---|---|---|
| Madagascar | 156 | Madagascar | 156 | |
| Burkina Faso | 157 | Rwanda | 157 | 3 |
| Mozambique | 158 | Mozambique | 158 | |
| Nigeria | 159 | Burkina Faso | 159 | –2 |
| Rwanda | 160 | Burundi | 160 | 1 |
| Burundi | 161 | Nigeria | 161 | –2 |
| Malawi | 162 | Malawi | 162 | |
| Tanzania | 163 | Tanzania | 163 | |
| Niger | 164 | Niger | 164 | |
| Somalia | 165 | Ethiopia | 165 | 1 |
| Ethiopia | 166 | Somalia | 166 | –1 |

# APPENDIX B2

## COUNTRY RANKINGS FOR FEMALE HUMAN CAPITAL PER CAPITA

*Table B2.*

| 1990 | | 2020 | | |
|---|---|---|---|---|
| Country | Rank | Country | Rank | Difference |
| Luxembourg | 1 | Luxembourg | 1 | |
| Switzerland | 2 | Switzerland | 2 | |
| Norway | 3 | Norway | 3 | |
| United States | 4 | Denmark | 4 | 1 |
| Denmark | 5 | United States | 5 | –1 |
| Canada | 6 | Sweden | 6 | 3 |
| Finland | 7 | Belgium | 7 | 5 |
| France | 8 | Iceland | 8 | 6 |
| Sweden | 9 | Austria | 9 | 2 |
| Germany | 10 | Netherlands | 10 | 5 |
| Austria | 11 | Finland | 11 | –4 |
| Belgium | 12 | France | 12 | –4 |
| United Kingdom | 13 | United Kingdom | 13 | |
| Iceland | 14 | Ireland | 14 | 8 |
| Netherlands | 15 | Germany | 15 | –5 |
| Singapore | 16 | Canada | 16 | –10 |
| Australia | 17 | Macao | 17 | 6 |
| Israel | 18 | Australia | 18 | –1 |

| | | | | |
|---|---|---|---|---|
| Japan | 19 | Hong Kong | 19 | 2 |
| Italy | 20 | Japan | 20 | –1 |
| Hong Kong | 21 | Singapore | 21 | –5 |
| Ireland | 22 | Italy | 22 | –2 |
| Macao | 23 | Israel | 23 | –5 |
| Bahamas | 24 | Spain | 24 | 2 |
| New Zealand | 25 | United Arab Emirates | 25 | 4 |
| Spain | 26 | New Zealand | 26 | –1 |
| Brunei Darussalam | 27 | Slovenia | 27 | 1 |
| Slovenia | 28 | Brunei Darussalam | 28 | –1 |
| United Arab Emirates | 29 | Malta | 29 | 4 |
| Portugal | 30 | Portugal | 30 | |
| Qatar | 31 | Bahamas | 31 | –7 |
| Korea, Republic of | 32 | Korea, Republic | 32 | |
| Malta | 33 | Cyprus | 33 | 3 |
| Estonia | 34 | Greece | 34 | 1 |
| Greece | 35 | Qatar | 35 | –4 |
| Cyprus | 36 | Estonia | 36 | –2 |
| Barbados | 37 | Croatia | 37 | 2 |
| Hungary | 38 | Czechia | 38 | 2 |
| Croatia | 39 | Barbados | 39 | –2 |
| Czechia | 40 | Hungary | 40 | –2 |
| Uruguay | 41 | Bahrain | 41 | 3 |
| Slovakia | 42 | Chile | 42 | 10 |
| Argentina | 43 | Kuwait | 43 | 8 |
| Bahrain | 44 | Slovakia | 44 | –2 |
| Gabon | 45 | Latvia | 45 | 1 |
| Latvia | 46 | Costa Rica | 46 | 10 |
| Trinidad & Tobago | 47 | Lithuania | 47 | 2 |
| Poland | 48 | Argentina | 48 | –5 |
| Lithuania | 49 | Oman | 49 | 22 |
| Russia | 50 | Uruguay | 50 | –9 |
| Kuwait | 51 | Poland | 51 | –3 |
| Chile | 52 | Trinidad & Tobago | 52 | –5 |
| Suriname | 53 | Saudi Arabia | 53 | 9 |
| Belarus | 54 | Russia | 54 | –4 |
| Panama | 55 | Venezuela | 55 | 2 |
| Costa Rica | 56 | Panama | 56 | –1 |
| Venezuela | 57 | Maldives | 57 | 18 |
| Azerbaijan | 58 | Brazil | 58 | 1 |
| Brazil | 59 | Malaysia | 59 | 2 |

| | | | | |
|---|---|---|---|---|
| Brazil | 59 | Malaysia | 59 | 2 |
| Romania | 60 | Belarus | 60 | –6 |
| Malaysia | 61 | Suriname | 61 | –8 |
| Saudi Arabia | 62 | Azerbaijan | 62 | –4 |
| Kazakhstan | 63 | Mauritius | 63 | 5 |
| Jamaica | 64 | Romania | 64 | –4 |
| Cuba | 65 | South Africa | 65 | 1 |
| South Africa | 66 | Cuba | 66 | –1 |
| Bulgaria | 67 | Mexico | 67 | 5 |
| Mauritius | 68 | Turkey | 68 | 8 |
| Bosnia & Herzegovina | 69 | Kazakhstan | 69 | –6 |
| Namibia | 70 | Gabon | 70 | –25 |
| Oman | 71 | Bulgaria | 71 | –4 |
| Mexico | 72 | Jamaica | 72 | –8 |
| Serbia | 73 | Serbia | 73 | |
| Turkmenistan | 74 | Dominican Republic | 74 | 3 |
| Maldives | 75 | Namibia | 75 | –5 |
| Turkey | 76 | Bosnia & Herzegovina | 76 | –7 |
| Dominican Republic | 77 | North Macedonia | 77 | 1 |
| North Macedonia | 78 | Colombia | 78 | 8 |
| Samoa | 79 | Belize | 79 | 1 |
| Belize | 80 | Bhutan | 80 | 16 |
| Guyana | 81 | Guyana | 81 | |
| Angola | 82 | China | 82 | 12 |
| Botswana | 83 | Turkmenistan | 83 | –9 |
| Guatemala | 84 | Thailand | 84 | 11 |
| Eswatini | 85 | Albania | 85 | 8 |
| Colombia | 86 | Paraguay | 86 | 1 |
| Paraguay | 87 | Eswatini | 87 | –2 |
| Armenia | 88 | Botswana | 88 | –5 |
| El Salvador | 89 | Fiji | 89 | 2 |
| Sri Lanka | 90 | Angola | 90 | –8 |
| Fiji | 91 | Guatemala | 91 | –7 |
| Ukraine | 92 | El Salvador | 92 | –3 |
| Albania | 93 | Samoa | 93 | –14 |
| China | 94 | Sri Lanka | 94 | –4 |
| Thailand | 95 | Jordan | 95 | 4 |
| Bhutan | 96 | Peru | 96 | 6 |
| Vanuatu | 97 | Tunisia | 97 | 10 |
| Ecuador | 98 | Armenia | 98 | –10 |

| | | | | |
|---|---|---|---|---|
| Jordan | 99 | Cabo Verde | 99 | 7 |
| Congo | 100 | Djibouti | 100 | 13 |
| Bolivia | 101 | Ecuador | 101 | –3 |
| Peru | 102 | Honduras | 102 | 1 |
| Honduras | 103 | Ukraine | 103 | –11 |
| Moldova | 104 | Iran | 104 | 28 |
| Uzbekistan | 105 | Vanuatu | 105 | –8 |
| Cabo Verde | 106 | Bolivia | 106 | –5 |
| Tunisia | 107 | Morocco | 107 | 7 |
| Georgia | 108 | Uzbekistan | 108 | –3 |
| Viet Nam | 109 | Viet Nam | 109 | |
| Egypt | 110 | Congo | 110 | –10 |
| Indonesia | 111 | Mongolia | 111 | 1 |
| Mongolia | 112 | Indonesia | 112 | –1 |
| Djibouti | 113 | Georgia | 113 | –5 |
| Morocco | 114 | Mauritania | 114 | 6 |
| Papua New Guinea | 115 | Algeria | 115 | 18 |
| Sao Tome & Principe | 116 | Nicaragua | 116 | 3 |
| Philippines | 117 | Moldova | 117 | –13 |
| Ghana | 118 | Egypt | 118 | –8 |
| Nicaragua | 119 | Ghana | 119 | –1 |
| Mauritania | 120 | Sao Tome & Principe | 120 | –4 |
| Kenya | 121 | Papua New Guinea | 121 | –6 |
| Cameroon | 122 | Philippines | 122 | –5 |
| Haiti | 123 | Laos | 123 | 1 |
| Laos | 124 | Cameroon | 124 | –2 |
| Zambia | 125 | Kenya | 125 | –4 |
| Syria | 126 | Haiti | 126 | –3 |
| Yemen | 127 | Syria | 127 | –1 |
| Zimbabwe | 128 | Pakistan | 128 | 10 |
| Lesotho | 129 | Lesotho | 129 | |
| Kyrgyzstan | 130 | Côte d'Ivoire | 130 | 1 |
| Côte d'Ivoire | 131 | Zambia | 131 | –6 |
| Iran | 132 | Bangladesh | 132 | 5 |
| Algeria | 133 | Zimbabwe | 133 | –5 |
| Gambia | 134 | Kyrgyzstan | 134 | –4 |
| India | 135 | Guinea | 135 | 1 |
| Guinea | 136 | Benin | 136 | 6 |
| Bangladesh | 137 | India | 137 | –2 |
| Pakistan | 138 | Myanmar | 138 | 1 |
| Myanmar | 139 | Gambia | 139 | –5 |
| Chad | 140 | Cambodia | 140 | 5 |

| | | | | |
|---|---|---|---|---|
| Senegal | 141 | Chad | 141 | –1 |
| Benin | 142 | Senegal | 142 | –1 |
| Tajikistan | 143 | Sierra Leone | 143 | 6 |
| Korea, Democratic People's Republic of | 144 | Nepal | 144 | 10 |
| Cambodia | 145 | Mali | 145 | 3 |
| Central African Republic | 146 | Togo | 146 | 4 |
| Congo, Democratic Republic of | 147 | Eritrea | 147 | 4 |
| Mali | 148 | Congo, Democratic Republic of | 148 | –1 |
| Sierra Leone | 149 | Central African Republic | 149 | –3 |
| Togo | 150 | Korea, Democratic People's Republic of | 150 | –6 |
| Eritrea | 151 | Yemen | 151 | –24 |
| Uganda | 152 | Rwanda | 152 | 5 |
| Madagascar | 153 | Afghanistan | 153 | 6 |
| Nepal | 154 | Uganda | 154 | –2 |
| Mozambique | 155 | Madagascar | 155 | –2 |
| Burkina Faso | 156 | Tajikistan | 156 | –13 |
| Rwanda | 157 | Mozambique | 157 | –2 |
| Nigeria | 158 | Burkina Faso | 158 | –2 |
| Afghanistan | 159 | Burundi | 159 | 1 |
| Burundi | 160 | Malawi | 160 | 3 |
| Tanzania | 161 | Nigeria | 161 | –3 |
| Iraq | 162 | Tanzania | 162 | –1 |
| Malawi | 163 | Iraq | 163 | –1 |
| Ethiopia | 164 | Niger | 164 | 2 |
| Somalia | 165 | Ethiopia | 165 | –1 |
| Niger | 166 | Somalia | 166 | –1 |

# APPENDIX B3

## CHANGES IN RELATIVE RANKING OF MALE VERSUS FEMALE HUMAN CAPITAL PER CAPITA

*Table B3.*

| | 1990 | | | 2020 | | | |
|---|---|---|---|---|---|---|---|
| Country | Male | Female | Difference | Male | Female | Difference | Change in difference |
| Afghanistan | 144 | 159 | –15 | 135 | 153 | –18 | 3 |
| Albania | 95 | 93 | 2 | 97 | 85 | 12 | –10 |
| Algeria | 99 | 133 | –34 | 98 | 115 | –17 | –17 |
| Angola | 86 | 82 | 4 | 90 | 90 | 0 | 4 |
| Argentina | 45 | 43 | 2 | 51 | 48 | 3 | –1 |
| Armenia | 98 | 88 | 10 | 104 | 98 | 6 | 4 |
| Australia | 18 | 17 | 1 | 15 | 18 | –3 | 4 |
| Austria | 8 | 11 | –3 | 8 | 9 | –1 | –2 |
| Azerbaijan | 63 | 58 | 5 | 64 | 62 | 2 | 3 |
| Bahamas | 28 | 24 | 4 | 32 | 31 | 1 | 3 |
| Bahrain | 34 | 44 | –10 | 37 | 41 | –4 | –6 |
| Bangladesh | 136 | 137 | –1 | 131 | 132 | –1 | 0 |
| Barbados | 39 | 37 | 2 | 44 | 39 | 5 | –3 |
| Belarus | 60 | 54 | 6 | 61 | 60 | 1 | 5 |
| Belgium | 9 | 12 | –3 | 6 | 7 | –1 | –2 |
| Belize | 76 | 80 | –4 | 75 | 79 | –4 | 0 |
| Benin | 139 | 142 | –3 | 137 | 136 | 1 | –4 |
| Bhutan | 93 | 96 | –3 | 81 | 80 | 1 | –4 |
| Bolivia | 108 | 101 | 7 | 109 | 106 | 3 | 4 |
| Bosnia & Herzegovina | 73 | 69 | 4 | 74 | 76 | –2 | 6 |
| Botswana | 94 | 83 | 11 | 96 | 88 | 8 | 3 |
| Brazil | 59 | 59 | 0 | 57 | 58 | –1 | 1 |
| Brunei Darussalam | 25 | 27 | –2 | 26 | 28 | –2 | 0 |
| Bulgaria | 74 | 67 | 7 | 72 | 71 | 1 | 6 |
| Burkina Faso | 157 | 156 | 1 | 159 | 158 | 1 | 0 |
| Burundi | 161 | 160 | 1 | 160 | 159 | 1 | 0 |
| Cabo Verde | 112 | 106 | 6 | 102 | 99 | 3 | 3 |
| Cambodia | 147 | 145 | 2 | 144 | 140 | 4 | –2 |
| Cameroon | 126 | 122 | 4 | 127 | 124 | 3 | 1 |
| Canada | 10 | 6 | 4 | 19 | 16 | 3 | 1 |
| Central African Republic | 148 | 146 | 2 | 150 | 149 | 1 | 1 |
| Chad | 141 | 140 | 1 | 142 | 141 | 1 | 0 |
| Chile | 48 | 52 | –4 | 43 | 42 | 1 | –5 |
| China | 96 | 94 | 2 | 91 | 82 | 9 | –7 |
| Colombia | 84 | 86 | –2 | 80 | 78 | 2 | -4 |
| Congo | 104 | 100 | 4 | 114 | 110 | 4 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Congo, Democratic Republic of | 151 | 147 | 4 | 153 | 148 | 5 | –1 |
| Costa Rica | 52 | 56 | –4 | 46 | 46 | 0 | –4 |
| Côte d'Ivoire | 127 | 131 | –4 | 130 | 130 | 0 | –4 |
| Croatia | 41 | 39 | 2 | 40 | 37 | 3 | –1 |
| Cuba | 67 | 65 | 2 | 69 | 66 | 3 | –1 |
| Cyprus | 37 | 36 | 1 | 35 | 33 | 2 | –1 |
| Czechia | 40 | 40 | 0 | 39 | 38 | 1 | –1 |
| Denmark | 5 | 5 | 0 | 4 | 4 | 0 | 0 |
| Djibouti | 105 | 113 | –8 | 101 | 100 | 1 | –9 |
| Dominican Republic | 80 | 77 | 3 | 78 | 74 | 4 | –1 |
| Ecuador | 97 | 98 | –1 | 103 | 101 | 2 | –3 |
| Egypt | 101 | 110 | –9 | 107 | 118 | –11 | 2 |
| El Salvador | 89 | 89 | 0 | 94 | 92 | 2 | –2 |
| Eritrea | 153 | 151 | 2 | 151 | 147 | 4 | –2 |
| Estonia | 38 | 34 | 4 | 42 | 36 | 6 | –2 |
| Eswatini | 88 | 85 | 3 | 88 | 87 | 1 | 2 |
| Ethiopia | 166 | 164 | 2 | 165 | 165 | 0 | 2 |
| Fiji | 83 | 91 | –8 | 87 | 89 | –2 | –6 |
| Finland | 15 | 7 | 8 | 14 | 11 | 3 | 5 |
| France | 7 | 8 | –1 | 10 | 12 | –2 | 1 |
| Gabon | 50 | 45 | 5 | 65 | 70 | –5 | 10 |
| Gambia | 135 | 134 | 1 | 141 | 139 | 2 | –1 |
| Georgia | 118 | 108 | 10 | 120 | 113 | 7 | 3 |
| Germany | 6 | 10 | –4 | 11 | 15 | –4 | 0 |
| Ghana | 125 | 118 | 7 | 124 | 119 | 5 | 2 |
| Greece | 35 | 35 | 0 | 34 | 34 | 0 | 0 |
| Guatemala | 85 | 84 | 1 | 86 | 91 | –5 | 6 |
| Guinea | 138 | 136 | 2 | 139 | 135 | 4 | –2 |
| Guyana | 79 | 81 | –2 | 82 | 81 | 1 | –3 |
| Haiti | 131 | 123 | 8 | 132 | 126 | 6 | 2 |
| Honduras | 102 | 103 | –1 | 105 | 102 | 3 | –4 |
| Hong Kong | 23 | 21 | 2 | 20 | 19 | 1 | 1 |
| Hungary | 43 | 38 | 5 | 41 | 40 | 1 | 4 |
| Iceland | 17 | 14 | 3 | 17 | 8 | 9 | –6 |
| India | 132 | 135 | –3 | 128 | 137 | –9 | 6 |
| Indonesia | 117 | 111 | 6 | 115 | 112 | 3 | 3 |
| Iran | 92 | 132 | –40 | 83 | 104 | –21 | –19 |
| Iraq | 140 | 162 | –22 | 145 | 163 | –18 | –4 |
| Ireland | 21 | 22 | –1 | 16 | 14 | 2 | –3 |
| Israel | 20 | 18 | 2 | 24 | 23 | 1 | 1 |
| Italy | 22 | 20 | 2 | 22 | 22 | 0 | 2 |
| Jamaica | 69 | 64 | 5 | 73 | 72 | 1 | 4 |
| Japan | 24 | 19 | 5 | 21 | 20 | 1 | 4 |
| Jordan | 66 | 99 | –33 | 70 | 95 | –25 | –8 |
| Kazakhstan | 71 | 63 | 8 | 71 | 69 | 2 | 6 |
| Kenya | 128 | 121 | 7 | 129 | 125 | 4 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Korea, Democratic People's Republic of | 146 | 144 | 2 | 154 | 150 | 4 | –2 |
| Korea, Republic of | 32 | 32 | 0 | 30 | 32 | –2 | 2 |
| Kuwait | 42 | 51 | –9 | 45 | 43 | 2 | –11 |
| Kyrgyzstan | 134 | 130 | 4 | 136 | 134 | 2 | 2 |
| Laos | 129 | 124 | 5 | 126 | 123 | 3 | 2 |
| Latvia | 51 | 46 | 5 | 49 | 45 | 4 | 1 |
| Lesotho | 137 | 129 | 8 | 133 | 129 | 4 | 4 |
| Lithuania | 53 | 49 | 4 | 52 | 47 | 5 | –1 |
| Luxembourg | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| Macao | 19 | 23 | –4 | 18 | 17 | 1 | –5 |
| Madagascar | 156 | 153 | 3 | 156 | 155 | 1 | 2 |
| Malawi | 162 | 163 | –1 | 162 | 160 | 2 | –3 |
| Malaysia | 61 | 61 | 0 | 58 | 59 | –1 | 1 |
| Maldives | 62 | 75 | –13 | 54 | 57 | –3 | –10 |
| Mali | 150 | 148 | 2 | 146 | 145 | 1 | 1 |
| Malta | 30 | 33 | –3 | 28 | 29 | –1 | –2 |
| Mauritania | 111 | 120 | –9 | 110 | 114 | –4 | –5 |
| Mauritius | 68 | 68 | 0 | 63 | 63 | 0 | 0 |
| Mexico | 70 | 72 | –2 | 67 | 67 | 0 | –2 |
| Moldova | 115 | 104 | 11 | 121 | 117 | 4 | 7 |
| Mongolia | 122 | 112 | 10 | 118 | 111 | 7 | 3 |
| Morocco | 110 | 114 | –4 | 100 | 107 | –7 | 3 |
| Mozambique | 158 | 155 | 3 | 158 | 157 | 1 | 2 |
| Myanmar | 143 | 139 | 4 | 140 | 138 | 2 | 2 |
| Namibia | 77 | 70 | 7 | 79 | 75 | 4 | 3 |
| Nepal | 155 | 154 | 1 | 152 | 144 | 8 | –7 |
| Netherlands | 11 | 15 | –4 | 7 | 10 | –3 | –1 |
| New Zealand | 27 | 25 | 2 | 27 | 26 | 1 | 1 |
| Nicaragua | 121 | 119 | 2 | 119 | 116 | 3 | –1 |
| Niger | 164 | 166 | –2 | 164 | 164 | 0 | –2 |
| Nigeria | 159 | 158 | 1 | 161 | 161 | 0 | 1 |
| North Macedonia | 82 | 78 | 4 | 77 | 77 | 0 | 4 |
| Norway | 3 | 3 | 0 | 3 | 3 | 0 | 0 |
| Oman | 44 | 71 | –27 | 38 | 49 | –11 | –16 |
| Pakistan | 116 | 138 | –22 | 116 | 128 | –12 | –10 |
| Panama | 57 | 55 | 2 | 59 | 56 | 3 | –1 |
| Papua New Guinea | 123 | 115 | 8 | 123 | 121 | 2 | 6 |
| Paraguay | 90 | 87 | 3 | 89 | 86 | 3 | 0 |
| Peru | 109 | 102 | 7 | 99 | 96 | 3 | 4 |
| Philippines | 124 | 117 | 7 | 125 | 122 | 3 | 4 |
| Poland | 54 | 48 | 6 | 53 | 51 | 2 | 4 |
| Portugal | 33 | 30 | 3 | 31 | 30 | 1 | 2 |
| Qatar | 29 | 31 | –2 | 33 | 35 | –2 | 0 |
| Romania | 65 | 60 | 5 | 66 | 64 | 2 | 3 |
| Russia | 56 | 50 | 6 | 56 | 54 | 2 | 4 |
| Rwanda | 160 | 157 | 3 | 157 | 152 | 5 | –2 |
| Samoa | 81 | 79 | 2 | 85 | 93 | –8 | 10 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sao Tome & Principe | 120 | 116 | 4 | 122 | 120 | 2 | 2 |
| Saudi Arabia | 36 | 62 | –26 | 36 | 53 | –17 | –9 |
| Senegal | 142 | 141 | 1 | 143 | 142 | 1 | 0 |
| Serbia | 75 | 73 | 2 | 76 | 73 | 3 | –1 |
| Sierra Leone | 152 | 149 | 3 | 147 | 143 | 4 | –1 |
| Singapore | 12 | 16 | –4 | 23 | 21 | 2 | –6 |
| Slovakia | 46 | 42 | 4 | 47 | 44 | 3 | 1 |
| Slovenia | 31 | 28 | 3 | 29 | 27 | 2 | 1 |
| Somalia | 165 | 165 | 0 | 166 | 166 | 0 | 0 |
| South Africa | 64 | 66 | –2 | 68 | 65 | 3 | –5 |
| Spain | 26 | 26 | 0 | 25 | 24 | 1 | –1 |
| Sri Lanka | 87 | 90 | –3 | 92 | 94 | –2 | –1 |
| Suriname | 55 | 53 | 2 | 62 | 61 | 1 | 1 |
| Sweden | 13 | 9 | 4 | 12 | 6 | 6 | –2 |
| Switzerland | 2 | 2 | 0 | 2 | 2 | 0 | 0 |
| Syria | 113 | 126 | –13 | 108 | 127 | –19 | 6 |
| Tajikistan | 145 | 143 | 2 | 149 | 156 | –7 | 9 |
| Tanzania | 163 | 161 | 2 | 163 | 162 | 1 | 1 |
| Thailand | 100 | 95 | 5 | 95 | 84 | 11 | –6 |
| Togo | 149 | 150 | –1 | 148 | 146 | 2 | –3 |
| Trinidad & Tobago | 49 | 47 | 2 | 48 | 52 | –4 | 6 |
| Tunisia | 91 | 107 | –16 | 93 | 97 | –4 | –12 |
| Turkey | 72 | 76 | –4 | 60 | 68 | –8 | 4 |
| Turkmenistan | 78 | 74 | 4 | 84 | 83 | 1 | 3 |
| Uganda | 154 | 152 | 2 | 155 | 154 | 1 | 1 |
| Ukraine | 106 | 92 | 14 | 106 | 103 | 3 | 11 |
| United Arab Emirates | 16 | 29 | –13 | 9 | 25 | –16 | 3 |
| United Kingdom | 14 | 13 | 1 | 13 | 13 | 0 | 1 |
| United States | 4 | 4 | 0 | 5 | 5 | 0 | 0 |
| Uruguay | 47 | 41 | 6 | 50 | 50 | 0 | 6 |
| Uzbekistan | 114 | 105 | 9 | 113 | 108 | 5 | 4 |
| Vanuatu | 107 | 97 | 10 | 111 | 105 | 6 | 4 |
| Venezuela | 58 | 57 | 1 | 55 | 55 | 0 | 1 |
| Viet Nam | 119 | 109 | 10 | 117 | 109 | 8 | 2 |
| Yemen | 103 | 127 | –24 | 112 | 151 | –39 | 15 |
| Zambia | 130 | 125 | 5 | 134 | 131 | 3 | 2 |
| Zimbabwe | 133 | 128 | 5 | 138 | 133 | 5 | 0 |

CHAPTER

03

# Social emotional learning *and human capital*

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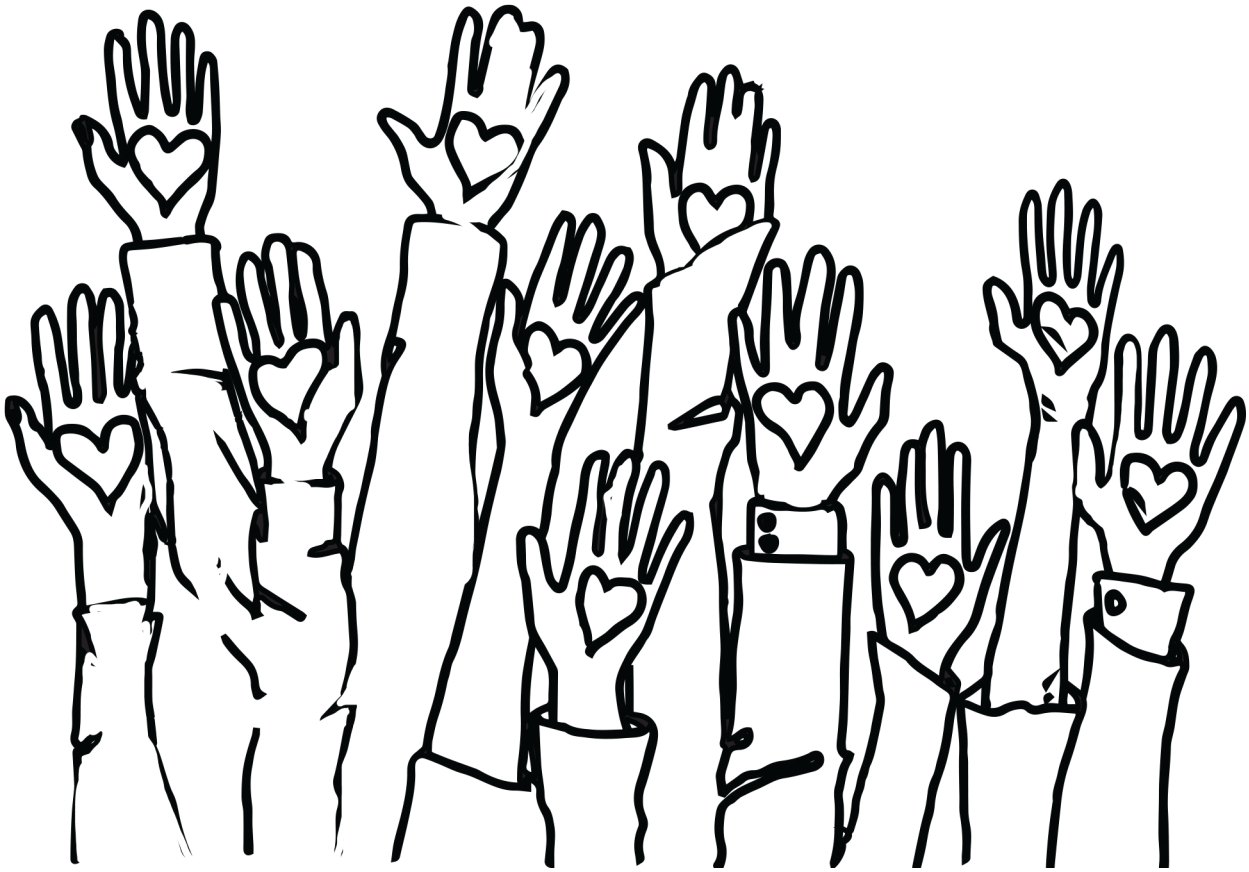
*abstract*

Humans are inherently wired to be social emotional beings. Social bonds are formed early in life, creating the foundation for human beings to coexist, live and work in groups, a critical aspect of being human. Over the last two decades, research has shown that human relationships and not material wealth contribute to well-being and flourishing. This chapter summarizes the role of social and emotional learning (SEL) at every stage of human development and seeks to make the case that any measurement of human capital is incomplete without the inclusion of SEL.



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## INTRODUCTION

For some time now, nations have equated economic growth with overall well-being. Since human capital is essential for economic growth (Mincer, 1958) and is measured in terms of literacy and numeracy (Soysal and David, 1989; Melton, 2003), education has played a pivotal role. Consequently, education has been designed to build people's knowledge, skills, and abilities in literacy and numeracy as essential for economic growth, and educational attainment is considered a marker of human capital. Thus, the emphasis of nations has been on cultivating a human capital-driven knowledge-based economy to create a skilled workforce that enhances productivity and increases economic growth (Stiglitz and Greenwald, 2013) with the underlying assumption that it will ultimately foster well-being (Gilead, 2012).

However, the overemphasis on economic growth as an outcome of human capital has come at the expense of human values and

relationships and has been counterproductive in promoting well-being (Bhugra and Becker, 2005). While the rise in mental health issues cannot solely be attributed to a socio-educational emphasis on economic growth, values like competitiveness, workaholism and consumerism, which often stem from such a focus, can be linked to heightened stress levels, which are widely recognized to affect both mental and physical well-being (Sapolsky, 2017). Increasingly, research indicates that prioritizing economic growth as the primary measure of well-being, while neglecting subjective and other objective aspects of well-being, might contribute to the growing prevalence of unhappiness, insecurity and strained interpersonal relationships (Kosoy et al., 2012). This is also supported by recent findings that reveal a marked decrease in well-being and mental and emotional wellness (Eckersley, 2011).

The World Health Organization's (WHO, 2004) World Mental Health Survey exposes a significant range in the occurrence of mental disorders worldwide, affecting anywhere from 6% to 27% of individuals in the surveyed countries. WHO (2017), focusing on the mental health of South Asian adolescents aged 13 to 17, found that 10% to 20% of adolescents experienced mental health challenges, including anxiety, depression, self-harm and suicidal thoughts. The latest study from Lancet Psychiatry (McGrath et al., 2023, p.1) estimates that about half of the world's population 'can expect to develop' at least one type of mental disorder by the time they are 75 years old.

A reimagining of human capital is therefore essential. As a species, humans have evolved to be inherently social. Human brain anatomy includes substantial sections of biological tissue devoted to fostering social connections and eliciting emotional rewards. Consequently, humans possess an inherent, biologically driven capacity to establish

Research has demonstrated that social and emotional proficiencies are teachable within the classroom, akin to literacy and numeracy•

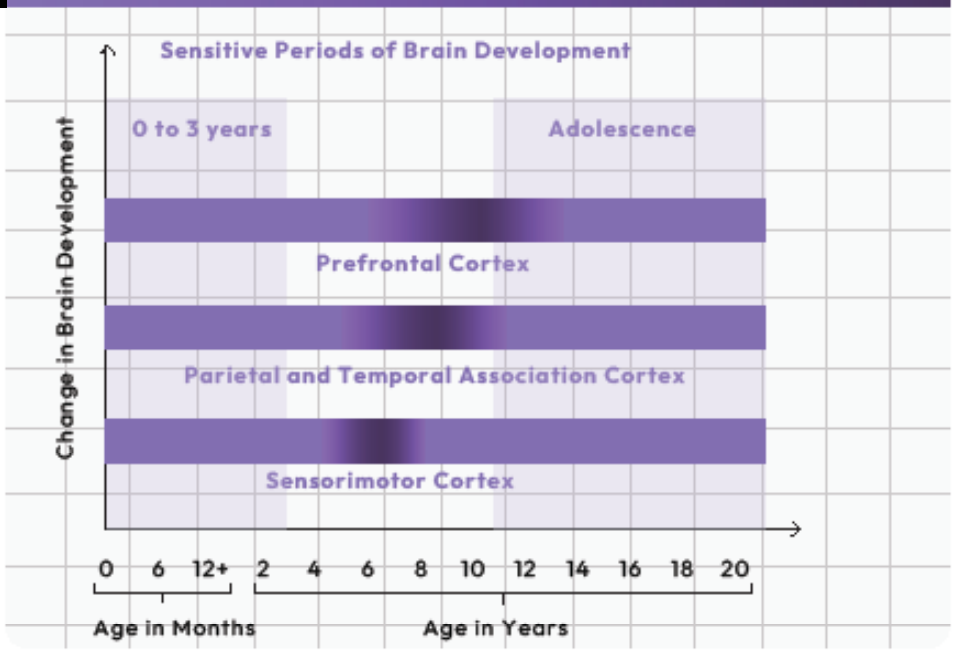
and cultivate human relationships. These early-formed social bonds lay the groundwork for harmonious coexistence within and between groups, constituting an indispensable aspect of the human journey.

Recent neuroscience and cognitive psychology findings underscore that these social bonds and emotional rewards are fundamental contributors to overall well-being (Diener and Seligman, 2004; Hülsheger and Schewe, 2011; Gable and Bromberg, 2018). Poor social and emotional competencies are risk factors for developmental outcomes that carry over into adult life (Domitrovich et al., 2017). Notably, research has demonstrated that these social and emotional proficiencies are teachable within the classroom, akin to literacy and numeracy. Furthermore, neuroscientific evidence shows that well-being is a skill that is plastic in nature (Dahl, Wilson-Mendenhall and Davidson, 2020), that is, it can be cultivated and trained through building and practising social and emotional competencies, such as mindfulness-based well-being training (Crone et al., 2023; Kubzansky et al., 2023).

Therefore, the cultivation of human capital must prioritize holistic development, melding academic aptitude with cognitive and socio-emotional competencies and appreciating the impact of these competencies on overall well-being (Duraiappah et al., 2022). Since principles of neuroplasticity have enabled the realization that the social and emotional brain can be trained explicitly in the classroom to build social and emotional competencies, well-being is achievable through training (Dahl, Wilson-Mendenhall and Davidson, 2020).

Social emotional learning (SEL) can be defined as the process of developing competencies, abilities, and/or attitudes necessary to recognize and control emotions, develop caring and concern for others, form positive relationships, make responsible decisions and deal with challenging situations (Payton et al., 2000; Greenberg et al., 2003; Weissberg et al., 2015).

*Fig 1.*




*Sensitive periods of brain development after birth (from Borst and Srinivasan, 2020, p. 22)*

This chapter will consider how SEL manifests across different age groups. It will examine the link between SEL and well-being and the factors that intersect with this link. Finally, it will collate evidence to indicate why SEL is necessary for the estimation of human capital and relevant for elevating the wealth of a nation.

## 2. SOCIAL EMOTIONAL LEARNING ACROSS THE LIFESPAN

SEL occurs throughout life; however, infancy, childhood and adolescence are periods of considerable SEL development.

Humans are social-emotional beings with a fundamental need to form social bonds (Baumeister and Leary, 1995). Emotional and social connections, driven by neurobiological processes, promote relationships that are critical for survival. Contextual factors and daily experiences shape socio-emotional development (Mascolo and Fischer, 2010), with individuals drawing on core social and intellectual competencies amid progress, setbacks and growth.

The development of social and emotional competencies is intertwined with cognitive development and is a non-linear, dynamic process. These processes, biologically connected, advance together (Gotlieb, 2022).

SEL occurs throughout life; however, infancy, childhood and adolescence are periods of considerable SEL development where

Early years of childhood is a peak period for developing learning potential through training, teaching and implicit processing•

maximum growth and restructuring of the brain occurs through informal and formal learning (Figure 1). These are developmental phases during which the brain is highly receptive to social influences and sensitive to training-induced changes in learning SEL competencies (Chatterjee and Duraiappah, 2020).

Genetic, epigenetic, environmental and socio-emotional factors shape individual brain development, impacting attitudes and behaviours (Black et al., 2017; Britto et al., 2017). Thus, effective interventions for population-level SEL must encompass the entire brain, body and context.

## 2.1. SOCIAL AND EMOTIONAL DEVELOPMENT DURING INFANCY AND EARLY CHILDHOOD

In the early years of childhood, the brain is most amenable to plasticity, learns from experiences and responds to its environment (Cachia et al., 2022). This is a peak period for developing learning potential through training, teaching and implicit processing. Learning is not solely cognitive; it is also driven by social relationships and the emotions they generate (Moore, 2006; National Scientific Council on the Developing Child, 2008.; Garner et al., 2012; Vela, 2014; Immordino-Yang and Knecht, 2020).

Infants possess fundamental cognitive, social and emotional abilities from birth, enabling them to process sensory information from social and nonsocial stimuli. Interactions with caregivers in the initial two years of life shape social and emotional functions, such as emotional responses to rewards and punishments. Early interactions and relationships significantly impact the development of these skills (Sameroff, 1975; Howes and Spieker, 1999; National Scientific Council on the Developing Child, 2004).

SEL skills are crucial for academic success and development of positive peer relationships•

Self-awareness, which can be defined as 'conscious knowledge of one's feelings, motives, needs and desires' (Oxford Language, n.d.) is a foundational SEL domain on which other competencies build. It is developed through interactions between sensory, linguistic, cognitive, emotional and social interactions (Gotlieb et al., 2022). Positive relationships in early childhood foster autonomy, self-confidence and exploration-based learning (Raikes and Thompson, 2006). Moreover, the quality of caregiver relationships influences SEL progression (Patton et al., 2016; Cachia et al., 2022). Early relationships shape later social and emotional competencies, including identity formation and healthy relationships (Ainsworth, 1989; Vaughn et al., 2008).

As children navigate early childhood, neural circuits mature, allowing the expression of a range of emotions by age three. Sensorimotor and language regions integrate, enabling language, emotional awareness and a complex understanding of the environment. Development of the frontal cortices leads to inhibitory control, self-control and delayed gratification (Diamond, 1991; Gotlieb et al., 2022).

In preschool, SEL expands to social competence, emotional expression, behaviour management and inhibitory control (Thompson and Raikes, 2006). On the one hand, these skills are crucial for academic success and development of positive peer relationships. On the other, difficulties recognizing others' emotions may lead to aggression and poor social relationships (Denham et al., 2003). Children exhibiting internalizing and externalizing behaviours face academic challenges (Rimm-Kaufmanh et al., 2000). Adequate SEL development is essential for overall well-being, mental health and functional behaviour (see section 4 for more detail).

Early stress during the prenatal period or early childhood can lead to lifelong social and emotional issues. In addition, childhood attachment shapes social behaviour. For example, low attachment

Educational attainment hinges on a combination of cognitive and non-cognitive skills, including self-regulation, motivation for learning and interpersonal communication•

security and sensitivity are associated with social anxiety and neuroticism, and insecure attachment relates to conduct disorder and aggression (Bohlin et al., 2000). In contrast, secure attachment boosts school-age social competence (Brocki and Bohlin, 2004; Bohlin et al., 2005), with early secure attachment and maternal sensitivity predicting positive attitudes, activity, popularity, agreeableness and more during the school years (Bohlin and Hagekull, 2009). Likewise, educational attainment, a significant predictor of adult life achievements, hinges on a combination of cognitive and noncognitive skills, including self-regulation, motivation for learning and interpersonal communication. Evaluating social and emotional competencies in kindergarten demonstrates a robust connection with a range of outcomes in young adulthood, spanning education, employment, substance use and involvement in criminal activities (Jones et al., 2015).

The adverse effects of the prenatal and perinatal environment as a result of early experiences of threat, fear, adversity or risk can show regression in individuals through resilience-based positive adaptability. Supportive adult relationships, such as teacher-student relationships, strongly predict positive academic and relationship outcomes in children with adverse childhood experiences (Keane and Evans, 2022). This indicates that the brain has adaptive capabilities, and these capabilities can be induced with training-based SEL programmes.

## 2.2. SOCIAL AND EMOTIONAL DEVELOPMENT DURING MIDDLE CHILDHOOD

As brain regions mature, they process multisensory information to form an abstract idea of the individual and the physical, cognitive and socio-emotional world that exists outside them (Carlson and Wang, 2007). As children enter middle childhood, they form more meaningful

SEL interventions will show maximum gains when integrating the evolutionary developmental perspective and contextually appropriate tools•

friendships and a stronger sense of agency and autonomy. Social and emotional processes continue to interact and develop together throughout childhood. Thus, interventions promoting SEL will show maximum gains when integrating the evolutionary developmental perspective and contextually appropriate tools.

## 2.3. SOCIAL AND EMOTIONAL DEVELOPMENT DURING ADOLESCENCE

Adolescence is the period between the onset of puberty and the establishment of adulthood, and is marked by intense physiological, hormonal, cognitive and psychosocial development (Wang et al., 2020).

Neurodevelopmentally, due to hormonal changes, the adolescent brain shows high neural sensitivity to rewards, as evidenced by higher activation of the striatum (a brain region associated with reward processing), along with increased susceptibility to peer influences (Steinberg, 2014; Schreuders et al., 2018).

The intense and volatile emotional responses and complex social interactions that mark adolescence (Blakemore, 2008; Hare et al., 2008; Smith et al., 2014) can be attributed partly to a developmental misalignment between the phylogenetically older limbic system and the newer frontal regions. During the early years of adolescence, the limbic areas associated with the affective responses to rewards (such as pleasure) develop much faster than the frontal cortices that mediate the inhibitory self-regulatory functions (Casey, 2015). As a result, early adolescence might involve increased risk-taking to seek out social and nonsocial rewards, and reduced rational judgement, which can increase vulnerability considerably (Steinberg, 2014).

In this period of high intensity, uncertainty, volatility and vulnerability,

SEL should be an ongoing process throughout an individual's life for personal development and also for the betterment of society•

adolescence is also a period of great learning. The individual tries to find meaning and purpose in their life and attempts to secure their place in the world through cultural norms, social practices, shifting roles and expectations, and evolving relationships within and outside the family (Viner et al., 2012; Patton et al., 2016). This task becomes much easier in a supportive family, community and peer network. In fact, immediate and larger sociocultural milieus characterized by urbanization, globalization, access to digital media and social networks (Martínez-Ferre et al., 2018), social hierarchies and marginalization greatly influence adolescent neurobiological and psychosocial development and expression of SEL competencies. This, in turn, impacts the health and well-being of adolescents, which can continue into adulthood.

## 2.4. SOCIAL EMOTIONAL LEARNING DURING ADULTHOOD

As critical as SEL development is in childhood and adolescence, it remains a pivotal adult learning domain. Continuous learning and practice of social and emotional competencies are associated with job satisfaction, healthy relationships, mental health, well-being, and finding and maintaining meaning and purpose in life.

SEL should be an ongoing process throughout an individual's life, not only for personal development but also for the betterment of society. The ability of adults to critically reflect on their social, emotional and cultural competencies is crucial for driving systemic changes towards equity and social justice. This skill is important for decision-makers, educators, medical practitioners, CEOs and all individuals who can engage in civic actions. If adults lack adequate social and emotional functioning, specific SEL programmes should prioritize equipping them with relevant competencies such as empathy, compassion, critical thinking and self-regulation.

There are marked individual differences in the expression of SEL competencies across the lifespan•

Programmes like these can enhance social awareness, fostering acceptance and respect for diverse cultural and ethnic perspectives. This, in turn, can facilitate the development of empathy and compassion (Jagers et al., 2018). Likewise, engaging in critical self-reflection to identify one's biases (Devine et al., 2012) and developing collaborative and perspective-taking skills (Burgess, 2013) can mitigate racial or ethnic biases and promote equitable outcomes.

## 3. HOW TO MOBILIZE SOCIAL EMOTIONAL LEARNING

While most SEL competencies occur naturally in humans, as evident from the previous sections, the interaction between genetics, epigenetics and proximal as well as distal environments greatly influences the developmental trajectory of these competencies. As a result, there are marked individual differences in the expression of SEL competencies across the lifespan.

A recent report that reviewed 12 meta-analyses of SEL intervention, which involved nearly one million students from early childhood education through high school, showed that SEL programmes have consistent positive impacts on a broad range of student outcomes, including increased SEL skills, attitudes, prosocial behaviours and academic achievement, and decreased conduct problems and emotional distress (Durlak et al., 2022). Thus, given the enormous impact of SEL on well-being and its subsequent benefit in every aspect of education and work, there is an urgent need to mainstream it in education (Jones et al., 2015; Greenberg et al., 2017).

However, despite this, data, evidence and implementation in the context of SEL remain sparse or geographically clustered, with the highest density in the Global North. As a result, the task of integrating SEL into education remains embryonic. Furthermore, earlier generations of the adult population have missed out on

Global mainstreaming of SEL education calls for concerted efforts across policy, practice and research domains to develop context-specific, culturally sensitive, scalable and cost-effective education•

SEL education. Nevertheless, social and emotional competencies have never been more crucial in decision-making, tackling global challenges, addressing increasing inequalities and social justice, and promoting general mental health and well-being. Therefore, implementing SEL programmes across all stages of life necessitates targeting students, teachers, parents, decision-makers, refugees, trauma victims, marginalized groups and others.

Nonetheless, achieving global mainstreaming of SEL education is challenging. It calls for concerted efforts across policy, practice and research domains to develop context-specific, culturally sensitive, scalable and cost-effective education for SEL. For example, the available tools, expertise, data and evidence will differ across and within nations, implying that the best practices for SEL education will vary according to these and other limiting factors. Similarly, SEL programmes in an urban, conflict-free, high socio-economic status (SES) school will differ significantly from those in emergency settings or rural schools in violence-prone areas. Long et al. (2015) provide a thorough cost analysis of an effective, universal, school-wide SEL intervention programme. Such a tool is valuable for calculating the cost-effectiveness and benefit-cost analysis of SEL interventions. As such, these analyses should be an integral component of the planning stages for SEL programmes.

Despite these limitations to the generalizability of SEL programmes, the SEL competencies that must be taught and the benefits that SEL can provide to both individuals and society remain the same.

## 3.1. COMPONENTS OF A SOCIAL EMOTIONAL LEARNING EDUCATION PROGRAMME

### 3.1.1. K-12 EDUCATION

Despite limitations to the generalizability of SEL programmes, the benefits that SEL can provide to both individuals and society remain the same•

There are multiple ways to execute SEL programmes. However, the two most common are: (1) a designated SEL curriculum taught as a distinct subject; and (2) employing a whole-brain approach that merges SEL with cognitive skills and concentrates on both instructional methods and integrating SEL-oriented activities into traditional curricula. Irrespective of the implementation strategy, a robust SEL programme in schools should (UNESCO MGIEP, 2022):

- be grounded in theory and research, and be informed by theories of child development;
- teach learners how to utilize social and emotional abilities and ethical principles in their everyday lives (this involves structured teaching and the practical application of acquired knowledge to real-life situations);
- help form social connectedness with the school by promoting caring, and engaging classroom and school practices, and employing various teaching techniques to encourage student participation in creating a classroom environment where empathy, accountability and a commitment to learning are fostered;
- include developmentally and culturally appropriate instructions to ensure cultural sensitivity and respect for diversity;
- enhance school performance by taking a whole-brain approach to learning, engaging cognitive, social, emotional and behavioural domains, and introducing engaging teaching and learning methods, such as problem-solving approaches and cooperative learning, which motivate students to learn and succeed academically;
- involve families and communities as partners, that is, involve

Social and emotional competency in teachers is pertinent to the development of students' SEL. competencies•

school staff, peers, parents and community members in applying and modelling SEL-related skills and attitudes at school, at home and in the community;

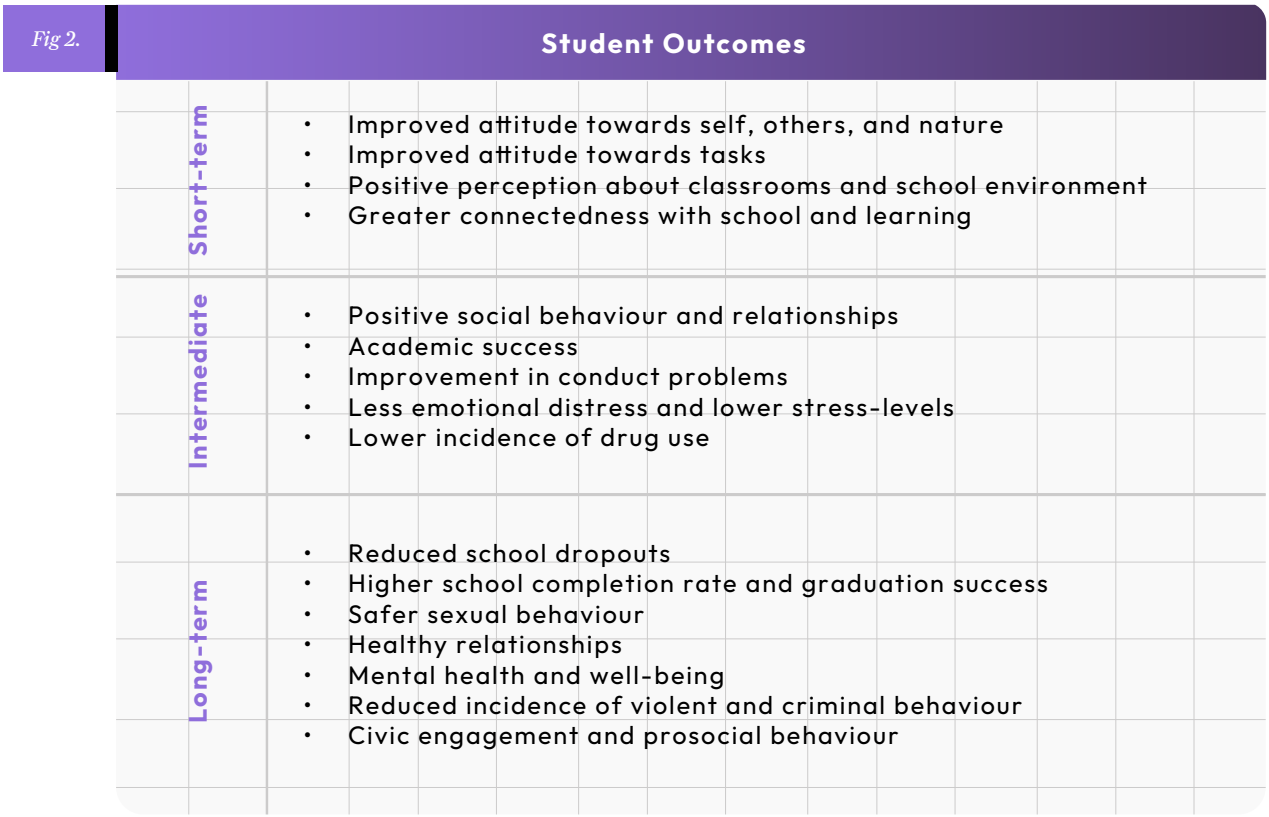
- establish organizational support and policies that foster success, thus ensuring high-quality programme implementation that includes active participation in programme planning by everyone involved, adequate time and resources, and alignment with school, district and state policies;
- provide high-quality staff development and support that offers well-planned professional development for all school personnel; and
- incorporate continuing evaluation and improvement, that is, continuous data collection to assess progress, ensure accountability and shape programme improvement.

However, evidence suggests that a whole-school-centred SEL approach leads to better SEL outcomes and a positive school environment than stand-alone SEL classes (Gotlieb et al., 2022).

Multiple actors have critical roles in making a whole-school-centred SEL approach successful, including learners, teachers, school leaders and administrators, school support staff and families.

Social and emotional competency in teachers is pertinent to the development of students' SEL. Teaching, which is known to be a high-stress profession (Montgomery and Rupp, 2005), not only has adverse effects on the mental and physical health of teachers (De Souza et al., 2012; De Simone et al., 2016) it also has negative repercussions for students' well-being, their learning and the overall classroom atmosphere (Oberle and Schonert-Reichl, 2016). There are various

*Fig 2.*




*Intended student outcomes of transformational school-wide SEL education programmes (adapted from Schlund, Jagers and Schlinger, 2020, p. 4)*

The positive outcomes observed due to SEL intervention programmes show that social and emotional competencies can be acquired at all stages of life•

SEL training programmes for teachers (Oliveira et al., 2021a, 2021b), but incorporating brief and straightforward practices into everyday routines, such as five-minute mindfulness sessions during regular classroom activities and regular emotion check-ins with students, can cultivate social and emotional competencies in both teachers and students in a process of intergenerational learning. It can also reduce teacher burnout (Flook et al., 2013; Roeser et al., 2013). The positive outcomes observed due to such intervention programmes show that social and emotional competencies can be acquired at all stages of life.

In the case of young children in preschool and kindergarten, play-centred programmes for SEL have demonstrated significant promise. Both unstructured play and guided play, designed with specific learning objectives in mind, offer a range of physical, cognitive, social and emotional advantages (Schlesinger et al., 2020). The social dimension of guided play, characterized by interactions, collaboration and active participation, contributes to the promotion of SEL within early childhood care and educational environments (Toub

SEL can act across classrooms, schools, homes and communities to lead to short-term, intermediate and long-term student outcomes•

et al., 2016). However, a school-wide approach to SEL goes beyond improving individual students' and teachers' SEL competencies and academic performance. It can also be a powerful driver for equity and social justice. Transformational SEL in education can reshape schools into learning spaces for acquiring SEL competencies as well as action places to practise SEL regularly and holistically (Schlund et al., 2020). It can act across classrooms, schools, homes and communities to lead to short-term, intermediate and long-term student outcomes (Figure 2).

### 3.1.2 HIGHER EDUCATION

During the transition to adulthood, higher education often overlaps with individuals' formative years of social development (e.g., Astin, 1984; Evans et al., 2009). It is also a time when new challenges in cognitive, social and emotional domains emerge (Howard et al., 2006; McDonald et al., 2006) and increasing responsibilities associated with the foray into adulthood have significant impacts on mental health and well-being (Stewart-Brown et al., 2000; Stallman, 2010). In this context, social emotional skills that build positive interpersonal relationships and help make responsible decisions are particularly critical (Conley et al., 2015).

Programmes such as Art and Science of Human Flourishing (ASHF), which builds a safe classroom environment along with experiential and academic learning opportunities, have shown improvement in undergraduate students' proximal and distal outcomes (Hirshberg et al., 2023; Inkelas et al., 2023). Students in the course cohort showed an increase in multiple attention and socio-emotional skills (e.g., attention function, self-compassion) and prosocial attitudes such as common humanity and empathic concern, as well as improvement in distal outcomes such as mental health (reduced depression, increased flourishing).

SEL implementation in higher education continues to be rare, and more effort should be taken to support the social and emotional needs of young adults and youth•

A meta-analysis of different SEL interventions in higher education found that skills-oriented programmes on mindfulness work best in a higher educational context (Conley, 2015). These programmes focus on cultivating a range of skills in self-awareness, self-management, social awareness and relationships, and most often show improvements in self-perception, emotional distress, and social emotional skills (Shapiro et al., 2007, 2008; Sears and Kraus, 2009). Promising programmes in higher education involve those that focus on cognitive-behavioural intervention (e.g., Dekro et al., 2002), social skills intervention (e.g., Braithwaite and Fincham, 2007) and relaxation interventions (Ratanasiripong et al., 2012).
However, SEL implementation in higher education continues to be rare, and more effort should be taken to support the social and emotional needs of young adults and youth.

### 3.1.3. ADULT PROFESSIONAL LIFE

In the present job market, social emotional skills are deemed more crucial than any other recent development in workforce requirements (LinkedIn Talent Solutions, 2019). This requires SEL competencies (and underlying skills) and skills developed through SEL programmes in schools to align with those sought by employers (Yoder, 2020). Analysis of surveys reveals that in North America, the SEL skills and attitudes most sought by employers include positive communication and interpersonal relationships, and the ability to collaborate, problem-solve, self- regulate, show integrity and make ethical decisions (Yoder, 2020). The analysis also reveals that SEL competencies learnt in school form the foundation for more complex work-life applications.

However, in addition to being highly desirable, SEL skills are also the most deficient skill set among employees (Bloomberg, 2019). Commission on Achieving Necessary Skills (SCANS), which works to pinpoint essential

Successful organizations are places where emotional intelligence plays a considerable role•

skills for the 21st century, especially concerning younger and up-and-coming workforce members, found that besides academic skills, skills such as personal accountability, self-worth, self-control, interpersonal adeptness and honesty are considered imperative (Kane et al., 1990).

Butrymowicz (2021) points out the need to integrate SEL to advance equitable workforce environments. Collaborative States Initiative (CSI) partners have suggested explicit integration of SEL in all collaborative and work-space activities with immersion, participation and preparation (Dermody, 2022). SEL skills such as emotional intelligence have also gained momentum for increasing employee motivation (Njoroge and Yazdanifard, 2014).

Traditionally, emotions and their expressions have been viewed as negative manifestations in the workplace, such as the inability to control oneself, weakness, negation, avoidance and negligence (Fineman, 1993; Turnbull, 1999; Ericsson, 2004). Only recently have organizational scholars considered emotional expression in the workplace as positive (Domagalski, 1999; Brief and Weiss, 2002; Jordan and Troth, 2002). These researchers have identified successful organizations as places where emotional intelligence plays a considerable role (Lynn, 2002). According to Cooper (1997), effectively managed emotions can aid individuals in fostering trust, loyalty and dedication within themselves, their teams and their organizations.

Emotional intelligence is also cost-effective. According to a report submitted to Congress by the US General Accounting Office (GAO) in 1998, significant cost savings were achieved by the United States Air Force through the utilization of Bar- On's Emotional Quotient Inventory (EQ-i) in its selection of programme recruiters. Choosing individuals who scored the highest on Bar-On's EQ-i led to a threefold increase in the ability to identify successful recruiters, resulting in annual savings of US$3 million.

Continuing social and emotional training in the workplace results in a more equitable workplace environment, greater trust and other positive outcomes•

Furthermore, Boyatzis (1999) conducted a study in a multinational consulting organization, revealing that partners who scored above the median on emotional intelligence competencies generated an additional US$1.2 million in profit compared to their counterparts. In the United States, the failure to adhere to established training guidelines for enhancing emotional intelligence in the workplace, as outlined by Cherniss and Goleman (1998), caused a significant annual economic impact between US$5.6 billion and US$16.8 billion due to this oversight. The research found that the positive impact of training employees in emotional and social skills, using programmes aligned with their recommended guidelines, exceeded the impact of other programmes. Failure to implement these programmes diminished effectiveness and led to financial losses for businesses.

Thus, continuing social and emotional training in the workplace and workforce not only results in a more equitable workplace environment, greater trust and other positive outcomes, it also has substantial economic upsides for the employer (Khalili, 2012).

## 4. EVIDENCE FOR THE LINK BETWEEN SOCIAL EMOTIONAL LEARNING, MENTAL HEALTH AND WELL-BEING

Poor SEL can stem from genetic, epigenetic or environmental factors like perinatal surroundings, poverty and marginalization. Often, it is a mix of biology, culture and economics. Population-wide poor mental health strains economies. It leads to weak academic outcomes, job prospects and relationships, and increases anxiety, depression and disengagement. Conversely, optimal SEL developed naturally or through training can protect mental health.

Well-being is a broader term that signifies an individual's ability to live a healthy, meaningful and productive life. Well-being encompasses

Social marginalization refers to the systematic exclusion or relegation of certain groups to the edges of social, economic and political spheres•

many aspects of life-physical, mental and social, with emotional, spiritual, intellectual, occupational, environmental and physiological dimensions. Well-being is closely linked to individual and collective human flourishing; thus, conditions conducive to well-being must be provided at the individual, social, institutional and policy levels.

## 4.1. MARGINALIZATION

Social marginalization refers to the systematic exclusion or relegation of certain groups to the edges of social, economic and political spheres. This process denies non-dominant groups equal access to opportunities, resources and decision-making, perpetuating cycles of disadvantage and inequality (Kabeer, 2005). Marginalized individuals often face limited access to education, health care, employment and representation, leading to social disparities and hindering overall societal progress (Sen, 1999; United et al., 2015; UNESCO, 2020).
In recent years, there has been a concerning global trend of increasing marginalization, wherein certain groups are systematically excluded and pushed to the peripheries of society, exacerbating disparities and inhibiting equitable development (UN Department of Social and Economic Development, 2009).

One key area where increasing marginalization is evident is in access to education. UNESCO's Global Education Monitoring Report highlights how marginalized groups, including girls, children with disabilities and those from low-income backgrounds, often face unequal access to quality education (UNESCO, 2020). This lack of educational opportunities can perpetuate cycles of disadvantage and hinder social mobility (UNESCO, 2020).

Economic marginalization is another critical dimension. The World Inequality Database reveals wealth and income disparities have been widening in many countries, leading to the concentration of resources

among a privileged few and marginalizing others (World Inequality Lab, 2020).

Marginalization in the workplace reflects marginalization in society at large and manifests as unequal treatment, limited opportunities and exclusion of certain individuals or groups • Marginalization in the workplace reflects marginalization in society at large and manifests as unequal treatment, limited opportunities and exclusion of certain individuals or groups based on factors such as gender, race, ethnicity or disability. This form of discrimination not only stifles talent and creativity but also hampers overall productivity and innovation within organizations.

Research by Pager, Western and Bonikowsk (2009) demonstrates the persistence of racial and gender disparities in hiring practices, leading to the marginalization of minority groups in employment opportunities. Additionally, a study by Catalyst (2020) underscores how women, especially women of colour, often face barriers to career advancement and leadership roles, contributing to their marginalization within corporate settings.

Addressing increasing marginalization requires concerted efforts on both local and global scales. It involves dismantling structural barriers, implementing inclusive policies and promoting social cohesion. Failure to address this trend could perpetuate inequalities and hinder progress towards a more just and equitable world (United

Marginalization greatly influences how social and emotional competencies and behaviour driven by them are expressed in real-world scenarios•

Nations, 2015).

Marginalization has far-reaching implications for the overall well-being of affected individuals and communities. It greatly influences how social and emotional competencies and behaviour driven by them are expressed in real-world scenarios. For instance, empathy-driven prosocial actions are differentially mediated by marginalization. As adolescents embark on finding their place in the world, becoming more aware of social hierarchies and sensitive to marginalization, they exhibit an increasing need and disposition to contribute to society.

Being socially and emotionally aware of others' needs and making positive contributions towards friends, communities and family members have positive psychological and physical benefits for youth (Schreier and Chen, 2013; van Goethem et al., 2014; Schacter and Margolin, 2018). As marginalized youth discover their sense of self, they become aware of their place within the social hierarchy and share a desire to support their community and their experiences of discrimination (Sumner et al., 2018). However, evidence shows marked differences in the opportunities adolescents receive to make a contribution to the society (Crone and Fuligni, 2020). It shows that inherent social structures provide implicit and explicit barriers towards SEL development and expressions in marginalized adolescents.

To summarize, human beings continue to experience personal growth and self-discovery throughout life, but marginalization can pose challenges and exacerbate vulnerability. SEL can be a protective factor, fostering emotional resilience to overcome these challenges. However, policy-makers must prioritize providing opportunities for SEL training to marginalized youth, enabling them to develop and practise these competencies positively beyond just coping with their daily struggles.

Evidence suggests that SEL programmes can improve emotional support, organization and academic outcomes in schools where the learner population is from a disadvantaged background•

## 4.2. POVERTY

Poverty in early childhood unequivocally puts children's cognitive, socio-emotional and physical development at risk. Besides parental economic and emotional investments and parental practices, chronic stress and the continuous need to cope with challenges at all levels can alter these developmental pathways. In the face of chronic stressors, which can be physical, such as violence, unhygienic living conditions and lack of nutrition, or psychosocial, such as emotional neglect, separation from caregivers and unstable family life, biological stress response pathways become chronically activated, leading to atypical development. The resultant behavioural expressions include low levels of self-regulation, emotionally reactive responses, increased risk of anxiety and depression, and conduct problems that can continue into adulthood if they are not properly addressed (Evans and Kim, 2013).

Evidence suggests that SEL programmes can improve emotional support, organization and academic outcomes in schools where the learner population is from a low SES background and/or ethnic or racial minorities (Webster-Stratton et al., 2008; 4Rs: Jones et al., 2011; RULER: Brackett et al., 2012; Responsive Classroom: Abry et al., 2013; Hagelskamp et al., 2013; PATHS: Morris et al., 2014). Some suggest that SEL programmes' effect on distal academic outcomes is mediated by changes in the classroom environment and students' temperaments (McCormick et al., 2015; Parett and Budge, 2020). Initial data also suggest that SEL can bridge gaps in academic achievements and the later consequences of poverty and ethnic/racial marginalization (LeBuffe and Bryson, 2017).

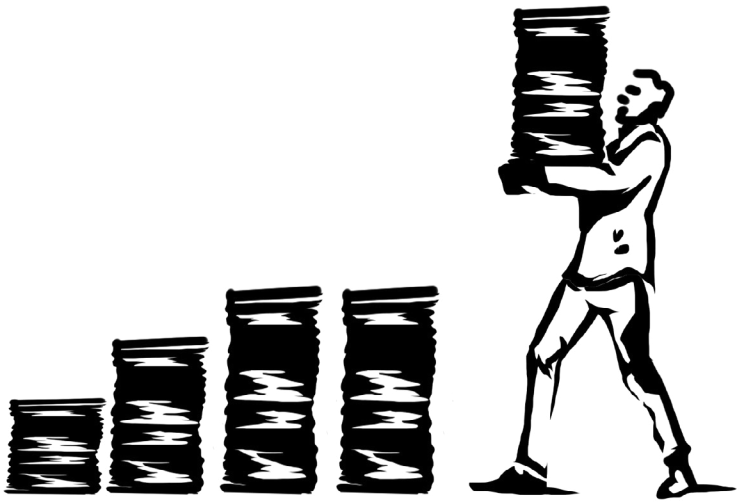
Economists need to redefine human capital by encompassing a spectrum of social and emotional competencies, moving beyond the conventional emphasis on academic and physical skills•

## 5. ELEVATING THE WEALTH OF A NATION: INTEGRATING SEL IN THE ESTIMATION OF HUMAN CAPITAL

The argument for considering social and emotional competencies as a form of human capital stems from the fact that various personality traits like self-regulation, emotion regulation and empathy, among others, exhibit a certain degree of stability, yet can be cultivated further through explicit training. These traits improve task performance, boost labour productivity, and contribute to favourable economic results both directly and indirectly by promoting stable relationships and overall well-being (Durlak et al., 2011).

Research studies report that some of the significant benefits of integrating SEL into education are increased academic achievement (Durlak et al., 2011), reduced high-school absenteeism (Taylor et al., 2017; Jackson et al., 2021), reduced propensity to quit high school (Maguire et al., 2017) and lower dropout rates (Is and Matters, 2021). Reduced high-school absenteeism and reduced propensity to quit high school, in particular, can explain most of the relationship between high school graduation and earnings (Weiss, 1988). Thus, human capital, often measured as educational attainment, greatly depends on students' social and emotional competencies but has yet to be explicitly included. Moreover, disparities in SES that lead to gaps in social and emotional competencies during early childhood play a role in perpetuating inequality across generations (Lundberg, 2018). The Organization of Economic and Cultural Development (Kautz et al., 2015, p. 5) emphasizes early childhood SEL interventions, which are relevant for academic success and economic output.

In summary, (a) longitudinal research shows that social emotional skills are risk factors for developmental outcomes, (b) these effects may last into adulthood and (c) programmes that modify these risk



factors can therefore reduce problems and their sequelae, thereby (d) giving a return on investment to societies that invest early and consistently to prevent problems and promote strengths in relation to academic achievement and attainments and, perhaps, student mental health (Domitrovich et al., 2017).

This requires economists to redefine human capital by encompassing a spectrum of social and emotional competencies, moving beyond the conventional emphasis on academic and physical skills. However, incorporating social and emotional competencies into the economic growth model is a complex challenge. Comprehending the life-long progression of social and emotional competencies can be a foundational step (Lundberg, 2018), and not only because it will help assess competencies across different developmental stages.

## 6. CONCLUSION

The findings summarized in this chapter highlight the enormous benefits of SEL interventions in policy and education systems

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The findings summarized in this chapter highlight the enormous benefits of SEL interventions in policy and education systems. In fact, a recent study that investigated the macroeconomic costs of not addressing SEL shows a high benefit- to-cost ratio with an average of 29% on per capita income (Duraiappah and Sethi, 2020). Given the vital role played by social and emotional competencies in building human capital due to their direct impact on individual health, performance and well-being- the consequences of which are also evident indirectly through distal outcomes, namely reduced attrition, increased attendance and improved societal health-social and emotional competencies must become an essential component of human capital measurements and educational policies worldwide.

## KEY MESSAGES

**Social emotional learning (SEL)** must be included with literacy and numeracy skills to build human capital that is academically and cognitively competent and emotionally resilient.

**The development of social and emotional competencies i**s intertwined with cognitive development.

**Social and emotional competencies a**re malleable and trainable.

**SEL training is beneficial at any age,** but early childhood and adolescence represent sensitive periods for brain development, making SEL education particularly effective during these stages.

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CHAPTER

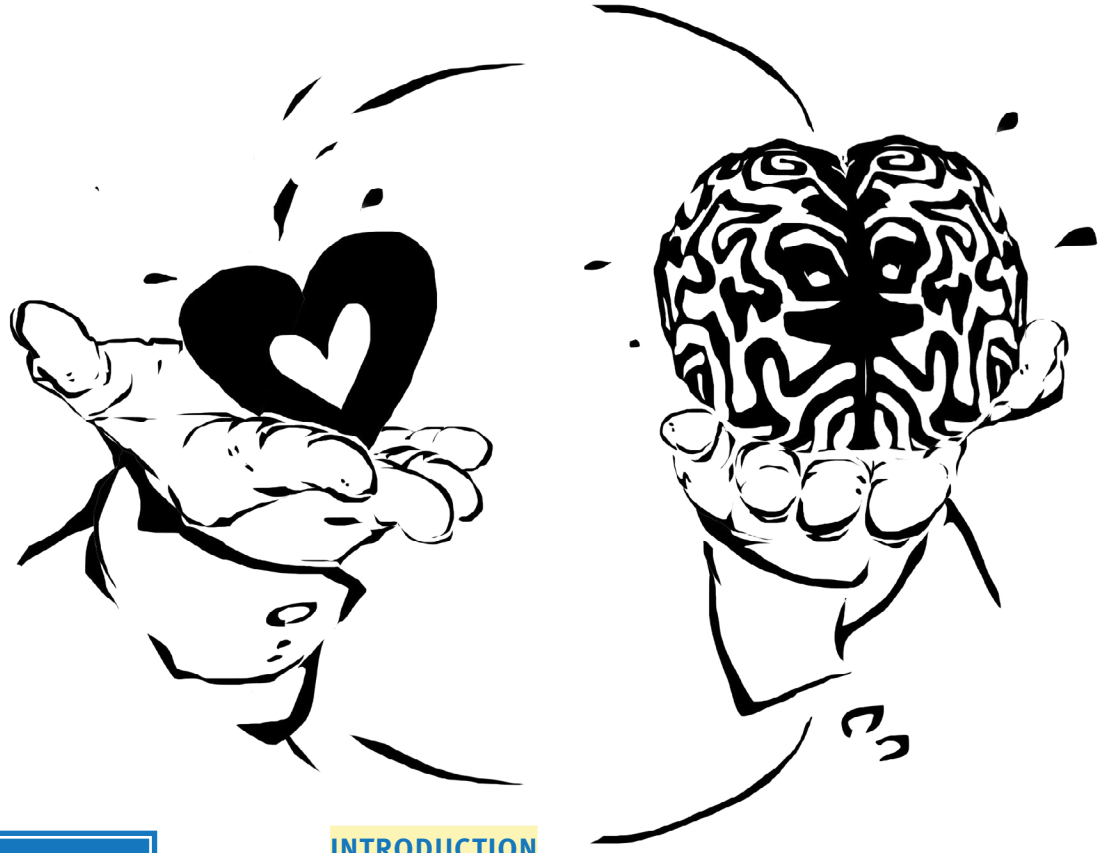
04

# The economic benefits *of* social *and emotional learning*

**Julia Oas, Clive R. Belfield and A. Brooks Bowden**

*abstract*

Educational research on social emotional learning (SEL) has proliferated over the last decade. However, economic research – specifically benefit–cost analysis – has been much more limited. In a prior review we identified significant omissions and deficiencies in research on the costs of SEL programmes and their economic benefits, meaning there is a dearth of research on whether SEL programmes are efficient (Belfield et al., 2015). Here we review the new evidence base on the costs, impacts, benefits and benefit–cost ratios of SEL programmes in the United States. We find limited progress in cost analysis, significant progress in analysis of impacts, but only modest linkage between impacts and benefits and thereby few benefit–cost analyses. Newly available evidence does support the contention that SEL programmes will generate significant economic benefits and that these will exceed their implementation costs. To help advance this contention, we make a series of recommendations for future research to better identify the efficiency of SEL programmes.



# 1

## INTRODUCTION

Over the last decade, interest in social emotional learning (SEL) in schools has proliferated. Building on two important reviews by Durlak et al. (2011) and Skiba et al. (2014), researchers have now investigated in much more detail how children's SEL should be defined, measured and evaluated. Attention from education professionals has grown, with many more schools and districts promoting social-emotional skills within the classroom. Policy-makers have also shown interest, with state-wide reforms to encourage SEL (e.g., in California and Texas). Although our focus is on the United States, attention has been growing globally (as reviewed by Chatterjee Singh and Duraiappah, 2020). As a broad social trend, there has been a shift toward education systems that, whilst primarily seeking to maximize students' test scores, are now more explicitly oriented toward the promotion of students' social-emotional competencies.[1]

1. This literature is now vast. An overview is by Duckworth and Yeager (2015). Recent reviews include: Gershon and Pellitteri (2018); Taylor et al. (2017); Moy (2018). State-wide reforms include: California's SEL agenda (www.cde.ca.gov/ci/se/index.asp); New York state run Technical Assistance Centers for SEL (www.nysed.gov/back-school/social-emotional-learning); and Texas schools incorporation of SEL in many programs (texas. gov/about-tea/other-services/mental-health/). The EASEL Lab at Harvard University provides new evidence and taxonomies for interpreting SEL studies (exploresel.gse.harvard.edu/).

There has been a shift toward education systems that are now more explicitly oriented toward the promotion of students' social-emotional competencies•

Economic research on SEL has lagged behind this educational trend. This is unfortunate because economic evaluations may yield significant information on the value of SEL. Economic evaluations apply either benefit–-cost analysis (BCA) or cost-effectiveness analysis (CEA). Both analytical methods have been adapted for educational interventions and applied across early education programmes, K–12 schooling and post-secondary reforms. As a result, there is a growing evidence base on which to assess whether these education reforms are technically and socially efficient. However, there has been very limited methodological study or evaluation of SEL programmes from an economic perspective.

The purpose of this chapter is to review the economics of SEL and consider how economic research might develop so as to improve the provision of SEL programmes. For clarity and consistency, our focus is on US evidence; nevertheless, the conclusions we draw are likely to be relevant internationally. We begin by stating our definition of SEL and by giving a short primer on economic methods, which shows how economic analysis is well-suited to the evaluation of SEL programmes. Based on a comprehensive literature review, we then chart how the economics of SEL has developed. We contrast the current research evidence with the evidence base at the time of our prior review (Belfield et al., 2015). We divide our description into the four components of economic evaluation: cost analysis; impact identification; benefit assignment; and economic metrics. Our review shows there has been progress in the economics of SEL for one component (impacts) but very little progress in the other components. In response, we set out a research protocol and agenda that may serve as the focus for future economic analysis. Such inquiry would allow economic evaluation to catch up with the growing attention paid to SEL programmes both in the United States and globally.

SEL may be conceptualized as any intervention or programme that promotes the growth of any social and/or emotional skills in children•

## 2. METHOD AND EVIDENCE BASE

### 2.1 DEFINING SEL

In general terms, SEL may be conceptualized as any intervention or programme that promotes the growth of any social and/or emotional skills in children. This is a very expansive definition and may, to some extent, encompass almost all child development interventions. Therefore, for the purposes of this review we define SEL as a programme delivered to all students in school settings that teaches a set of skills to enhance a broad range of social and emotional abilities. By contrast, a more expansive definition would include programmes that: are not universal (for all); are directly reactive to child needs (rather than preventative); are designed for children with a diagnosed need; not primarily instructional; or are delivered in out-of-school settings (e.g., at home or in the offices of a doctor, therapist or counsellor). Programmes with these features are likely to have very different costs, impacts and benefits from those included in our selected definition.

Our definition of SEL includes many SEL programmes. Such programmes may operate through various theories of change or mechanisms and may be evaluated in terms of various skills or competencies. They may be offered to any or all school grades. Also, the impacts of these SEL programmes can be measured in many different ways. Importantly, this definition does not restrict measured impacts to those only vested in the individual child. However, the definition does exclude programmes that are targeted directly at specific emotional states (such as anxiety) and common therapeutic approaches (such as cognitive behavioural therapy). These targeted programmes are becoming popular; but they represent an alternative – and narrower – approach to SEL than is discussed here.

## 2.2 ECONOMIC METHOD

Economic evaluation of these SEL programmes uses one of the two distinct methods: BCA or CEA•

Economic evaluation of these SEL programmes uses one of two methods: BCA or CEA. These methods are distinct.

BCA quantifies in monetary terms the net economic value to a given agency – in this case society – of the impacts and consequences of any SEL programme. With this method, each SEL programme is treated as a resource investment that should yield a stream of money benefits over time. The costs of the SEL programme are measured using the ingredients method (Levin et al., 2018). The money benefits are derived from shadow pricing (placing dollar values on) the impacts caused by the SEL programme. Importantly, the benefits are social benefits: they include private benefits to the student and external benefits to the wider society. All money amounts are expressed in present values at the time of the intervention. The comparison of costs and benefits is expressed as either the net present value (benefits minus costs) or the benefit–cost ratio (benefits over costs). SEL programmes are designated as socially efficient if the net present value is positive or if the benefit–cost ratio exceeds 1.[2]

The alternative economic evaluation method is CEA. This method compares policy alternatives based on the ratio of costs to a single quantifiable (but not monetized) effectiveness measure. CEA is valid when the SEL programme has only one outcome (or has multiple outcomes that can be numerically aggregated into a single metric). The cost of delivering the SEL programme is then divided by that outcome to yield a cost-effectiveness ratio (CER). Interventions with lower CERs are more technically efficient.

BCA and CEA may yield important insights for policy-makers. Both

2. On the formal method of benefit–cost analysis, see Farrow and Zerbe (2013), Boardman et al. (2018); on adapting the methods to education contexts, see Vining and Weimer (2010), Levin et al. (2018). Examples of applied benefit–cost analyses are: Reynolds et al. (2011); Karoly (2012); Oreopoulos and Petronijevic (2013); Conti, Heckman and Pinto (2016).

BCA and CEA yield important insights for policy-makers. Both types of analysis provide evidence on affordability and funding needed for each SEL programme•

types of analysis necessitate accurate cost accounting and resource use, thus both types provide evidence on affordability and the funding needed for each SEL programme. Both methods yield economic metrics (ratios or rates of return). These metrics indicate how efficient a programme is; they also allow policy-makers to compare across programmes to see which ones are the most efficient.

Although both BCA and CEA may be applied to any SEL programme, BCA is the primary economic method for evaluation of SEL. BCA is preferred because of the features of most SEL programmes. First, these programmes impose costs across various agents (e.g., parents or schools). Second, they generate multiple and diverse outcomes. Third, they have significant resource implications over time and across various agents. Incorporating all three of these features into a BCA is straightforward. By contrast, CEA is conventionally applied to targeted interventions that cause one specific outcome and where the time horizon is fixed (hence its common application for health technologies and health treatments). CEA is valid for SEL interventions that address a specific (or diagnosed) health condition, such as anxiety or depression. However, given our definition of SEL, these targeted SEL interventions are not the focus of this review. Therefore, the main economic evaluation approach is BCA (not CEA).

## 2.3 EVIDENCE BASE

This review builds on the evidence base collected from our prior economic investigation of SEL (Belfield et al., 2015).[3] In that analysis, we discussed how economic methods should be applied for SEL programmes and reviewed the available evidence. Also, as specimen examples, we applied BCA to four SEL interventions. (We discuss the results below.) We then drew a series of inferences about SEL programmes and about the status of economic research on SEL.

3. This paper has been cited over 80 times and is one of the most viewed articles published by the Journal of Benefit-Cost Analysis.

We performed a full search for evidence on the economics of SEL with an aim to capture all published studies on SEL interventions in school settings from January 2014 to July 2021.

We add to this evidence based on a new and comprehensive literature review from 2021. Based on the above definition, we performed a full search for evidence on the economics of SEL. The search aimed to capture all published studies of SEL interventions in school settings from January 2014 to July 2021. Studies included impact and economic evaluations as well as relevant methodological discussions related to evaluating SEL interventions. Searches were conducted in the EBSCO database using the keywords 'social emotional learning', 'social-emotional program' and 'social and emotional learning'. No additional keywords were searched, and no phrasing, truncation or word combinations were entered. Results were scanned for relevance to SEL programme interventions and cost-analysis studies in related areas. Studies conducted outside of the United States were excluded. The study method was noted for each evaluation and no evaluation was excluded on methodological grounds. This search yielded 112 relevant studies on SEL programmes. Of these, 13 were meta-analyses or reviews, 60 were impact evaluations of SEL interventions and the remainder (39) were methodological discussions.

Three additional evidence bases were reviewed. We considered all relevant studies produced by the Washington State Institute for Public Policy (an independent agency tasked with using economic methods to evaluate all policies proposed for the state of Washington). This review yielded 29 economic evaluations. As these evaluations are all specific to the economic and educational context in Washington, they were reviewed separately. Also, we reviewed the evidence collated by the What Works Clearinghouse (a unit of the US Federal Government Department of Education tasked with identifying all proven and promising educational interventions nation-wide). This review yielded zero studies.[4] Finally, we reviewed the broader economics literature

4. The What Works Clearinghouse has produced no relevant reviews since 2013. (Their review of the PATHS program is the version for students with emotional and behavioural disturbances.)

We reviewed the broader economics literature that relates to the benefits of social-emotional skills•

that relates to the benefits of social-emotional skills. This literature includes estimates of willingness to pay for social skills or shadow prices for outcomes affected by SEL. Prima facie, this evidence suggests the importance of developing social-emotional skills and can be used to calculate the benefits of SEL. However, for the most part this broader economics research has not considered how these non-cognitive competencies are generated. Its relevance for specific SEL programmes is therefore limited.

We use this new evidence – in conjunction with our prior analysis – to review the economics of SEL in the United States. As discussed above, the US policy context for SEL has changed significantly over the last decade. Our updated evidence shows the extent to which – over that same time frame – the economics of SEL has developed.

## 3. COSTS OF SEL PROGRAMMES

In our first review of the costs of SEL programmes or reforms we found very modest evidence. This initial finding was unsurprising: the dearth of cost analysis has been regularly noted, going back to Levin (2001). Therefore, for almost all SEL interventions, we were unable to determine the resources required for adequate implementation. There was no evidence on induced costs (e.g., spending on subsequent services such as remedial education), and no evidence on external costs (e.g., spending by parents on SEL). Thus, where SEL programmes have spillover or downstream effects (e.g., by motivating more students to seek counselling), the cost consequences of these SEL programmes were unknown. We were unable to find information on how resources for SEL programmes might displace resources for alternative developmental programmes. Finally, data on cost per agency was unknown: the burden of funding across families, schools or districts for SEL programmes was not reported for any SEL intervention. Overall, the affordability of SEL programmes was unknown: schools had no information with which to decide whether

In response to the dearth of evidence and analysis on the costs of SEL programmes, we collected data on costs and benefits for four SEL interventions.

they could afford any programme or what resources would be needed to sustain it. Of course, in the absence of reliable cost data then CEA and BCA were not performed. Put starkly, no economic evaluations of SEL programmes were available for use by education professionals, policy-makers or researchers.

In response to this dearth of evidence and analysis, we collected data on costs and benefits for four SEL interventions. The results are shown in Table 1 (results are in present values at the start of the intervention, adjusted to 2023 USD). These sample interventions are a 'convenience sample' of SEL programmes for which it was feasible to estimate costs and benefits.

Looking first at the cost per participant, it appears that each SEL intervention is affordable. Across the four specimen interventions, the average cost per student ranged from $170 to $1,460 with an average duration per intervention of 1–2 years. However, affordability must be very cautiously considered. In fact, the cost per intervention appears 'too cheap' in the sense that expenditures on SEL interventions are insufficient or sub-optimal. First, the costs seem too low relative to what the programmes are expected to do: based on their theory of change, these SEL interventions are intended to permanently

SEL programmes are underfunded in relation to the theory of change and intended outcomes•

change student behaviour. Such changes may be difficult – perhaps impossible – to effect with an expenditure of only $180 per student. Second, the costs of these SEL programmes appear low relative to per student annual spending for each K–12 grade year, which is currently more than $15,000. If students have already received significant amounts of resources, it is unlikely that a small marginal amount will make much difference. Finally, the net resources for these SEL programmes may be even lower than the estimated cost in Table 1. Often, SEL programmes are substitutes for alternative modes of instruction, therefore, the net resources for students are less than the cost of SEL (and diminish the net impacts). Overall, this available evidence (as limited as it is) may suggest that SEL programmes are affordable. However, a more valid conclusion is that these programmes are underfunded in relation to the theory of change and intended outcomes.

Since this earlier review, there has been very modest progress in cost analysis of SEL programmes. Of the 13 reviews or meta-analyses of SEL programmes since 2015, none directly calculate costs and only two refer to cost analysis indirectly. The two studies with indirect reference to costs do provide some helpful contextual information. Jones et al. (2017) (updated in 2020) describe SEL programmes in terms of implementation components (e.g., amount of professional development for teachers); these components may, in theory, be translated into inputs and priced out using the ingredients method (Levin et al., 2018). Similarly, Lawson et al. (2019) describe core components that may relate to ingredients. However, the studies do not include a full cost analysis.

With regard to specific SEL interventions, our new search has identified only four studies that report delivery costs of SEL programmes. Hunter et al. (2018) calculate the costs of the *Social Skills Improvement System – Class Wide Intervention Program (SSIS-*

Overall, the evidence on costs is very limited and the number of studies is growing at a very slow pace•

*CIP)*. This programme is a curriculum intervention focused on ten important social skills, with learning materials for home–school support. Using the ingredients method, they estimate the cost at $20 per student. In keeping with prior studies, this cost estimate appears very low. A cost analysis of CARE (a mindfulness programme for teachers) was performed by Doyle et al. (2019). This study uses the ingredients method and collects costs from participants in a randomized controlled trial. The cost to train teachers in the SEL programme was $1,220, but this too did not include the costs of implementing the programme in the classroom. Borman et al. (2019) report the costs of an intervention intended to help middle school students 'reappraise' their concerns about fitting in socially and their feelings of belonging. They report the cost of replicating this SEL programme at less than $5 per student per year. Limited information is provided on how this extremely low estimate is derived.

In the United States, the SEL programme that has been evaluated the most is Second Step. This programme is a holistic approach to SEL embedded across the learning experience in grades from K to 12. In our earlier analysis, we estimated the cost per student for Second Step at $600 (see Table 1). A new analysis calculates the cost per participant at only $120 (Lawson et al., 2019). However, this estimate only includes programme materials costs and teacher training time; also, the cost estimate is imprecise (bounded with a cost range of ±40%).

Overall, the evidence on costs is very limited and the number of studies is growing at a very slow pace. Methodologically, the studies do not consistently apply the ingredients method and so do not provide full information on inputs and input prices. Also, there is no information on the perspective adopted or how the burden of funding is split across agencies.

There is considerable scope for more cost analysis to help address questions of affordability and the burden of who should pay for SEL programmes•

Again, based on this cost evidence, practitioners may infer that SEL programmes are affordable. This inference may be invalid, however, because these reported estimates appear very low. Possibly, these new cost estimates may be valid if the SEL programmes displace other programmes and so involve only resource redistribution (rather than extra resources). However, only one study formally addresses this issue of 'treatment contrast'. Jones et al. (2017) identify what is displaced by the SEL programme, classifying each programme in terms of: in-school lesson-based SEL; out-of-school SEL; or in-school non-curricular approaches. This classification helps to establish what resources are no longer used when SEL programmes are implemented. But if programmes do cost so little, it seems unlikely that they will generate strong benefits.

Too little is known about the costs of SEL interventions. There is considerable scope for more cost analysis to help address questions of affordability and the burden of who should pay for SEL programmes. Such cost analyses should be a priority for research on SEL programmes.

## 4. IMPACTS OF SEL INTERVENTIONS

Research on the impacts of SEL is sizeable and growing at a moderate pace. Here the focus is on impact evaluations that can be integrated into economic evaluations, that is, the impacts can be expressed in money terms.

Not all impacts can be expressed in money terms. For SEL programmes, the primary outcome may be (i) the emotional status of the student (e.g., handling/understanding feelings), and emotional states are very hard to express in dollars. However, it is possible to evaluate SEL programmes using other impacts besides emotional status. Three other impact domains of SEL are salient. These domains

Research on the impacts of SEL is sizeable and growing at a moderate pace. Here the focus is on impact evaluations that can be integrated into economic evaluations•

relate to a child's (ii) educational performance (e.g., attendance, achievement or attainment), (iii) internalizing or externalizing behaviour (e.g., social withdrawal, nervousness or defiance, delinquency), and (iv) health status (e.g., eating disorders, anxiety/ stress). For any SEL intervention, there may be impacts in each of these three other domains and, importantly, these impacts may be expressed in money terms.

In our earlier review we identified four deficiencies in how impacts were calculated and derived for the purposes of conducting BCA. First, all impacts of SEL should be identified and counted so that they can be aggregated to compare against costs. Yet this identification was not common in the available research. If SEL interventions are evaluated using a partial set of outcome measures, the economic evaluation will be incomplete. (This includes positive and negative impacts.) Potentially, an efficient SEL programme may be rejected because there is insufficient evidence of its impacts and so its monetary benefits. (Of course, SEL programmes may still be justified on equity grounds.) Omission of some impacts will (logically) underestimate the economic value of SEL. Also, any comparison between SEL interventions –- or between SEL interventions and other child development programmes – will be invalid. Formally, it is invalid to evaluate interventions in terms of social efficiency when these interventions vary in the (number of) impacts identified.

Second, impacts should be measured both for the individual students receiving the SEL intervention and for other students and for school personnel. However, few studies paid attention to the external impacts of SEL programmes. Formally, economic analysis identifies both private impacts – on individuals who are the target of the intervention – and external impacts – on other parties. Conventionally, economic analysis is based on the sum of these private and external impacts (i.e., the full social impact), not just on

The measured impacts of SEL programmes should be mutually exclusive•

the private impacts.[5] External consequences are an important reason for investing public funds in child development programmes, and these external consequences may be more economically significant than the impacts on each individual child. Therefore, when external impacts are neglected, the economic value of SEL programmes is under-estimated.[6]

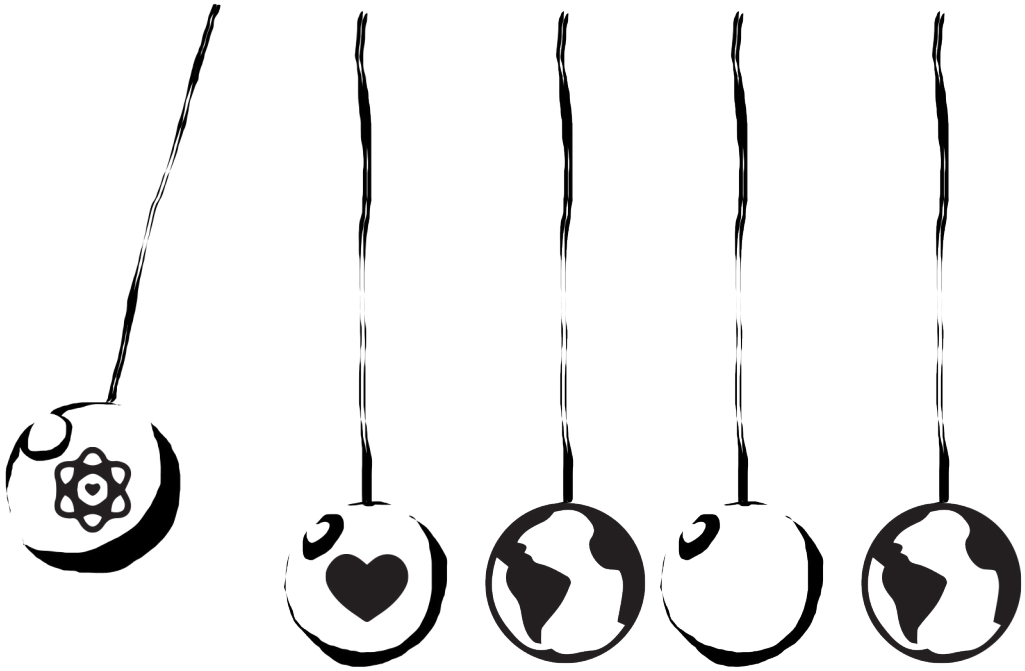
Third, impacts should be measured for the time period when they occur. To our knowledge, no studies have explicitly taken account of when the impacts of the intervention occurred. For economic analysis, the time when outcomes happen is important: delayed or short-lived impacts are less valuable (efficient) than immediate or long-lasting impacts. For some SEL interventions, impacts take time to develop and they fade out; these impacts are much less valuable than SEL interventions that have immediate effects that persist throughout childhood.

Finally, the measured impacts of SEL programmes should be mutually exclusive. Impacts such as test scores and externalizing behaviour should not be counted as two distinct impacts (i.e., they should not be double-counted). Yet no evaluations of SEL programmes explicitly separated out impacts as mutually exclusive.

At the time of our prior review, most SEL impact evaluations fell short

5. Most SEL evaluations focus on private impacts, such as students' test scores or the individual consequences of any externalizing behaviour. External impacts (e.g., teacher well-being, within-class climate or peer bullying) are omitted. For academic interventions, focus on private impacts is justified. By contrast, SEL interventions are often motivated to change private and external behaviours, with consequences for external – and thereby social – outcomes.

6. If the impacts that are omitted relate to spending by school districts, the economic evaluation may fail to identify SEL programs that benefit taxpayers. Public support for SEL programs would therefore be undermined.



New research does consider more impacts, often within the same evaluation•

in each of these four areas. Few evaluations considered all impacts caused by a given SEL intervention; most focused on one domain (e.g., externalizing behaviour). None considered the time frame for analysis, and none were explicit about whether impacts were separable or double-counted.[7]

Since that initial review, considerable progress has been made on the identification and measurement of impacts and outcomes from SEL. We focus on how these advances affect economic evaluation of SEL programmes; specifically, how they affect the validity of impacts used in BCA.

First, new research does consider more impacts, often within the same evaluation. Taylor et al. (2017) conduct a meta-analysis of 44 SEL programmes (including 38 programmes delivered outside the United States). Programmes were at any grade from kindergarten to high school, were universal across students and had evaluations with outcomes at least six months post-intervention. This meta-analytic review is strongly positive. Taylor et al. (2017) identify significant durable and enhanced child outcomes for all age and racial groups, finding these gains both in promoting well-being and in offsetting delinquency.

7. Similarly, Jones et al. (2017) examine the theories of change for 11 SEL programs and find 'imprecise program impacts' and 'too-general measures of outcomes'.

More impacts external to the student such as peer interactions and teacher outcomes are being considered•

Second, more impacts external to the student are being considered (Stearns, 2018). These include peer interactions, such as bullying in school (Osher et al., 2016), and teacher outcomes, such as burnout (Oliveira et al., 2021). New evaluations have considered outcomes with respect to public health, school organization and classroom management, family function, and culture (writ broadly).[8] In addition, more continuous scales are being used: unlike binary (yes/no) indicators, such scales map more closely to the range of behaviours and their consequences (Tefera, Hernandez-Saca and Lester, 2019). Critically, the more external impacts of SEL are counted, the more important BCA becomes. BCA identifies which programmes have economic value to society. But it also identifies that programmes have social value beyond their private value and so would not be optimally selected if programmes are evaluated only in terms of their private consequences. Critically, greater consideration of the external impacts of SEL means that applying BCA becomes more important in providing evidence on the economic value of SEL to society.[9]

Third, the time dimension of SEL programmes is also gaining more attention. Specifically, distal impacts are increasingly likely to be evaluated. Although many interventions were implemented and studied over a short period (six months to two years), there is a clear trend for studies to look over a longer horizon.[10] Also some studies

8. See respectively, Blewitt et al. (2021), Greenberg et al. (2017), Bettencourt et al. (2018), Jagers, Rivas-Drake and Williams.= (2019), Rivas-Drake et al. (2020).

9. One growing critique of SEL evaluations is construct invalidity: measures used in evaluations may not adequately reflect the purpose of SEL (Soland et al., 2019b). For example, SEL may not capture important values such as cultural identity or human rights, particularly for marginalized groups (see Garner et al., 2014; Gregory and Fergus, 2017; Rodriguez-Izquierdo, 2018; Barnes, 2019). Logically, if these values are omitted from impact evaluations they will necessarily be missing from BCAs.

10. For example, Bettencourt et al. (2018) examine children's social-behavioural readiness at kindergarten and related those to 4th grade outcomes (e.g., being retained in grade or being suspended/expelled). Davis et al. (2014) report on high school outcomes (see also Domitrovich et al., 2017).

There is growing interest in the relationship between achievement and social-emotional outcomes•

are measuring more outcomes, and over the longer term. In their evaluation, Jones, Greenberg and Crowley (2015) include a range of distal outcomes relating to education, public assistance, crime, substance abuse and mental health; they find significant associations between the SEL skills measured in kindergarten and outcomes over the life course. In their extensive randomized controlled trial of Head Start REDI, Nix et al. (2016) follow students over five years post-intervention and measured multiple behaviours.[11] This new evidence shows that social emotional skills do not necessarily develop in a linear way as children age, and that fade-out is common (Zvoch and Stevens, 2015).

Finally, there is more attention on the degree to which SEL outcomes are distinct or collinear. Specifically, there is growing interest in the relationship between achievement and social-emotional outcomes. This new evidence shows that achievement and SEL are highly correlated (on how SEL explains variance in achievement see Soland et al. (2019a), Fairless et al., (2021)). One recent study has looked at SEL skills and a range of youth outcomes at the school-level. Jackson et al. (2020) find that schools with high social-emotional development scores have significantly lower school-based arrests and increased high school completion, college attendance and college persistence rates. Moreover, these social-emotional development scores explain more of the variance in these outcomes than do value-added test scores.[12] Although far from providing a conclusive consensus, these studies are helping ensure that the economic gains from SEL are not double-counted.

11. Head Start REDI (Research-based Developmentally-informed) is a literacy and social-emotional programme. Nix et al. (2016) identifies: child trajectories in social competence; aggressive oppositional behaviour; learning engagement; attention problems; student–teacher closeness; peer rejection; social behaviour; learning behaviours; and interpersonal relationships.

12. Similarly, Liu et al. (2022) contrast absenteeism and suspensions against social well-being to identify student outcomes; their findings indicate the former is more predictive than the latter.

The benefits of SEL programmes are simply the impacts expressed in tdollars. These expressions are often based on concepts of opportunity cost or willingness to pay•

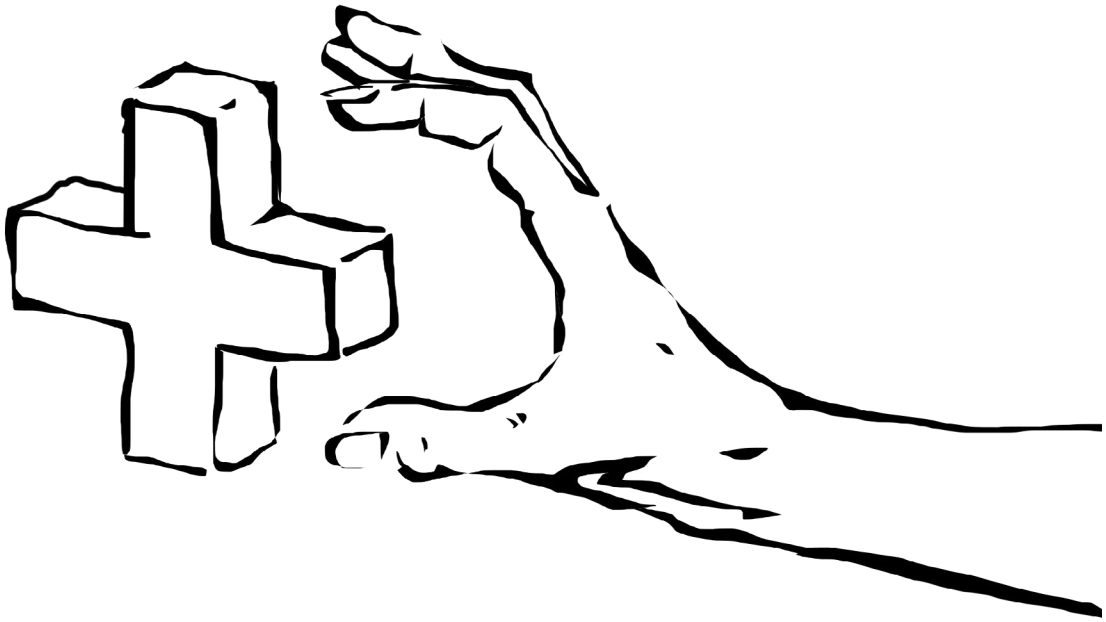
Overall, recent research on the impacts of SEL is promising. Collectively, this body of research reaffirms the conclusion that there are strongly positive impacts of SEL across a range of developmental indicators and direct behaviours, and that these impacts may be durable. Thus the research allows for greater understanding of how social-emotional skills are produced, how quickly they develop, how long before they fade out and how salient they are across domains of child development.

## 5. BENEFITS OF SEL

The benefits of SEL programmes are simply the impacts expressed in dollars. These expressions are often based on concepts of opportunity cost (what other resources are available) or willingness to pay. Logically, where evidence on impacts is unavailable (or otherwise invalid) then benefits cannot be calculated. But even when impacts are known, their economic value is often unexplored. Indeed, in our earlier review we found no studies that had monetized the impacts of SEL; moreover, we found no studies that had directly considered how SEL impacts might be monetized.

In our four specimen studies we focused on the benefits of SEL in terms of educational attainment. Benefits were calculated based on the association between educational attainment and lifetime earnings gains (Belfield and Levin, 2007; Heckman, Humphries and Veramendi, 2018b). Notably, even this narrow focus yielded substantial economic benefits, ranging from $760 to $17,720 per student (see column 1 of Table 1). SEL programmes appear valuable via their effect on educational attainment by itself (domain ii). If a more extensive set of impacts were available (for the other domains), it is likely that the estimated benefits would have been substantially larger.

Since this initial review, there has been some progress in monetizing



There is limited direct evidence on economic values for two important domains: emotional regulation and behaviour•

the value of SEL skills. Taylor et al. (2017, Table 3) summarize five studies that report benefits in domains including sexuality, crime, school status, relationships and mental health. These five studies find very large benefits from these distal outcomes.

However, there is limited direct evidence on economic values for two important domains: emotional regulation – handling feelings; and behaviour – either internalizing or externalizing. For any change in emotional state, it is difficult to identify any resulting resource changes (and difficult to put money values on these changes). However, it should be possible to assign money values to behavioural changes.[13]

Few studies have explicitly considered SEL interventions in terms of the benefits per domain. A priori, we might expect behavioural and health-related domains (iii) and (iv) to be emphasized: considerable school-level and taxpayer-level resources are devoted to these two domains. It is possible to express impacts within these two domains in dollars using standard shadow pricing methods (as discussed in detail in Boardman et al. (2018) and Levin et al. (2018)). As illustrated in the four specimen studies, it is feasible to calculate the economic

13. There are some studies of the value of 'social skills' in the labour market: Deming (2017) finds that employers are willing to recruit and pay a premium for workers with higher social skills. But the constructs used to identify social skills in the labour market are conceptually distinct from the constructs used in evaluations of SEL programmes. Other related studies are by Heckman and Mosso (2014) and Heckman, Humphries and Veramendi (2018a); these studies discuss the economic benefits of pre-school SEL programs.

There has been some methodological advance in monetizing SEL skills with more studies measuring distal outcomes that have a clear economic value•

value of educational gains (domain ii). As well, almost no studies investigated the economic importance across multiple domains and most did not put dollar values on any programme impacts.

Finally, there has been some methodological advance in monetizing SEL skills. The first advance is how impacts are measured: more studies measure distal outcomes that have a clear economic value. For example, Jackson et al. (2021) identify reduced crime from SEL; there are numerous studies on the economic value of crime reduction (McCollister, French and Fang, 2012; Cohen and Piquero, 2009). Similarly, studies that identify high school completion as a result of SEL can draw on the large evidence relating high school completion to lifetime earnings (Autor, 2014; Hanushek et al., 2017). A second methodological advance is the greater reliance on independent metrics to evaluate SEL programmes. Earlier studies relied more heavily on self-reported responses; these responses are often weakly related to impacts that might be monetized (Steedle, Hong and Cheng, 2019). The new trend is to use objective measures of status (e.g., college enrolment, suspensions). This trend is helpful for economic evaluation: outcomes from revealed preference (in terms of behaviours) are preferred to outcomes based on stated preferences (Chen et al., 2020). It is easier to assign money values to objective measures of behaviour or status (in terms of health or labour market activity). However, some shadow pricing methods – such as hedonic pricing – have not been explored. Also neglected is how benefits from one study transfer to another. There is scope for methodological advances.

## 6. BENEFIT–COST ANALYSIS

Logically, without much evidence on either the costs or benefits of SEL programmes, there is very limited scope for BCA to be performed. That was the case in our earlier review: no BCA (or CEA) of any SEL

*SEL programmes: benefit–cost results*

*Table 1.*

| | Benefits | Costs | Benefit/Cost Ratio |
|---|---|---|---|
| Responsive Classroom | $17,720 | $1,460 | 12.1 |
| Second Step | $4,260 | $600 | 7.3 |
| Life-Skills Training | $760 | $170 | 4.4 |
| 4Rs | $2,350 | $900 | 2.6 |

*Source: Belfield et al. (2015). Notes: Present value 2023 USD.*

Research is still far short of being able to offer guidance on which is the most efficient SEL intervention•

programme was available.

For our specimen studies, we calculated the economic returns to SEL. The benefit–cost ratios are shown in the final column of Table 1. This available evidence – albeit sparse – shows high benefit–cost ratios from the four SEL programmes. Per student the range of costs is $170 to $1,460 and the range of benefits is $760 to $17,720. Thus, benefit–cost ratios range from 2.6 to 12.1. These ratios are significantly greater than 1 and so indicate that each programme is a socially efficient investment. Given this was a convenience sample, and with only a few benefits identified, the results are promising for applying BCA more widely.

However, research is still far short of being able to offer guidance on which is the most efficient SEL intervention. These four BCAs are harmonized with respect to costing methods, input prices and benefit shadow prices. Nevertheless, their benefit–cost ratios should not be compared directly. As noted above, the costs may be underestimated (by a different proportion for each intervention). Also, the calculations are subject to many of the constraints described above: most notably, they are derived from evaluations that do not identify all impacts or benefit domains. The calculations of benefits are therefore conservative. Also, these SEL interventions are delivered to children at different stages of development and so are not substitutes for each other. Overall, this BCA evidence is suggestive: the returns to SEL programmes may possibly be high; but ranking programmes in terms of efficiency is far from conclusive.

With respect to the analysis of benefits and costs, there has not been much improvement since this analysis. (Of the 80+ research papers that have cited Belfield et al. (2015), none appears to have produced a BCA.) The few studies with cost analysis (as described above) do not follow on to perform a BCA (see Doyle et al., 2019; Borman et al.,

*WSIPP interventions: benefit–cost results*

*Table 2.*

| | Benefits | Costs | Benefit/Cost Ratio |
|---|---|---|---|
| Growth mindset interventions | $ 4,730 | $ 50 | 93.23 |
| Lions Quest Skills for Adolescence | $ 870 | $ 10 | 63.32 |
| Good Behavior Game | $ 12,390 | $ 200 | 62.80 |
| Project EX | $ 3,600 | $ 80 | 46.41 |
| Sunshine Circle Model | $ 6,090 | $ 200 | 30.08 |
| Positive Action | $ 38,330 | $ 1,310 | 29.32 |
| Playworks Coach | $ 5,180 | $ 200 | 26.36 |
| Group/individual CBT | $ 13,350 | $ 570 | 23.57 |
| Promoting Alternative Thinking Strategies | $ 10,280 | $ 460 | 22.09 |
| All Stars | $ 2,910 | $ 140 | 21.56 |
| Coping and Support Training (CAST) | $ 9,400 | $ 590 | 15.87 |
| Peer Group Connection | $ 5,020 | $ 320 | 15.74 |
| School - Wide Positive Behavioral Interventions and Supports (SWPBIS) | $ 11,310 | $ 800 | 14.12 |
| Communities in Schools | $ 4,550 | $ 320 | 14.01 |
| Life Skills Training | $ 1,750 | $ 130 | 13.49 |
| keepin' it REAL | $ 730 | $ 60 | 11.52 |
| Caring School Community | $ 14,170 | $ 1,350 | 10.47 |
| 'Check -in' behaviour interventions | $ 16,310 | $ 2,060 | 7.91 |
| Mentoring: School - based (teachers/staff) | $ 24,750 | $ 4,270 | 5.80 |
| Roots of Empathy | $ 1,690 | $ 380 | 4.46 |
| Community - based Mentoring | $ 5,320 | $ 2,130 | 2.50 |
| Seattle Social Development Project | $ 10,950 | $ 4,870 | 2.25 |
| City Connects | $ 3,620 | $ 1,920 | 1.88 |
| InShape | $ 40 | $ 30 | 1.41 |
| Coping Power Program | $ 1,140 | $ 910 | 1.25 |
| | | | |
| Mentoring: School - based (volunteers) | $ (11,020) | $ 3,010 | n.a. |
| Project SUCCESS | $ (890) | $ 210 | n.a. |
| Responsive Classroom | $ (13,160) | $ 1,160 | n.a. |
| Project ALERT | $ (360) | $ 20 | n.a. |
| | | | |
| Mean (n=29) | $ 6,310 | $ 960 | 6.59 |
| SD (n=25) | $ 9,760 | $ 1,260 | 22.81 |

*Source: Washington State Institute for Public Policy, wsipp.wa.gov. Results retrieved 21 November 2021.*
*Notes: Present value 2023 USD (rounded). Interventions meet criteria for SEL designation in K–12 grades. Parenting programs excluded. a CBT for children/adolescents with anxiety b Mentoring for children with disruptive behaviour.*

The social efficiency of recent SEL programmes is unknown, and there is not much evidence of technical efficiency•

2019). In their evaluation of SSIS-CIP, Hunter et al. (2018) undertake CEA. They report the average cost per one unit change in social skills for first grade students at $151 (95% CI, $58-$633) and for second grade students at less than $2.[14] However, it is difficult for policy-makers to apply these results: CEA is a comparative analysis and other interventions may be more socially efficient. Overall, the social efficiency of recent SEL programmes is unknown (i.e., there are no BCAs), and there is not much evidence of technical efficiency (i.e., CEAs are sparse).

There has been considerable progress in BCA in Washington state. The Washington State Institute for Public Policy (WSIPP) produces a compendium of BCAs of social programmes. These BCAs are from the perspective of Washington state (rather than the standard social perspective) and so only account for costs incurred and benefits accrued within the state. Nevertheless, the compendium is regularly updated and includes 101 economic evaluations in three relevant categories: children's mental health; pre-K to 12th grade education; and child welfare.[15] These BCAs are informative about the efficiency of SEL programmes.

From our review of the WSIPP evaluations, we identify 29 that are relevant for economic evaluation of SEL.[16] The benefits, costs and

14. Similarly, Liu and Yang (2021) report on 23 CEAs of interventions related to screening and CBT: most of these are found to be cost-effective.

15. This review is based on studies reported as of September 2021.

16. Many of the evaluations are of interventions that do not match our definition of SEL programmes. We exclude from the 101 economic evaluations those that focus only on academic mechanisms (not social-emotional mechanisms) or only measure academic achievement outcomes (43 evaluations). We also exclude evaluations of full pre-school programs with multiple goals (six evaluations) and those that are targeted to students with diagnosed health conditions or in response to a specific trauma (12) or delivered in non-school settings such as therapy offices (22). These excluded interventions may be more efficient than interventions that meet our criteria but, as well as conflicting with our definition of SEL, they are likely to have very different costs and benefits per participant.

Evidence on the net benefits of SEL programmes is very limited. In absolute terms, the count of benefit–cost ratios (excepting WSIPP) is low•

benefit–cost ratios for these 29 interventions are listed in Table 2. We caution that the programmes include interventions with goals beyond SEL (e.g. early education), and although all have SEL components, few are formally identified as SEL programmes. Therefore, WSIPP evidence is illustrative rather than definitive.

The average cost per intervention evaluated by WSIPP is $960 (standard deviation, $1,260). Consistent with the evidence discussed above, most interventions appear affordable. Some interventions appear very low cost, with 20% (six) estimated to cost less than $100 per participant. The average benefit per intervention is $6,310 (standard deviation, $9,790). These high levels of benefits are also consistent with prior evidence, although WSIPP evidence shows 13% (four) have negative benefits. Importantly, the benefits exceed the costs in 83% (24) of the evaluations. The average benefit–cost ratio is 6.59. This result provides strong evidence that programmes in these fields (mental health, education and welfare) can be socially efficient. Finally, there are some SEL interventions where returns are extremely high; these interventions are distinguished by their very low cost per participant.

Overall, evidence on the net benefits of SEL programmes is very limited. In absolute terms, the count of benefit–cost ratios (excepting WSIPP) is low. Equally importantly, BCA results can be related to the many programmes that have had impact evaluations and that have established promising evidence of effectiveness. Many of these programmes would be appropriate for economic evaluation, particularly those that are direct alternatives or substitutes or that appear to require significant initial investment.

More evaluation of SEL from an economic perspective is needed. There are few estimates of what SEL programmes cost, even fewer estimates of the economic benefits of these programmes, and almost no BCA•

## 7. ADVANCING THE ECONOMICS OF SEL

More evaluation of SEL from an economic perspective is needed. There are few estimates of what SEL programmes cost, even fewer estimates of the economic benefits of these programmes, and almost no BCA. Here we set out an agenda for a broader application of economic analysis to more closely align with the evidence on impacts and the growing policy interest, both in the United States and globally. For the costs of SEL, the first item on the agenda is simple: perform more cost analysis. However, this cost analysis should conform more closely to standard research practice (Boardman et al., 2018; Levin et al., 2018). Doing so would require: greater clarity on the costing method; clearer specification of which resources are included; an explicit consideration of the opportunity cost of SEL programmes; and direct evidence on who funds these resources.

For the impacts of SEL, there has been modest research progress, so the main item on the agenda is to ensure that impact evaluations can be linked to economic evaluations. Specifically, impact evaluations of SEL programmes should: identify all possible consequences over the full horizon for the programme; distinguish private versus external impacts of SEL programmes, with a particular focus on the spillovers within classrooms and schools; accurately time-date each impact; and explicitly model the overlap between impacts to avoid double-counting.

For the benefits of SEL, we emphasize the need for all impacts to be translated into resource consequences. In our prior review we advocated for 'benefit maps' to assist in this translation (Belfield, 2015). Such maps can help identify who benefits from SEL programmes and where those benefits come from. Specifically, benefits of SEL should be described in relation to: savings on school resources; savings to health care systems; and labour market returns.

As more outcomes and more distal outcomes are considered across SEL research, then the benefits can be more comprehensively estimated•

If more shadow prices are available (e.g., on society's willingness to pay for reductions in externalizing behaviour), new studies can apply these to make economic evaluation more efficient.

For economic metrics, the primary agenda item is to decide between CEA and BCA. We have argued that BCA is valid under more conditions than CEA, but that argument reflects our definition of SEL programmes as population-wide, classroom-based interventions. For targeted SEL programmes that are responsive to a diagnosed clinical need, CEA may be more appropriate. Such cost-effectiveness analyses can be integrated into the large body of literature in health economics (see the CEA Registry at cearegistry.org).

Each of these four agenda items should be developed to ensure that SEL programmes can be economically justified. Indeed, as each item is developed, there will be cumulative improvements. As more outcomes and more distal outcomes are considered across SEL research, then the benefits can be more comprehensively estimated. Also, as more shadow prices are derived, then the economic value of SEL can be more precisely estimated. Finally, if costs are known, the values for benefits can be bounded (i.e., the benefit values must exceed the costs for the programme to be efficient).[17] Thus, there is an opportunity for research on the economics of SEL to develop reasonably rapidly.

Finally, we emphasize that this agenda aims to improve policy and decision-making. Research therefore needs to be clear about: the perspectives of policy-makers and the extent to which they are motivated by fiscal or social efficiencies; affordability, that is, whether policy-makers can find the resources to make these investments; and the time horizon for decisions and whether or not policy-makers can

17. For some SEL interventions, costs might – as an approximation – be 'guesstimated' with information on the components of the intervention, its duration, its location and the extent to which it substitutes for other programs or instructional time. If benefits are known, this cost 'guesstimate' might be helpful for deciding if an intervention merits a full BCA.

Currently, the economics of SEL provides far too little evidence for policy-makers and education professionals. This conclusion holds for the United States but it may be equally valid for other countries •

wait for results from long-term programmes. We are optimistic that the information generated by BCA and CEA will be useful for policy-makers.

## 8. CONCLUSIONS

In light of significant social problems (climate change, migration and pandemics), citizens need many more social – and emotional – skills. This need is further reinforced by changes in the world of work: robots and automation have expanded across the labour market, displacing workers from jobs requiring routine skills. With social-emotional skills, workers can be productive in many careers that require interaction with others. Finally, mental health challenges are increasingly being recognized; recent estimates are that one-in-five Americans are affected by mental health illnesses (Frank and Glied, 2023). SEL programmes can play an important role in boosting mental health. SEL can help communities become more resilient to these challenges. Finally, within families and schools, there is a growing appreciation of the variability in child development and student competencies. SEL can help all parties – including the child – understand and accept this heterogeneity. Thus, for each of these broad social and economic trends, a greater commitment to SEL would appear to be valuable. Currently, the economics of SEL provides far too little evidence for policy-makers and education professionals. This conclusion holds for the United States but it may be equally valid for other countries. There are many questions that economic research can address but it has so far failed to do so. These questions include which SEL programmes work? What are the optimal ages for investing in SEL? What outcomes of SEL are most economically important? What amount of resources is necessary for SEL programmes to be effectively implemented? Perhaps the most important question – which economics can respond to – is, how much money should be invested in SEL programmes?

This review has highlighted key interconnected features of SEL: the dearth of economic research in a context where SEL is economically important •

Based on the sparse evidence, investment in SEL appears to be insufficient, but a more thorough investigation is needed to verify this suggestion. This investigation will need to overcome a set of political and institutional barriers. First, education systems are focused on accountability frameworks and performance funding formulae, that is, achievement and test scores are given more attention – and more direct funding – relative to social-emotional skills. We have argued that this priority may be misplaced, but more research is needed to substantiate this argument. Second, school budgets are often funded per student, encouraging schools to treat students as private 'units' rather than as a community with social norms where peer interactions and social behaviours are most influential. Budgets should be structured to recognize the relationships between students and the classroom climate. Third, the incentive to invest in SEL programmes is dispersed across agents, each of which reaps only a small benefit from improved SEL skills. For example, elementary schools do not financially benefit from changes in internalizing behaviour in high school, and education systems do not financially benefit from reductions in mental health caseloads. Therefore, whereas the economic returns to SEL programmes are shared, the cost of providing SEL programmes typically devolves to schools. Finally, the most straightforward challenge is also the most basic: decision-makers are unaware (or possibly unconvinced) of the efficiency of SEL programmes.

In summary, this review has highlighted key interconnected features of SEL: the dearth of economic research in a context where SEL is economically important. This presents both an opportunity for economic evaluation of SEL and points to the promise of this evaluation.

## KEY MESSAGES

**This chapter reviews the economics of SEL,** focusing on evidence from the United States.

**The study defines SEL, providing a short primer on economic methods,** showing how economic analysis is well suited to evaluation of SEL programmes.

**This chapter charts development of the economics of SEL, contrasting** it with the evidence presented in the authors' prior study (Belfield et al., 2015).

**The study concludes that without evaluation researchers cannot offer guidance on SEL programmes** with respect to key questions concerning SEL programmes such as which SEL programmes work? What are the optimal ages for investing in SEL? What amount of resources are necessary for SEL programmes to be implemented?

**The study finds that the education system is not adequately investing in SEL programmes.**


## FUNDING ACKNOWLEDGMENT

The authors appreciate the helpful comments of an anonymous reviewer. Funding for this report was provided by The Institute of Education Sciences, US Department of Education, through Grant R305B200034 to the University of Pennsylvania. The opinions expressed are those of the authors and do not represent the views of the Institute or the US Department of Education.

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CHAPTER

05

# The economics of Social emotional competencies and *human capital*

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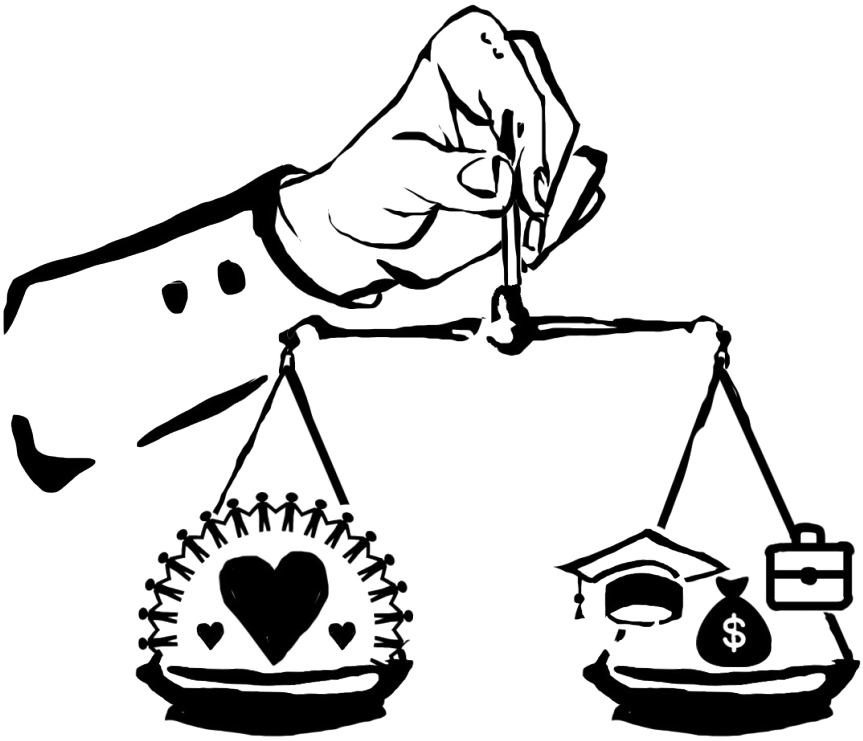
*abstract*

Human capital is defined in the Inclusive Wealth Index as the level of educational attainment, rate of return on education, and size of the working population multiplied by the social price of labour in a country. Previous inclusive wealth reports assert that human capital accounts for about 54% of the inclusive wealth of most nations. This chapter describes the methodology used to estimate the contribution of social emotional learning (SEL) to human capital through its impact on educational attainment. Specifically, we present three scenarios for SEL implementation. Preliminary estimates suggest a positive increase in human capital of 0.46–1.9% by 2030 across ten selected countries when SEL interventions are implemented in high schools and undergraduate colleges. We highlight the methodological and data challenges in incorporating social and emotional competencies in estimating human capital.



1

## INTRODUCTION

Human capital refers to the knowledge and skills people accumulate over time (Becker, 1964; Rosen, 1989). UNU-IHDP and UNEP (2014) define it as 'the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being'. People who are more knowledgeable and possess the required skills at the workplace are likelier to have better earnings than those who lack such skills (Becker, 1993). The role and contribution of human capital to a nation's productive capacity is well documented (Goldin, 2016; Kwon, 2009). Goldin (2016) has studied the historical evolution of human capital and states that 'the inclusion of human capital in growth accounting treats increases in education as enhancing the productivity of individuals' (p. 58). Meanwhile, Kwon (2009) argues that the accumulation of human capital through education and training only increases economic productivity. Nonetheless, there have been quite a few challenges associated with including human capital as part of a country's national accounts. Simon Kuznets, who designed the system of national income accounts, first acknowledged the omission of human capital from these accounts not only due to the sheer difficulty of measuring human capital investments but also because it would be hard to distinguish activities that add to national income from leisure activities (Abraham and Mallatt, 2022).

Human capital is defined as 'the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being' •

Consequently, research efforts have been directed toward finding innovative ways to measure human capital.

We echo Chapter 3 of this report, which calls for 'reimagining human capital' in the context of well-being. Since well-being is a multidimensional concept, measuring economic productivity alone is not enough to understand well-being (see definition of Inclusive Wealth Index in Chapter 1). Key messages from Chapter 3 clearly state that social and emotional competencies contribute directly and indirectly to the well-being of individuals and society. This is also supported by Figure 1, which shows some of the impacts social emotional learning (SEL) has on variables that directly or indirectly affect well-being in a selected number of countries for which information is available. The green arrows in the figure indicate an increase in the variable due to an SEL intervention. In contrast, the red arrows indicate a drop in variables (for instance, a decline in dropout rates from school when SEL is implemented). The arrow thickness indicates the magnitude of the effect, with thicker arrows representing a higher magnitude.

Recalling from Chapter 1, human capital is one of the three capital assets (the other two being produced and natural capital) that form the productive base of an economy as measured by inclusive wealth. The concept of inclusive wealth is an alternative to income-based measures such as GDP, which do not reflect societal well-being or the nature of development in a country. Inclusive wealth measures a society's productive base, according to capital assets such as produced, human, and natural capital. It can be used to examine whether or not the growth trajectory of a country is sustainable.

*Fig 1.*

| Impact of SEL interventions on | | | | | | |
|---|---|---|---|---|---|---|
| Country | Academic Performance | Drug use | Dropout rates | Delinquent behaviours | Mental health | Studies and reports |
| USA | ↑ (10.64%) | ↓ | ↓ | ↓ | ↑ | Durlak et al. (2011), Taylor et al. (2017), Belfield et al. (2015), Sklad et al. (2012), Elias (2014), Jones and Kahn(2017), Garcia-Carrion et al. (2019) |
| UK (England]) | ↑ (11.03%) | ↓ | ↓ | ↓ | ↑ | Wiglesworth et al. (2016), Clouder et al. (2008), Garcia-Carrion et al. (2019), Berry et al. (2016), White (2017) |
| India | ↑ (7.14%) | – | ↓ | ↓ | ↑ | UNESCO MGIEP (n.d.), Tagat et al. (2022), Bhadwal and Panda (1992) |
| China | ↑ (7.53%) | – | ↓ | ↓ | ↑ | UNESCO MGIEP (n.d.), Tagat et al. (2022), Bhadwal and Panda (1992) |
| Netherlands | ↑ (10.26%) | ↓ | ↓ | ↓ | ↑ | Sklad et al. (2012), Oliver et al. (2011), Clouder et al. (2008) |
| Peru | ↑ (7.53%) | ↓ | – | ↓ | ↑ | Adler (2016), Van-Ramirez (2022) |
| Mexico | ↑ (7.53%) | ↓ | – | ↓ | ↑ | Adler (2016), Clouder et al. (2015) |
| Portugal | ↑ (16.28%) | – | – | ↓ | ↑ | Cristovao et al. (2017), Linares et al (2005), OECD (2021), Clouder et al. (2011) |
| South Africa | ↑ (19.04%) | ↓ | ↓ | ↓ | ↑ | Clouder et al. (2013) |
| Australia | ↑ (11.03%) | ↓ | – | ↓ | ↑ | Ashdown and Bernard (2011), Dray et al. (2017) |
| Turkey | ↑ (11.03%) | – | ↓ | ↓ | ↑ | Alan et al. (2016), Martin and Alacaci (2015) |

*Impact of SEL interventions on academic performance, drug use, dropout rates, delinquent behaviours, and mental health*

The question we must ask when treating human capital as part of the inclusive wealth of a country is this: should the benefits accruing from education be limited to the productivity of an individual for economic purposes, or should they encompass the broader suite of

Should the benefits accruing from education be limited to the productivity of an individual for economic purposes, or should they encompass the broader suite of competencies that are essential to the well-being of individuals? •

competencies that are essential to the well-being of individuals? The potential to increase human capital through essential competencies for well-being, leading to an increase in the inclusive wealth of a nation, should ideally be incorporated into the country's national wealth accounting system.

Building on the data presented in Figure 1, and given that human capital contributes 54% of the inclusive wealth in most countries, it is reasonable to hypothesize that including SEL in education will impact the estimation of human capital. This chapter presents a methodology for estimating human capital that includes SEL and discusses its impact in key countries. The structure of the chapter is as follows. In Section 2, we present the methodology for the current estimation of human capital and how it has been revised to include SEL (for details on the methodology, see annexure). Section 3 elucidates the estimates of change in human capital relative to the case wherein no SEL intervention is implemented for ten countries. Section 4 outlines the challenges and opportunities, and Section 5 concludes and presents the limitations of this research.

## 2. METHODOLOGY

Human capital measurement approaches can be classified into two broad categories: indicator-based measures and monetary measures. Indicator-based measures such as school enrolment, educational attainment, and expected years of schooling are good proxies of human capital that are easy to measure and have long been used in academia (UNU-IHDP and UNEP, 2014). On the other hand, monetary measures based on cost- and income-based approaches, are suitable for providing a comprehensive view. They combine many aspects into one metric that measures human capital. Many recent international initiatives on human capital measurement have adopted an income-based approach; for instance, the lifetime income approach, which

Social and emotional capital accounting entails systematically identifying and evaluating SEL interventions that are instrumental to human well-being and flourishing •

aligns with the measurement of other forms of capital in the System of National Accounts (UNU-IHDP and UNEP, 2014). In the lifetime income approach, future earning potential (proxied by wage) is a shadow price of human capital.

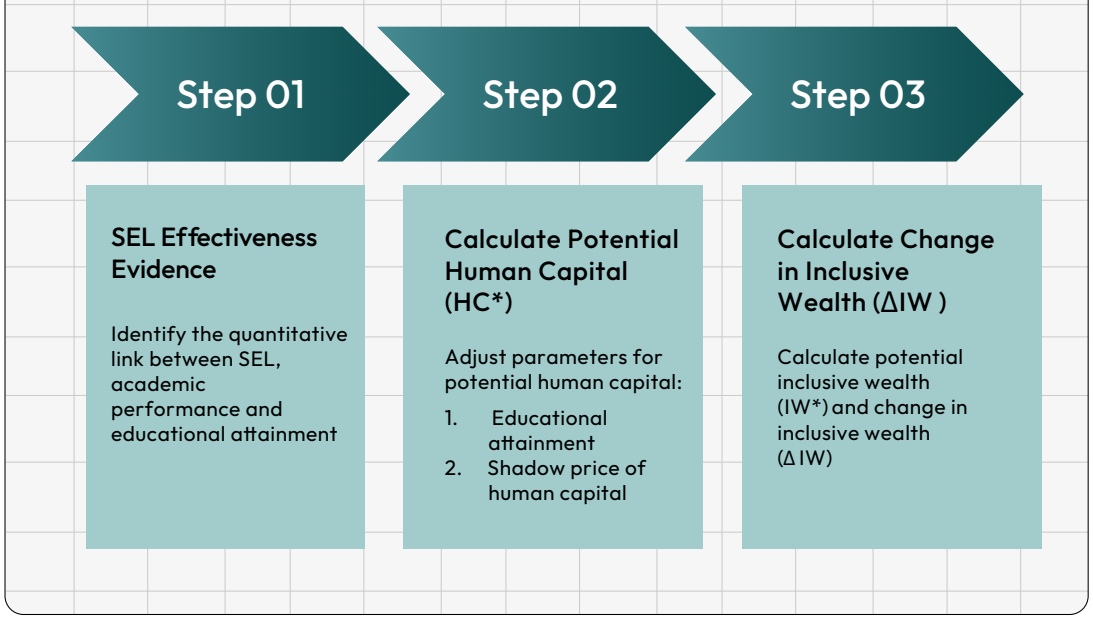
Here, to estimate the change in human capital, we build on the lifetime income approach adopted in previous editions of the Inclusive Wealth Report (UNU-IHDP and UNEP, 2012, 2014; Managi and Kumar, 2018). It is worth noting that a wealth-based policy evaluation is equivalent to a social cost–benefit analysis (Arrow et al., 2003; Dasgupta, 2009). We use a wealth-based policy evaluation framework that captures the net change in human capital stock to evaluate SEL interventions on a national level.

Social and emotional capital accounting entails systematically identifying and evaluating SEL interventions that are instrumental to human well-being and flourishing. We update the methodology used to calculate human capital by explicitly factoring in SEL in measures of human capital. Also, we include SEL by adjusting school enrolment rates which will have a subsequent impact on educational attainment. Our underlying assumption is that SEL reduces the number of dropouts from educational institutions and, thus, increases the number of graduates (Nowicki et al., 2004).

Owing to data limitations, we cannot include with high confidence all the potential positive consequences of improved social and emotional competencies (see Figure 1) as a result of SEL interventions. Instead, we focus on the association between SEL and improved academic performance as the primary link that translates into improved educational attainment and higher wages.[1] This facilitates a first

1. Cumulative evidence shows that SEL interventions improve academic performance among K-12 students (Cipriano et al., 2023; Corcoran et al., 2018; Diekstra and Gravesteijn, 2008; Durlak et al., 2011; Korpershoek et al., 2016; Linares et al., 2005; Sklad et al., 2012; Taylor et al., 2017). Durlak et al. (2011) conclude that SEL interventions can enhance academic performance by up to 11 percentage points. However, most of these studies are conducted in the Global North with a few emerging from the Global South.

*Fig 2.*




*Calculation steps for wealth accounting–based policy evaluation of SEL interventions*

exploratory voyage to integrate SEL into the existing methodology used to compute a country's human capital. Quantifiable evidence for the proposed link is available in the scholarly literature. For instance, academic performance is positively associated with educational attainment, i.e., a high GPA in high school is a strong predictor of degree completion, especially at the college level (Allensworth and Clark, 2020; French et al., 2015).

We adopt the following approach to investigate the impact of SEL on inclusive wealth. Produced and natural capital is kept fixed, but human capital is adjusted for its potential accruing from large-scale nationwide SEL interventions. The three steps for computing potential inclusive wealth are outlined in Figure 2. They are as follows:

**Step 1:** Review the literature for empirical evidence of the effectiveness of SEL interventions in formal and informal university scenarios. Specifically, we searched for the above links relevant to human capital calculations.

*Table 1.*

| Potential links that can be used to adjust human capital calculations | |
|---|---|
| **Link A: Educational attainment** | SEL interventions ⇢ Educational attainment<br>SEL interventions ⇢ Academic performance ⇢ Educational attainment<br>SEL interventions ⇢ Academic performance ⇢ Dropouts ⇢ Educational attainment |
| **Link B: LFP** | SEL interventions ⇢ LFP<br>SEL interventions ⇢ Dropout ⇢ Labour force participation (LFP)<br>SEL interventions ⇢ Academic performance ⇢ LFP |
| **Link C: Wage rates** | SEL interventions ⇢ Academic performance ⇢ Wage<br>SEL interventions ⇢ Academic performance ⇢ Educational attainment ⇢ Wage<br>SEL interventions ⇢ Academic performance ⇢ Dropouts ⇢ Wage |

We only incorporate changes in educational attainment due to SEL because of data challenges in adjusting income levels and expected working life •

**Step 2:** Calculate potential human capital by adjusting the human capital parameters. SEL can affect educational attainment, expected working life, and employee compensation. However, in this chapter, we only incorporate changes in educational attainment due to data challenges in adjusting income levels and expected working life due to SEL. Further, we adjust the human capital accounts presented to obtain the potential human capital in three scenarios.

**Step 3:** Compute potential inclusive wealth and change in inclusive wealth.

## STEP 1: EVIDENCE OF SEL EFFECTIVENESS

Our first step was to find evidence of SEL effectiveness in the literature. In this step, we searched for numerical estimates of effect

We emphasize SEL interventions and their effects on the parameters of human capital–educational attainment, LFP, and wage rates •

sizes for SEL effectiveness (see Figure 1 for studies that were used to obtain the effect sizes), which can be used to calculate human capital. As we focus on adjusting the human capital component of inclusive wealth, we highlight the factors relevant to the present methodology used to compute human capital. We, therefore, emphasize SEL interventions and their effects on the parameters of human capital – educational attainment, LFP, and wage rates. There is strong evidence that SEL interventions improve academic performance (see Table 1 for the potential mechanisms through which SEL interventions can affect human capital parameters).

To calculate the potential of human capital in Step 2, we incorporated the effect sizes compiled from the various studies listed in Figure 1. Because we lack data, we limit our computations to those related to SEL, academic performance, and school enrolment (i.e., Link 1). We define the equations used to achieve this in the annexure accompanying this chapter.

## STEP 2: CALCULATION OF POTENTIAL HUMAN CAPITAL

We adopt the lifetime income approach, where human capital wealth ($HCW$) is a product of three components (Arrow et al., 2012; Klenow and Rodriguez-Clare, 1997). The first component (or Term 1 as defined in Equation [1]) – human capital per capita (h) – is defined as a function of educational attainment (Edu) and additional compensation over time, which is assumed to be equivalent to the interest rate ($\rho$). The second component is the population which has achieved average educational attainment, to be considered for the human capital calculation ($P_{5+Edu(t)}$). The final component is the shadow price per unit of human capital, obtained by computing the present value of the average labour market compensation ($r$) workers receive over their expected working life ($T$). Note that in economics, shadow prices represent the social value of a good or service that is not reflected in market prices. They are used to approximate the value

of resources that do not have observable market prices. The parameter $T$ is obtained using various demographic and socio-economic indicators such as LFP and mortality rates.

Thus, in the conventional human capital approach, human capital for year t is calculated as follows:

(1) $$HCW(t) = e^{(Edu_{(t)} \cdot \rho)} \cdot P_{5+\,Edu\,(t)} \cdot \int_0^{T(t)} \bar{r} \cdot e^{-\delta \cdot t}\, dt$$

where human capital per capita, $h = e^{(Edu_{(t)} \cdot \rho)}$ [Term 1]

with Edu signifying the years of schooling attainment starting from the age of five, and ρ representing the rate of return on education.

$P_{5+\,Edu\,(t)}$ = Population that has obtained the average educational attainment [Term 2]

$\int_0^{T(t)} r \cdot e^{\delta \cdot t}\, dt$ = Shadow price per unit of human capital [Term 3]

We calculate potential human capital by adjusting the parameters of conventional human capital wealth.

(2) $$HCW^{*}(t) = e^{(Edu^{*}(t) \cdot \rho)} \cdot P_{5+\,Edu^{*}(t)} \cdot \int_0^{T^{*}(t)} (r)^{*} \cdot e^{-\delta \cdot t}\, dt$$

Note the three parameters that need to be adjusted in $HCW^{*}(t)$ are $Edu^{*}(t), T^{*}(t)$, and $(\bar{r})^{*}$. All three parameters must be adjusted,

We illustrate our method for estimating the potential effect of SEL on human capital and how it varies from traditional human capital estimates •

assuming SEL is introduced for all school-attending children. However, in our estimates, we only adjust Edu*(t) since limited evidence is available for adjusting income levels and expected working life due to SEL. These adjustments are drawn from the literature on SEL effectiveness obtained in Step 1 (for methodological details, see annexure). Here, we systematically estimate all three terms that compose traditional human capital measurement, based on the method proposed by Arrow et al. (2012) and Klenow and Rodriguez-Clare (1997). However, our calculations required sufficient modifications, which we elaborate on in the annexure.

## 2.1 IMPACT OF SEL ON EDUCATIONAL ATTAINMENT

In this section, we illustrate our method for estimating the potential effect of SEL on human capital and how it varies from traditional human capital estimates (also called business-as-usual scenario or BAU). To estimate the impact of SEL on educational attainment, we calculate adjustment factors for each country using the methodology described next. We explain in detail the calculation of the adjustment factor for the United States of America (USA).

Table 2 shows the adjustment factors used to calculate the impact of SEL on educational attainment. In the case of the USA, SEL interventions could potentially increase academic performance by 10.64%.[2] We arrive at this calculation as follows. A meta-analysis of 213 school-based, universal SEL programmes involving 270,034 kindergarten through high school students, conducted by Durlak et al. (2011), shows that SEL interventions led to a gain in standardized reading and math test scores of 0.27. This translates to an increase of approximately 11 percentage points or a percentage increase of 10.64% (Kim, 2015). To translate the impact of academic performance,

2. Durlak et al. (2011) report an effect size of 0.27 for academic performance, which translates to 10.64% using the Z-score table (or standard normal distribution table).

*Table 2.*

| Adjustment Factors | Source | USA | UK | India | China | Netherlands | Mexico | Portugal | South Africa | Australia | Turkiye | Peru |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEL -> Academic performance | Multiple* | 10.64 | 11.03 | 7.14 | 7.53 | 10.26 | 13.31 | 16.28 | 19.40 | 11.03 | 11.03 | 7.53 |
| Dropout rate reduction (additional graduates) | Levin and Belfield (2009) | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 | 10.40 |
| Academic performance base (1 SD) | Levin and Belfield (2009) | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 | 34.10 |
| Additional graduates (for SEL effect sizes) | Authors' own calculations | 3.25 | 3.36 | 2.18 | 2.30 | 3.13 | 4.06 | 4.97 | 5.92 | 3.36 | 3.36 | 2.30 |

*Educational attainment adjustment parameters in key countries (%)*

*Sources: USA (Durlak et al., 2011), UK (Wigelsworth et al., 2016), India (UNESCO MGIEP, forthcoming), China (Wang et al., 2019), Netherlands (Sklad et al., 2012), Mexico (Adler, 2016), Peru (Adler, 2016), Portugal (Cristóvão, Candeias and Verdasca, 2017), South Africa (Clouder et. al, 2013), Australia (Ashdown and Bernard, 2012), and Turkiye (Alan, Boneva and Ertac, 2019)*

Table 2 shows the adjustment factors used to calculate the impact of SEL on educational attainment•

we turn to a study by Levin and Belfield (2009), which shows that an increase in academic performance by one standard deviation (SD of 34.10%) leads to 10.40% additional graduates. Using the unitary method, an increment of 10.64% in academic performance leads to 3.25% more high school graduates. Note that these additional graduates would not have graduated without a SEL intervention. The specific calculation for 3.23% was arrived at using the following formula:

$$AG_c = AG_{LB\ 2009} * \frac{SEL\ Effect\ Size\ on\ Academic\ Performance_c}{Academic\ Performance_{LB\ 2009}}$$

where AGc = Additional graduates in country c;
AGLB 2009 = Additional graduates, according to Levin and Belfield (2009);
Academic performanceLB 2009 = 1 SD (from the standard normal distribution, 1 SD translates to 34.1%); and
SEL effect size on academic performance = Country-specific effect size of SEL intervention on academic performance.

*Table 3.*

| Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|
| A one-off implementation of SEL for 15-year old high school students in 2020, with no follow-up interventions. | Continuous yearly implementation of SEL interventions, starting with 15-year olds in 2020, with a new cohort of 15-year olds in 2021 joining now 16-year olds receiving SEL interventions in 2021. | All high school and undergraduate college students (from age 15 to 22) are part of a SEL intervention every year from 2020. |
| **Human capital estimates** | | |
| HC* | HC** | HC*** |

*Different scenarios for SEL implementation*

We estimate human capital from 2021 to 2030 across three scenarios, to measure the impact of large-scale, economy-wide implementation of SEL interventions•

Applying the values from Levin and Belfield (2009) [3], the previous equation can be rewritten as follows:

$$AG_c = 10.4 * \frac{SEL\ Effect\ Size\ on\ Academic\ Performance_c}{34.1}$$

Table 2 describes the adjustment factors for eleven countries: India, China, Mexico, the United Kingdom (UK), Peru, Turkiye, Australia, the Netherlands, Portugal, South Africa, and the USA.

## 2.2 IMPACT OF SEL INTERVENTIONS ON HUMAN CAPITAL: DEFINING DIFFERENT SCENARIOS

To estimate the impact of large-scale, economy-wide implementation of SEL interventions, we estimate human capital from 2021 to 2030 across three scenarios (see Table 3). We use the BAU scenario as the benchmark for comparison of the difference SEL implementation would have made to a country's human capital. In the BAU scenario, no SEL intervention is implemented. Assuming SEL interventions are adopted into the education curriculum, we estimate three scenarios described in Table 3. The human capital estimates obtained for each scenario are denoted by HC*, HC**, and HC*** and calculated till 2030.

Potential human capital in the best-case scenario (Scenario 3) is also

3. Ideally, we need separate evidence for each country to translate academic performance into additional graduates. However, in the absence of such country-specific evidence, we use Levin and Belfield (2009) as a reference for an estimation of academic performance to increase in graduates. Note that the research of Levin and Belfield (2009) is in the context of the USA.

We present the projected human capital changes in key countries in the BAU scenario, scenario 2, and the best-case scenario 3•

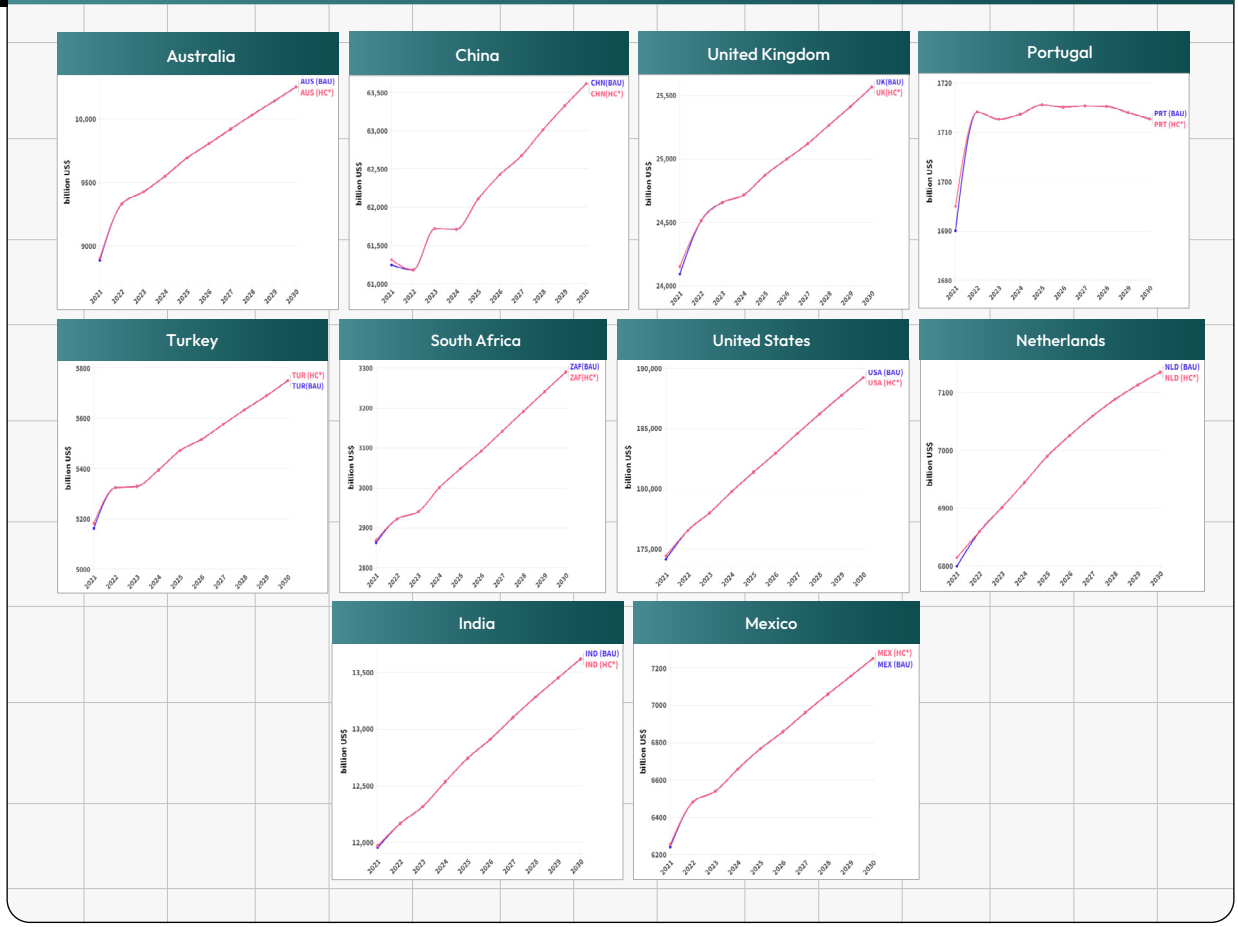
defined as the total human capital that would have been generated if all high school and undergraduate students in the country's education system were exposed to SEL interventions every year. Note that SEL interventions are highly country- and context-specific. When we refer to the implementation of an SEL intervention, we assume that it is conceptualized by taking into account cultural and context-relevant information of the particular region. Brush et al. (2022) emphasize the need for contextualization in SEL measurement tools to capture aspects of a child's environment that may hinder or promote the development of SEL. Thus, we do not advocate for an SEL intervention that is standardized across countries.

## 3.RESULTS

We estimate human capital in the three scenarios with SEL implementation, described in Table 3. We selected ten of the eleven countries, shown in Table 2, for which we obtained SEL adjustment factors from the literature. This selection is representative of developed (the USA, Australia, Netherlands, the UK, and Portugal) and developing (India, South Africa, Turkiye, China, and Mexico) countries from different regions of the world. We observe a differential human capital increase in the three scenarios for the ten countries.

We present the projected human capital changes in the ten countries in the BAU scenario, Scenario 2, and the best-case Scenario 3. We examine driving factors that may influence human capital levels, regardless of changes in educational attainments, such as demographic dynamics and educational return. Next, we analyse potential human capital gains from implementing SEL in the countries. We examine the reasons for the differences in SEL-related gain by countries, such as the level of human capital investment, population structure, and gender disparities in human capital.

*Fig 3.*




*Human capital in Scenario 1 versus the BAU scenario for Australia, China, Turkiye, United Kingdom, Portugal, South Africa, United States, Netherlands, India, and Mexico*

Though the increase in HC** and HC*** is modest in absolute terms, it is a substantial increase in human capital and geared towards increasing returns in the future•

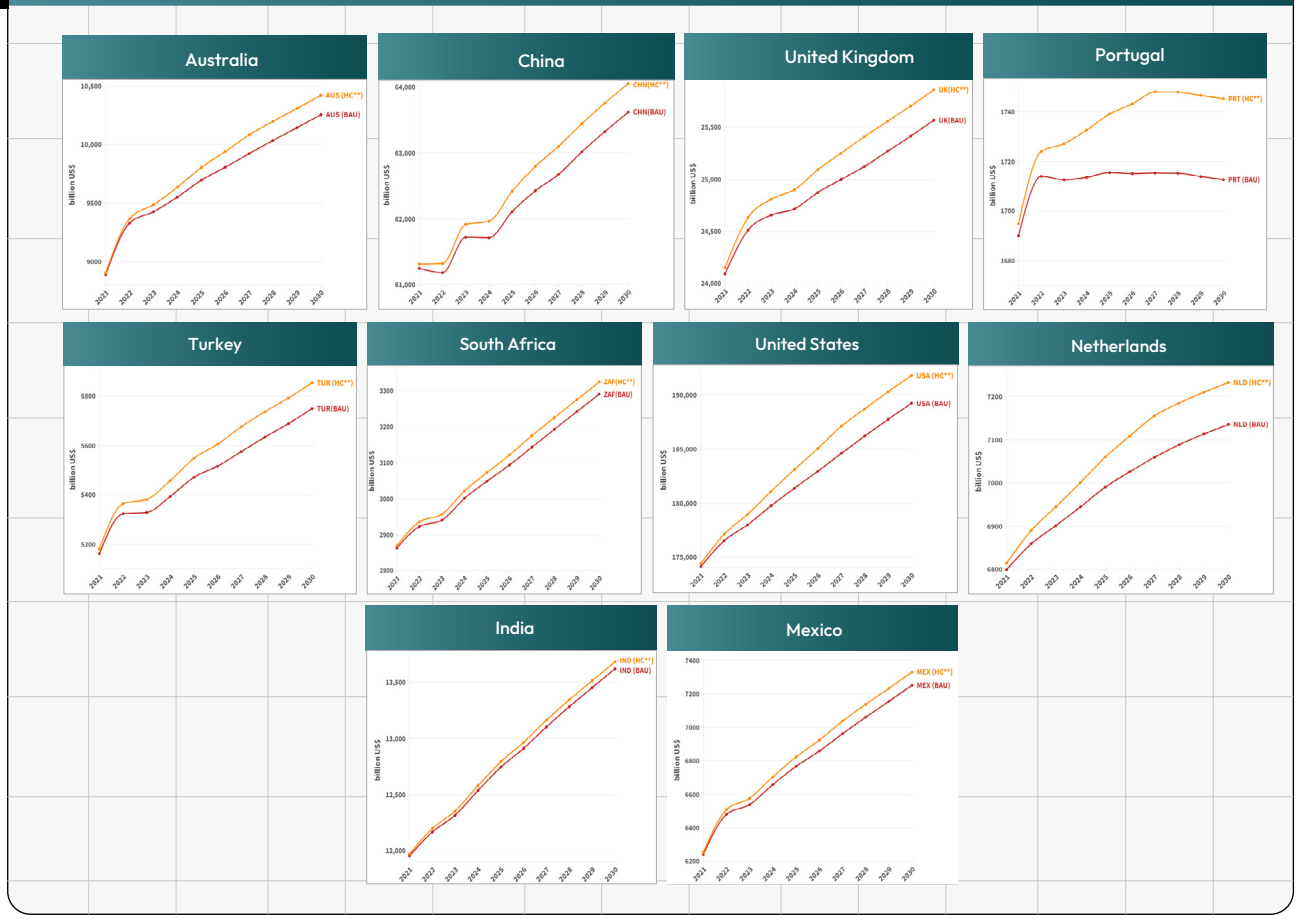
## 3.1 HUMAN CAPITAL IN DIFFERENT SCENARIOS

Given that the change in human capital is only due to a change in Term 1 of Equation (1), we observe a more than modest increase in human capital forecasts while incorporating SEL (referred to as HC*, HC**, and HC***), compared with BAU, as illustrated in Figure 3. Even though the relative increase in HC** and HC*** seems modest, in absolute terms, it is a substantial increase in human capital and geared towards increasing returns in the future.

### 3.1.1 SCENARIO 1 VERSUS BAU

In the first scenario, a single SEL intervention in 2020 for 15-year-old

*Fig 4.*




*Human capital in Scenario 2 versus the BAU scenario for Australia, China, Turkiye, United Kingdom, Portugal, South Africa, United States, Netherlands, India, and Mexico*

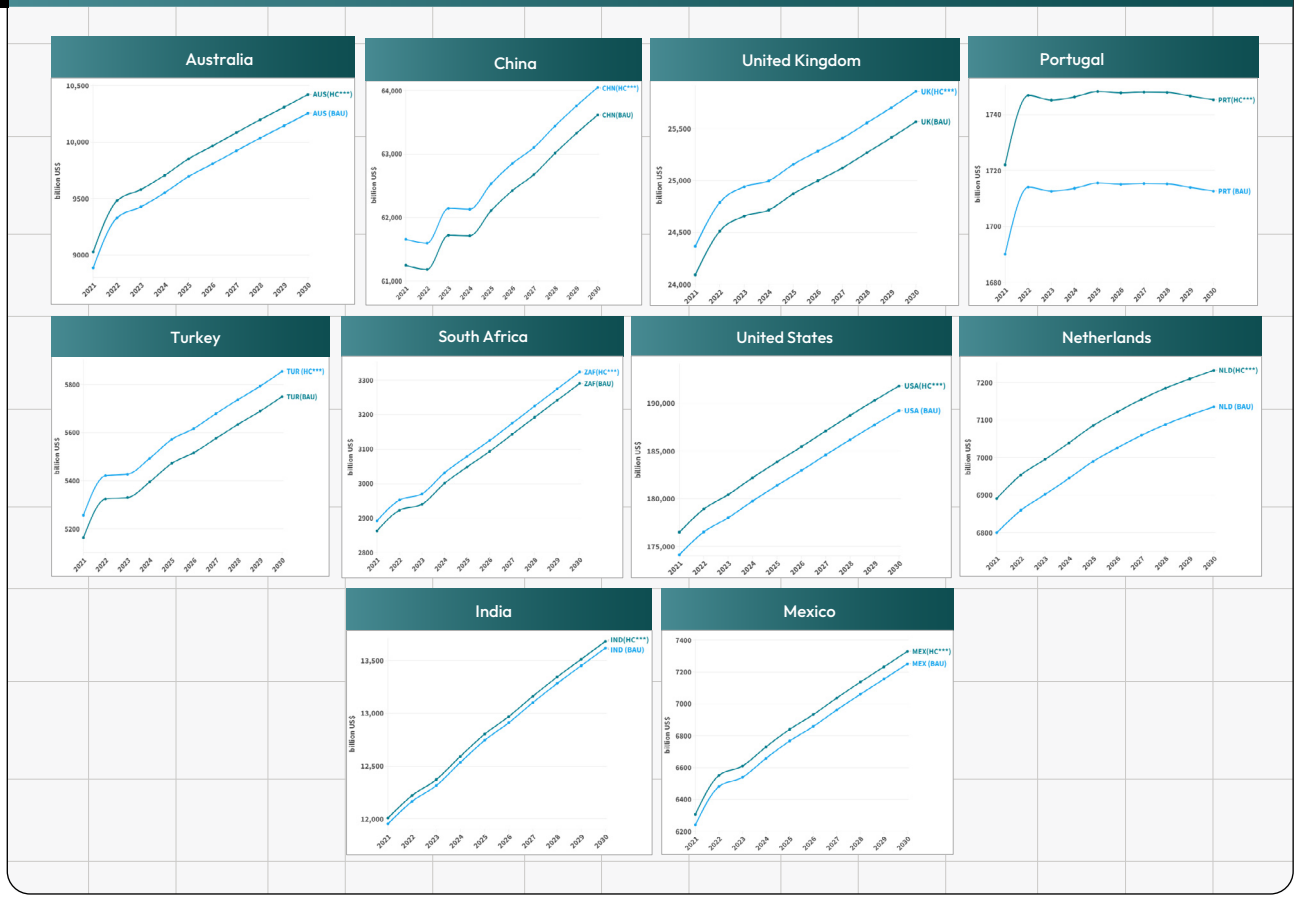
In scenario 2, SEL interventions include increasing age cohorts, starting with 15-year-olds in 2020 •

high school students led to higher enrolment rates of 16-year-olds in 2021. Thereafter, the enrolment rates returned to the BAU level. Underlying this scenario is the fact that the impact of SEL on students diminishes with time (Hunter et al., 2021). In Figure 3, following the implementation of SEL in 2020, we notice a jump in human capital in 2021 because of the increase in enrolment rates. Thereafter, it coincides with the human capital level in the BAU scenario.

### 3.1.2 SCENARIO 2 VERSUS BAU

In Scenario 2, SEL interventions include increasing age cohorts, starting with 15-year-olds in 2020, who are then joined by a new cohort of 15-year-olds in 2021, and so on. Here, we find that the human capital estimates for Scenario 2 increase gradually from

*Fig 5.*




*Human capital in Scenario 2 versus the BAU scenario for Australia, China, Turkiye, United Kingdom, Portugal, South Africa, United States, Netherlands, India, and Mexico*

In scenario 3, SEL interventions are introduced in high schools and undergraduate colleges, targeting 15- to 22-year-olds •

2021 to 2030. Moreover, the gap between human capital in the BAU scenario and Scenario 2 consistently increases (see Figure 4).

### 3.1.3 SCENARIO 3 VERSUS BAU

In Scenario 3, SEL interventions are introduced in high schools and undergraduate colleges, targeting 15- to 22-year-olds (i.e., until the students graduate from college). Here, we find an immediate increase in human capital estimates (see Figure 5), not the gradual increase as seen in Scenario 2. In Scenario 3, the human capital trend shifts upward from the BAU scenario – it is on a higher trajectory with broad-based SEL interventions being introduced (see Figure 5).

*Table 4.*

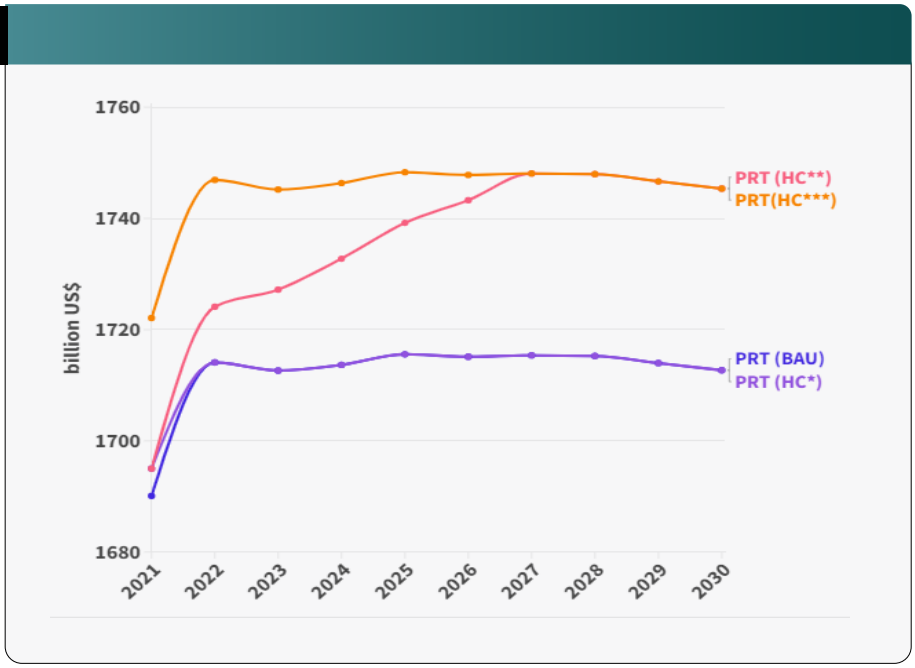
| BAU Scenario | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | UK | China | India | Turkiye | South Africa | Portugal | Netherlands | Mexico | USA | Australia |
| 2021 | 24,092.67 | 61,247.64 | 11,954.74 | 5,162.86 | 2,863.18 | 1,690.09 | 6,799.69 | 6,241.05 | 174,139.64 | 8,887.63 |
| 2022 | 24,513.27 | 61,182.28 | 12,166.91 | 5,324.37 | 2,922.72 | 1,714.10 | 6,859.44 | 6,481.62 | 176,529.09 | 9,330.46 |
| 2023 | 24,657.59 | 61,720.73 | 12,315.86 | 5,329.58 | 2,940.12 | 1,712.63 | 6,901.55 | 6,539.34 | 178,003.97 | 9,426.36 |
| 2024 | 24,715.84 | 61,712.26 | 12,536.19 | 5,394.52 | 3,000.73 | 1,713.66 | 6,944.97 | 6,658.96 | 179,754.72 | 9,552.29 |
| 2025 | 24,873.26 | 62,109.61 | 12,744.65 | 5,471.99 | 3,048.14 | 1,715.56 | 6,990.14 | 6,767.30 | 181,385.88 | 9,695.23 |
| 2026 | 24,997.88 | 62,425.85 | 12,911.48 | 5,516.64 | 3,093.02 | 1,715.12 | 7,026.18 | 6,858.32 | 182,953.60 | 9,806.71 |
| 2027 | 25,120.85 | 62,673.64 | 13,103.53 | 5,575.62 | 3,142.55 | 1,715.37 | 7,059.35 | 6,961.80 | 184,600.57 | 9,922.08 |
| 2028 | 25,267.58 | 63,013.32 | 13,283.44 | 5,634.29 | 3,192.18 | 1,715.26 | 7,088.61 | 7,060.17 | 186,197.96 | 10,035.92 |
| 2029 | 25,413.52 | 63,325.96 | 13,452.68 | 5,689.07 | 3,241.34 | 1,713.98 | 7,113.25 | 7,155.22 | 187,749.44 | 10,144.15 |
| 2030 | 25,567.16 | 63,616.59 | 13,620.13 | 5,749.95 | 3,290.20 | 1,712.69 | 7,135.56 | 7,251.46 | 189,241.40 | 10,255.07 |
| Scenario 2 (HC**) | | | | | | | | | | |
| Year | UK | China | India | Turkiye | South Africa | Portugal | Netherlands | Mexico | USA | Australia |
| 2021 | 24,151.25 | 61,313.91 | 11,970.61 | 5,182.21 | 2,869.22 | 1,695.00 | 6,814.63 | 6,254.56 | 174,422.08 | 8,904.40 |
| 2022 | 24,634.11 | 61,321.19 | 12,199.51 | 5,365.11 | 2,935.95 | 1,724.11 | 6,890.07 | 6,510.18 | 177,138.38 | 9,367.41 |
| 2023 | 24,809.51 | 61,915.38 | 12,353.71 | 5,382.15 | 2,956.38 | 1,727.19 | 6,944.93 | 6,576.46 | 178,971.66 | 9,485.97 |
| 2024 | 24,901.22 | 61,962.11 | 12,579.42 | 5,458.67 | 3,020.85 | 1,732.78 | 7,001.34 | 6,705.29 | 181,094.95 | 9,635.88 |
| 2025 | 25,091.44 | 62,419.03 | 12,793.48 | 5,548.65 | 3,072.15 | 1,739.20 | 7,059.80 | 6,823.08 | 183,109.46 | 9,804.21 |
| 2026 | 25,250.39 | 62,794.49 | 12,965.88 | 5,605.68 | 3,120.98 | 1,743.28 | 7,108.87 | 6,923.62 | 185,066.84 | 9,941.18 |
| 2027 | 25,407.01 | 63,100.34 | 13,163.72 | 5,676.44 | 3,174.53 | 1,748.09 | 7,155.48 | 7,037.01 | 187,109.37 | 10,082.37 |
| 2028 | 25,555.35 | 63,442.83 | 13,344.48 | 5,737.08 | 3,224.68 | 1,747.98 | 7,185.16 | 7,136.47 | 188,728.56 | 10,198.21 |
| 2029 | 25,703.15 | 63,757.68 | 13,514.49 | 5,792.89 | 3,274.36 | 1,746.67 | 7,210.08 | 7,232.55 | 190,301.83 | 10,308.19 |
| 2030 | 25,858.42 | 64,050.12 | 13,682.72 | 5,854.86 | 3,323.70 | 1,745.37 | 7,232.73 | 7,329.84 | 191,813.95 | 10,420.85 |
| Scenario 3 (HC***)/ Best-case Scenario | | | | | | | | | | |
| Year | UK | China | India | Turkiye | South Africa | Portugal | Netherlands | Mexico | USA | Australia |
| 2021 | 24,367.28 | 61,656.49 | 12,008.92 | 5,256.53 | 2,891.86 | 1,722.09 | 6,890.94 | 6,307.50 | 176,499.39 | 9,028.86 |
| 2022 | 24,788.67 | 61,596.78 | 12,222.72 | 5,421.05 | 2,952.18 | 1,746.93 | 6,953.94 | 6,551.74 | 178,916.27 | 9,480.83 |
| 2023 | 24,940.40 | 62,145.23 | 12,372.48 | 5,426.98 | 2,970.26 | 1,745.20 | 6,995.04 | 6,609.99 | 180,428.80 | 9,579.88 |
| 2024 | 24,997.55 | 62,130.97 | 12,593.71 | 5,492.88 | 3,031.23 | 1,746.37 | 7,039.47 | 6,730.81 | 182,197.41 | 9,706.12 |
| 2025 | 25,155.96 | 62,532.75 | 12,803.20 | 5,571.74 | 3,079.16 | 1,748.30 | 7,085.51 | 6,840.43 | 183,849.41 | 9,851.98 |
| 2026 | 25,283.12 | 62,851.95 | 12,970.80 | 5,617.34 | 3,124.58 | 1,747.82 | 7,121.73 | 6,932.41 | 185,441.50 | 9,965.45 |
| 2027 | 25,407.01 | 63,100.34 | 13,163.72 | 5,678.87 | 3,174.53 | 1,748.09 | 7,155.48 | 7,037.01 | 187,109.37 | 10,082.37 |
| 2028 | 25,555.35 | 63,442.83 | 13,344.48 | 5,737.08 | 3,224.68 | 1,747.98 | 7,185.16 | 7,136.47 | 188,728.56 | 10,198.21 |
| 2029 | 25,703.15 | 63,757.68 | 13,514.49 | 5,792.89 | 3,274.36 | 1,746.67 | 7,210.08 | 7,232.55 | 190,301.83 | 10,308.19 |
| 2030 | 25,858.42 | 64,050.12 | 13,682.72 | 5,854.86 | 3,323.70 | 1,745.37 | 7,232.73 | 7,329.84 | 191,813.95 | 10,420.85 |

*Human capital under the BAU scenario, Scenario 2, and Scenario 3 or the best-case scenario (billion US$)*

For India, Mexico, and South Africa, the shift in human capital estimates is only marginal when compared with that of the USA •

Table 4 presents the projected human capital of ten countries from 2021 to 2030. The initial figures are important to the growth trajectories because the enrolment rates due to SEL incorporation are a function of the initial rates, adjustment factor, and progress of students from primary to secondary and secondary to tertiary levels of education. Notably, for India, Mexico, and South Africa, the shift in human capital estimates is only marginal when compared with that of the USA. The adult/total population that has completed five plus average years of educational attainment (5+EDU) in the respective country shows the size of the human capital stock relative to the total population, and a reduction in this educated population implies a loss of human capital. Further, excessive population growth leads to increased unemployment and shorter work lifetimes, thus reducing the benefits gained from educational attainment.

*Fig 6.*




*The curious case of Portugal's human capital*

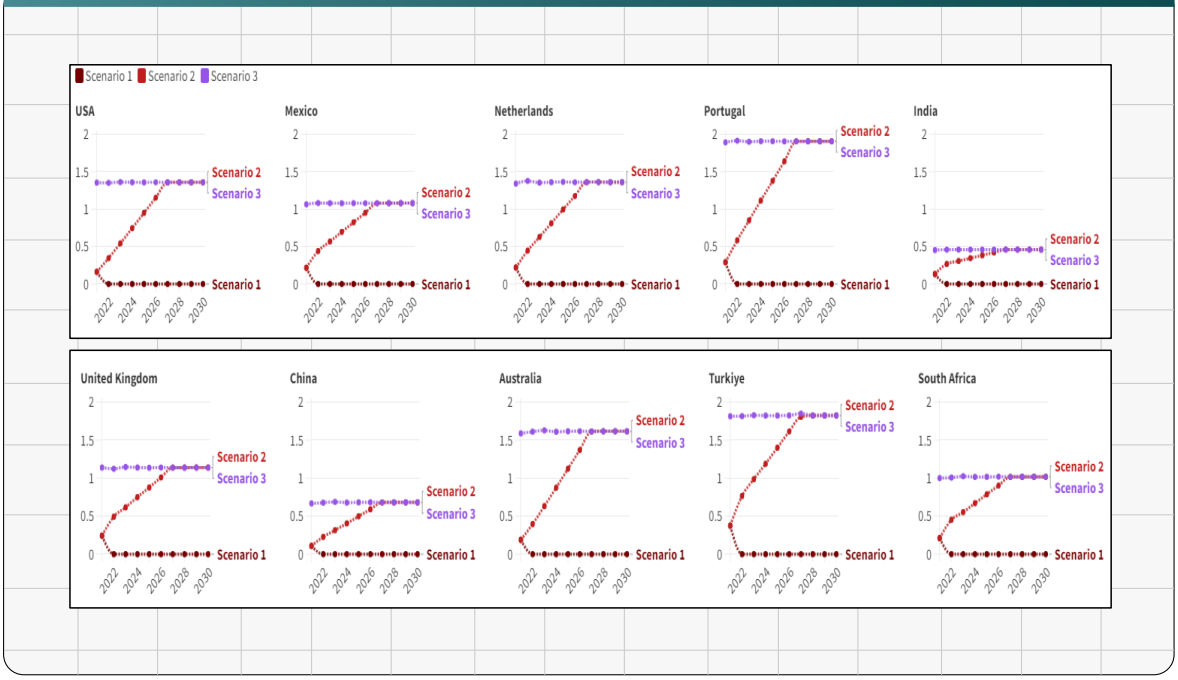
For each country considered, the results demonstrate that the educated population has significantly contributed to the increased human capital •

To understand the changes in human capital, we break down the driving factors into educational attainment, the adult population that has completed the average educational attainment, and the shadow price of human capital. This is done to compare their predicted contribution to human capital growth, as shown in Table C1 of Appendix C. For each country considered, the results demonstrate that the educated population has significantly contributed to the increased human capital (see Table C1). India's educated population is predicted to rise over the years, taken into consideration here, from 2021 to 2030. The discerning reader might question whether countries like India, with a predicted growing proportion of the population being educated, are likely to reap the benefits of a 'demographic dividend'. The answer to this question depends on whether the given population also acquires specific key competencies rather than just existing as part of the education system for a certain number of years. Metrics such as the World Bank's (2021) learning poverty represent an attempt to capture whether the time spent acquiring an education translates to skills and relevant competencies.[4]

Note that Portugal shows the least magnitude of increase in its absolute human capital estimates in all scenarios. This is explained by

4. Future extensions of this work will focus on bringing in competencies to measure educational attainment. We believe this will eventually help researchers assess the true nature of human capital in an economy.

*Fig 7.*




*Percentage change in human capital forecasts relative to the BAU scenario*

its falling female population and the proportion of females that have completed 5+EDU years of education. This drop is, however, balanced out by the increase in educational attainment and shadow price of human capital. This shows a modest increase in human capital from US$1,690.09 billion to US$1,712.69 billion in the BAU scenario (see Figure 6). However, it is important to note here that the overall trend in human capital is an interplay between the three terms defined in Equation (1). This can be seen in Table C2 in Appendix C. We first calculate human capital by gender and then sum the figures to arrive at the total human capital of a country. We outline this approach in detail in the annexure accompanying this chapter.

Portugal shows the least magnitude of increase in its human capital in all three scenarios •

Taking a closer look at Portugal's human capital estimates across scenarios, we see a non-increasing trend after 2022 for the BAU and best-case scenarios and after 2027 for Scenario 2. This is primarily because the female population in Portugal is estimated to decline (see Table C2 in Appendix C). This decline is not offset by the slight increase in the male population. It results in stabilizing the human

*Table 5.*

| Scenario 2: Change in HC** (%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | UK | China | India | Turkiye | South Africa | Portugal | Netherlands | Mexico | USA | Australia |
| 2021 | 0.243 | 0.108 | 0.133 | 0.375 | 0.211 | 0.291 | 0.220 | 0.216 | 0.162 | 0.189 |
| 2022 | 0.493 | 0.227 | 0.268 | 0.765 | 0.453 | 0.584 | 0.447 | 0.441 | 0.345 | 0.396 |
| 2023 | 0.616 | 0.315 | 0.307 | 0.987 | 0.553 | 0.850 | 0.629 | 0.568 | 0.544 | 0.632 |
| 2024 | 0.750 | 0.405 | 0.345 | 1.189 | 0.671 | 1.116 | 0.812 | 0.696 | 0.746 | 0.875 |
| 2025 | 0.877 | 0.498 | 0.383 | 1.401 | 0.788 | 1.378 | 0.997 | 0.824 | 0.950 | 1.124 |
| 2026 | 1.010 | 0.591 | 0.421 | 1.614 | 0.904 | 1.641 | 1.177 | 0.952 | 1.155 | 1.371 |
| 2027 | 1.139 | 0.681 | 0.459 | 1.808 | 1.018 | 1.908 | 1.362 | 1.080 | 1.359 | 1.615 |
| 2028 | 1.139 | 0.682 | 0.459 | 1.824 | 1.018 | 1.908 | 1.362 | 1.081 | 1.359 | 1.617 |
| 2029 | 1.140 | 0.682 | 0.460 | 1.825 | 1.019 | 1.907 | 1.361 | 1.081 | 1.359 | 1.617 |
| 2030 | 1.139 | 0.681 | 0.460 | 1.825 | 1.018 | 1.908 | 1.362 | 1.081 | 1.359 | 1.617 |
| **Scenario 3: Change in HC*** (%)** | | | | | | | | | | |
| Year | UK | China | India | Turkiye | South Africa | Portugal | Netherlands | Mexico | USA | Australia |
| 2021 | 1.140 | 0.668 | 0.453 | 1.814 | 1.002 | 1.893 | 1.342 | 1.065 | 1.355 | 1.589 |
| 2022 | 1.123 | 0.677 | 0.459 | 1.816 | 1.008 | 1.915 | 1.378 | 1.082 | 1.352 | 1.612 |
| 2023 | 1.147 | 0.688 | 0.460 | 1.828 | 1.025 | 1.901 | 1.355 | 1.080 | 1.362 | 1.629 |
| 2024 | 1.140 | 0.678 | 0.459 | 1.823 | 1.017 | 1.909 | 1.361 | 1.079 | 1.359 | 1.610 |
| 2025 | 1.137 | 0.681 | 0.459 | 1.823 | 1.018 | 1.908 | 1.364 | 1.081 | 1.358 | 1.617 |
| 2026 | 1.141 | 0.683 | 0.459 | 1.825 | 1.020 | 1.906 | 1.360 | 1.080 | 1.360 | 1.619 |
| 2027 | 1.139 | 0.681 | 0.459 | 1.852 | 1.018 | 1.908 | 1.362 | 1.080 | 1.359 | 1.615 |
| 2028 | 1.139 | 0.682 | 0.459 | 1.824 | 1.018 | 1.908 | 1.362 | 1.081 | 1.359 | 1.617 |
| 2029 | 1.140 | 0.682 | 0.460 | 1.825 | 1.019 | 1.907 | 1.361 | 1.081 | 1.359 | 1.617 |
| 2030 | 1.139 | 0.681 | 0.460 | 1.825 | 1.018 | 1.908 | 1.362 | 1.081 | 1.359 | 1.617 |

*Percentage change in human capital forecasts relative to the BAU scenario*

capital estimates, even though SEL implementation causes the human capital trend in the best-case scenario to shift upward.

Figure 7 plots the change in human capital estimates in all three scenarios relative to the BAU scenario. In the first scenario, since SEL is implemented in 2020, there is a spike in the change in human capital in 2021. Thereafter, there is no change in human capital compared with the BAU scenario. In Scenario 2, since the change in human capital is taking place gradually, it converges with the change in human capital in Scenario 3 from 2027 onwards. Thus, a more broad-based SEL implementation (Scenario 3) will increase human capital faster.

On average, human capital grows by 1.38% in Scenario 3 relative to the BAU in 2030, ranging from 0.46% in India to 1.9% in Portugal in Scenario 3 •

## 3.2 SUMMARIZING THE RESULTS ACROSS KEY COUNTRIES

The results in Table 5 show the SEL effect in 2030 on the ten key countries. On average, human capital grows by 1.38% in Scenario 3 (or best case scenario) relative to the BAU scenario in 2030, ranging from 0.46% in India to 1.9% in Portugal in Scenario 3. The dropout rate reduction due to SEL leads to longer expected years of schooling and increases the educational attainment in Term 1.

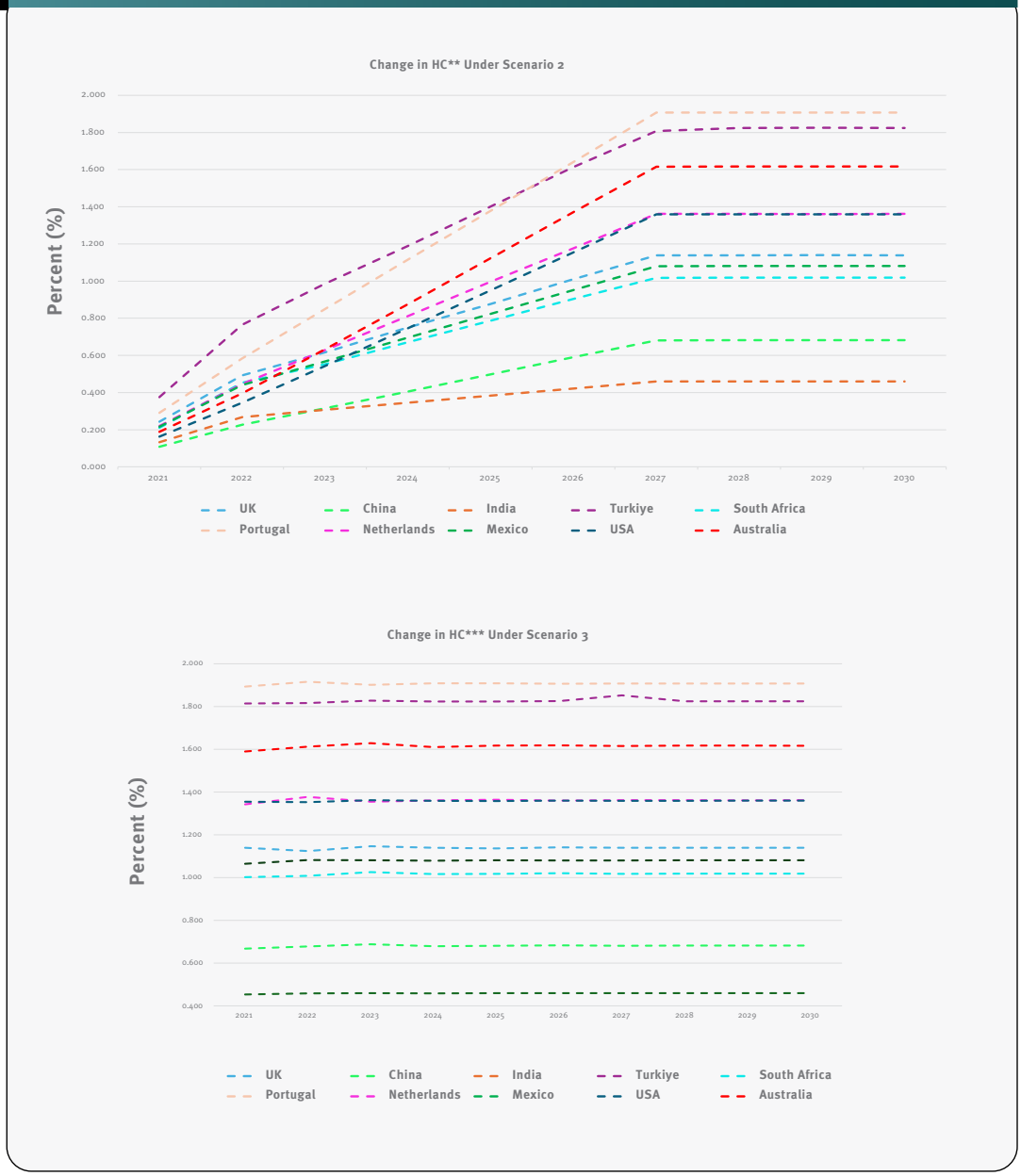
The average change due to SEL in Term 1, a function of educational attainment, is higher for females than males in the ten key countries. The average change in Term 1 due to SEL is 1.3% for females and 1.18% for males in the ten key countries. This difference could be influenced by the initial gender differences in education levels and the cultural and societal factors that affect educational opportunities and access to education for girls in each country. Countries with relatively lower growth effects have relatively lower enrolment rates. Thus, the initial education level is essential to determining the consequent SEL effect in the future.

The impact of SEL on human capital varies significantly across countries and is determined by several factors. For instance, in countries such as India and China, the impact is similar, with around 0.5–0.7% growth in human capital by 2030. The relatively low growth in the educated population, because of a declining population as well as individuals choosing to join the labour force early, result in a relatively lower impact of SEL on human capital. However, in India, the improvement in the quality of human capital resulting from reduced dropout rates and improved academic performance through SEL may be lower than in other countries due to the declining enrolment in secondary and tertiary education in recent years. This decline in enrolment is due to the falling trend in the population belonging to specific age cohorts. That is, the child population in the age groups of 6 to 11, 11 to 14, and 14 to 16 years is falling, which is reflected in the enrolment as well (Press Trust of India, 2022).

Results indicate that investing in education and SEL leads to a more productive, healthy, and engaged workforce •

It is noteworthy that Australia, which has high levels of education investment and a significant immigrant population, demonstrates a high impact of SEL on human capital. Despite the improvement in the level of education resulting from highly skilled immigrants, our results indicate that investing in SEL still significantly improves human capital.

*Fig 8.*




*Changes in human capital in Scenarios 2 and 3*

*Note: The SEL effect in 2030 is calculated by taking the difference between SEL- and BAU-based human capital divided by the BAU-based human capital in 2030. Terms 2 and 3 are set to be unaffected.*

Figure 8 illustrates the SEL effect by year in the key countries in Scenarios 2 and 3. If SEL is adopted in 2020, it is expected to contribute an approximate 1.24% increase in human capital in

Future research on human capital needs to move away from educational attainment calculated in school years to competencies •

Scenario 3. However, there are vast variations in the SEL impact in different countries. In Scenario 3, a more broad-based implementation of SEL, covering age cohorts from 15- to 22-year-olds from 2020, we note a gradual and steady increase in human capital (Figure 8).

These results indicate that investing in education and SEL leads to a more productive, healthy, and engaged workforce in the short term. The long-term benefits of SEL are, however, likely to vary depending on factors, such as initial education levels, societal and cultural factors, and government policies. The results indicate that the baseline educational attainment levels and population structure significantly impact human capital gains from implementing SEL in different countries. Countries with higher human capital tend to benefit more from SEL-induced educational improvements. However, in countries with low human capital levels, according to Becker, Murphy, and Temura (1990), it can be challenging to motivate better investment in education. So implementing SEL may not help improve the level of human capital. These countries may indeed return to a state of low human capital due to the difficulty in achieving consistent investment in education.

## 4. CHALLENGES AND OPPORTUNITIES

This section discusses the challenges in using educational attainment to measure human capital, together with difficulties in quantifying and assigning monetary value to SEL competencies.

### 4.1 FRAMEWORK DIFFICULTIES

Though educational attainment has been used as a standard measure of human capital, it is not comparable across nations due to inherent differences in the quality of education (Fraumeni and Liu, 2018; Hanushek and Kimko, 2000). Recent research points to the positive

Measuring SEL competencies is challenging primarily due to complexity in quantifying them, leading to a lack of data availability •

impacts of non-cognitive skills in determining educational outcomes and individual incomes (Lundberg, 2017). In addition, the learning poverty data seem to suggest that just focusing on educational attainment might not correlate with the required competencies such as literacy, numeracy, and SEL (UNICEF, 2022). Thus, future research on human capital needs to move away from educational attainment calculated in school years to competencies necessary for individuals to achieve well-being.

### 4.2 DATA AVAILABILITY

Although SEL frameworks provide well-defined lists of competencies, measuring SEL competencies is challenging primarily because of their complex nature. While it is important to convert all potential benefits (highlighted in Appendix A) into monetary terms and adjust the inclusive wealth, obtaining data on all those aspects is challenging. However, future studies can include them to provide a more comprehensive overview of potential inclusive wealth. In addition, the direct impact of SEL interventions on literacy and numeracy is much greater than the indirect impact from additional educational attainment. Indeed, we suspect the impacts would be much larger if we shifted computing human capital based on educational attainment in school years to competency-based estimates (Duraiappah and Sethi, 2020).

### 4.3 METHODOLOGICAL DIFFICULTIES

The best way to include social and emotional competencies in the inclusive wealth framework is to directly assign monetary values to the stock of competencies and use a separate account for social and emotional capital. Without reliable measures that convert social and emotional competencies into monetary terms, we use evidence on the potential benefits of SEL to adjust the human capital component of

We do not account for all the potential benefits resulting from implementing SEL interventions on a large scale •

inclusive wealth. This is an indirect measure of social and emotional competencies. In future, we need to update the current system of adjusting for potential human capital to include a separate account for social and emotional capital.

The impact of SEL on human capital is captured by changes in school enrolment and the impact on the compensation of employees and the expected working life of individuals is not considered due to data limitations. So we do not account for all the potential benefits resulting from implementing SEL interventions on a large scale. Therefore, comparing the costs of SEL interventions with the conservative estimate of benefits does not accurately compare the costs and benefits due to SEL implementation. Thus, the report does not examine the costs of SEL interventions. However, future work in this direction calls for recomputing human capital and the inclusive wealth of nations after considering the full extent of benefits and costs.

## 5. CONCLUSION

This chapter highlights the need for including social and emotional capital in the inclusive wealth framework. Though changes in human capital due to SEL require estimations of educational attainment, compensation of employees, and expected working life in a country, we have only incorporated educational attainment to forecast potential human capital. Our key finding in this chapter is that potential human capital tends to increase faster when SEL interventions target a large number of age cohorts in the current period. This is because additional graduates in the current period translate to higher numbers of graduates in the next period since a proportion of the additional graduates today are expected to continue pursuing higher education.

*Table 6.*

| Human capital estimates for 2021 | | | | | | (billion US$) |
|---|---|---|---|---|---|---|
| Country | BAU | HC* | HC** | HC*** | Change in HC**(%) | Change in HC***(%) |
| USA | 174139.64 | 174422.08 | 174422.08 | 176499.39 | 0.162 | 1.355 |
| India | 11954.74 | 11970.61 | 11970.61 | 12008.92 | 0.133 | 0.453 |
| Mexico | 6241.05 | 6254.56 | 6254.56 | 6307.50 | 0.216 | 1.065 |
| Netherlands | 6799.69 | 6814.63 | 6814.63 | 6890.94 | 0.220 | 1.342 |
| Portugal | 1690.09 | 1695.00 | 1695.00 | 1722.09 | 0.291 | 1.893 |
| Australia | 8887.63 | 8904.40 | 8904.40 | 9028.86 | 0.189 | 1.589 |
| China | 61247.64 | 61313.91 | 61313.91 | 61656.49 | 0.108 | 0.668 |
| Turkiye | 5162.86 | 5182.21 | 5182.21 | 5256.53 | 0.375 | 1.814 |
| UK | 24092.67 | 24151.25 | 24151.25 | 24367.28 | 0.243 | 1.140 |
| South Africa | 2863.18 | 2869.22 | 2869.22 | 2891.86 | 0.211 | 1.002 |

| Human capital estimates for 2021 | | | | | | (billion US$) |
|---|---|---|---|---|---|---|
| Country | BAU | HC* | HC** | HC*** | Change in HC**(%) | Change in HC***(%) |
| USA | 189241.39 | 189241.39 | 191813.95 | 191813.95 | 1.359 | 1.359 |
| India | 13620.13 | 13620.13 | 13682.72 | 13682.72 | 0.460 | 0.460 |
| Mexico | 7251.46 | 7251.46 | 7329.84 | 7329.84 | 1.081 | 1.081 |
| Netherlands | 7135.56 | 7135.56 | 7232.73 | 7232.73 | 1.362 | 1.362 |
| Portugal | 1712.69 | 1712.69 | 1745.37 | 1745.37 | 1.908 | 1.908 |
| Australia | 10255.07 | 10255.07 | 10420.85 | 10420.85 | 1.617 | 1.617 |
| China | 63616.59 | 63616.59 | 64050.12 | 64050.12 | 0.681 | 0.681 |
| Turkiye | 5749.95 | 5749.95 | 5854.86 | 5854.86 | 1.825 | 1.825 |
| UK | 25567.16 | 25567.16 | 25858.42 | 25858.42 | 1.139 | 1.139 |
| South Africa | 3290.20 | 3290.20 | 3323.70 | 3323.70 | 1.018 | 1.018 |

*Human capital estimates across scenarios for 2021 and 2030*

Our key finding is that potential human capital tends to increase faster when SEL interventions target a large number of age cohorts in the current period •

Since we presented a range of estimates, we summarize the human capital estimates across the three scenarios in Table 6. We find that human capital estimates incorporating a nationwide SEL intervention are likely to increase with time. In 2021, the maximum change in human capital in our set of key countries is 0.37% for Turkiye in Scenario 2 and 1.9% for Portugal in Scenario 3. However, in 2030, Portugal's maximum change in human capital is 1.9% in both scenarios. This result matches our expectation that SEL interventions that are more broad-based in their implementation result in a higher growth rate right from the beginning of the forecast period. However the variation in magnitude of the long-run increase in human capital across countries needs further investigation.

It is to be noted that the human capital estimates for Scenarios 2 and 3 converge in 2027. Thus, the absolute numbers and percentage of human capital for 2030 in Table 6 are the same for both scenarios. This convergence in 2027 is due to our definition of Scenarios 2 and 3 and our assumption that SEL interventions target high school and

Nurturing social and emotional competencies is essential for human well-being and flourishing •

undergraduate college students aged 15 to 22. In Scenario 2, SEL interventions are implemented gradually, starting with 15-year-olds in 2020. Then, a new cohort of 15-year-olds in 2021 join now 16-year-olds receiving SEL interventions in 2021, and so on. Meanwhile, Scenario 3 has a more broad-based implementation, targeting 15- to 22-year-olds from 2020. These definitions were intended to capture the impact of a gradual implementation versus an immediate implementation, targeting all intended ages from the beginning.

To reiterate, SEL is pivotal for human well-being and flourishing. Although our preliminary estimates in percentage terms were small, we only looked at a single aspect in our revised computations. We suspect that the numbers would be much larger if we were to incorporate more of the impacts of an SEL intervention on learning competencies and well-being.

Nurturing social and emotional competencies is essential and critical to solving the world's complex problems. We used the wealth accounting framework to conduct a project evaluation of a large SEL policy intervention, which can potentially be used as a policy evaluation tool. This will help policy-makers identify potential programmes that may lead to the best returns and improve the overall well-being of people in a country. In addition, it is worth examining the change in human capital resulting from implementing social and emotional intervention at a national level, to capture the corresponding benefits of such interventions. This will also aid the objective of estimating potential inclusive wealth and changes to existing wealth.

## KEY MESSAGES

This chapter highlights the need to include **social and emotional capital** in the inclusive wealth framework. It illustrates a method for estimating the potential effect of SEL on human capital and how it varies from traditional human capital estimates (also referred to as BAU).

Though changes in human capital due to SEL require an estimation of educational attainment, compensation of employees, and the expected working life in a country, this chapter incorporates **educational attainment** as a first step towards forecasting potential human capital.

To estimate the impact of large-scale, economy-wide implementation of SEL interventions, we define **three scenarios** and estimate human capital for 2021–2030 across these scenarios.

If SEL is implemented in 2020, **the human capital gain in the best-case scenario** for SEL implementation programmes is **0.46–1.93%** compared to the BAU scenario **in ten key countries by 2030.** However, there are notable **disparities in SEL gains across nations.** These differences are influenced by factors such as educational attainment levels, gender disparity, demographic structures, and socio-economic conditions.

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# APPENDIX A

## Summary of literature review: Potential benefits of SEL interventions

While SEL interventions can directly enhance the social emotional skills of students, other potential benefits could include improvement in mental health, better academic performance, and reduction in substance abuse and delinquency.

*Fig A1.*

| | |
|---|---|
| **Mental Health** | • Depression<br>• Anxiety<br>• Sexual activity<br>• Affect<br>• Life satisfaction<br>• Bullying<br>• Attention seeking<br>• ADHD<br>• Physiological well-being |
| **Academic** | • Achievement grades (reading, math)<br>• Grades<br>• Retention |
| **Substance Abuse** | • Drug use<br>• Prescription drug abuse<br>• Alcohol use<br>• Smoking<br>• Drug knowledge and attitudes |
| **Delinquency** | • Aggression<br>• Delinquency<br>• Risky driving |
| **Social Emotional Skills** | • Self-efficacy<br>• Social skills<br>• Social competence<br>• Decision making skills<br>• Isolation with others<br>• Internalizing<br>• Externalizing<br>• Maturity |

*Potential benefits of SEL interventions*

# APPENDIX B

## Summary of data sources

*Fig B1.*

| Indicator | Data source |
|---|---|
| **Edu (EYS)** | 1. Education data from UNESCO Institute for Statistics<br>2. Life table from the UN Population Division (2022) |
| **Rate of return of education ($\rho$)** | Klenow and Rodriquez Clare (1997) set as 8.50% |
| $P_{5+\,Edu}$ | Population by age group from the UN Population Division (2020) |
| **T** | 1. Life table from UN Population Division (2022)<br>2. ILOSTAT (n.d.) |
| $\bar{r}$ | 1. UN data on gross value added (UN Data 2015)<br>2. OECD employee compensation (OECD 2024) |
| **Discount rate ($\delta$)** | Klenow and Rodriquez Clare (1997) set as 8.50% |

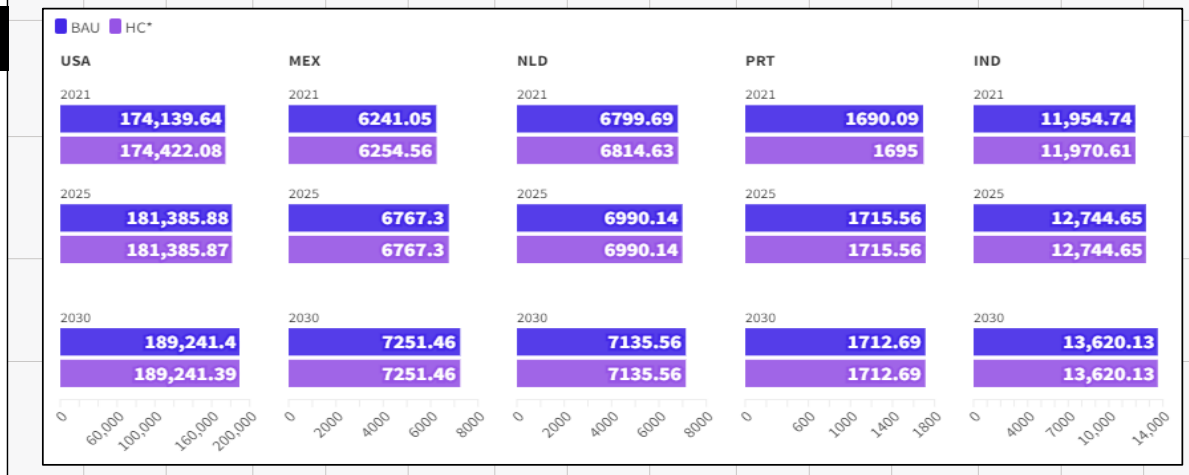
*Data Sources*

# APPENDIX C

## Human capital estimates in all scenarios and its components

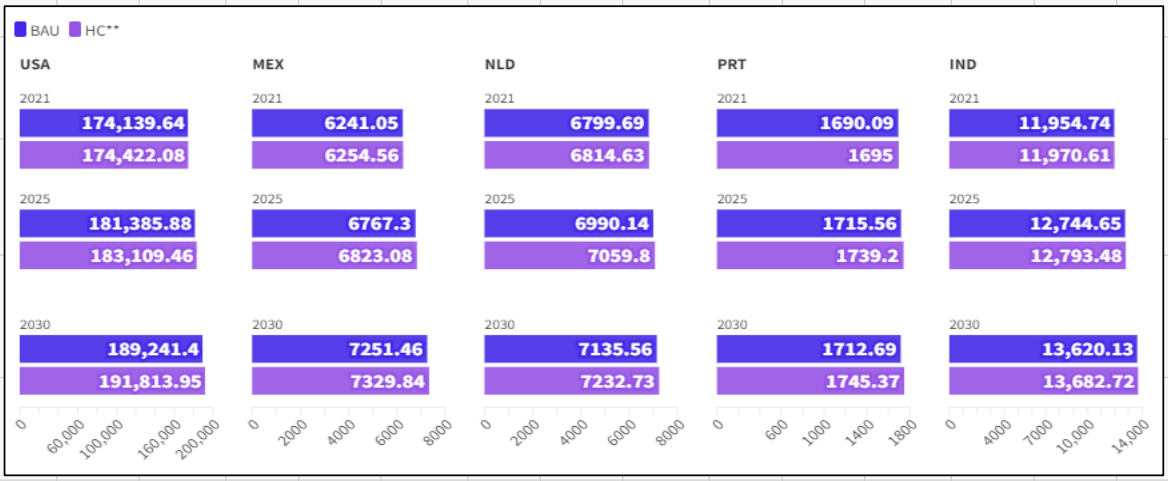
In Figures C1, C2, and C3, we compare the human capital estimates in different scenarios with those of the BAU scenario. We present the absolute numbers of human capital in all the scenarios presented in the preceding section. The best way to analyse these figures is to first compare the bars for each of the scenarios in 2021 and 2030, then proceed to analyse the figures across scenarios.

*Fig C1.*



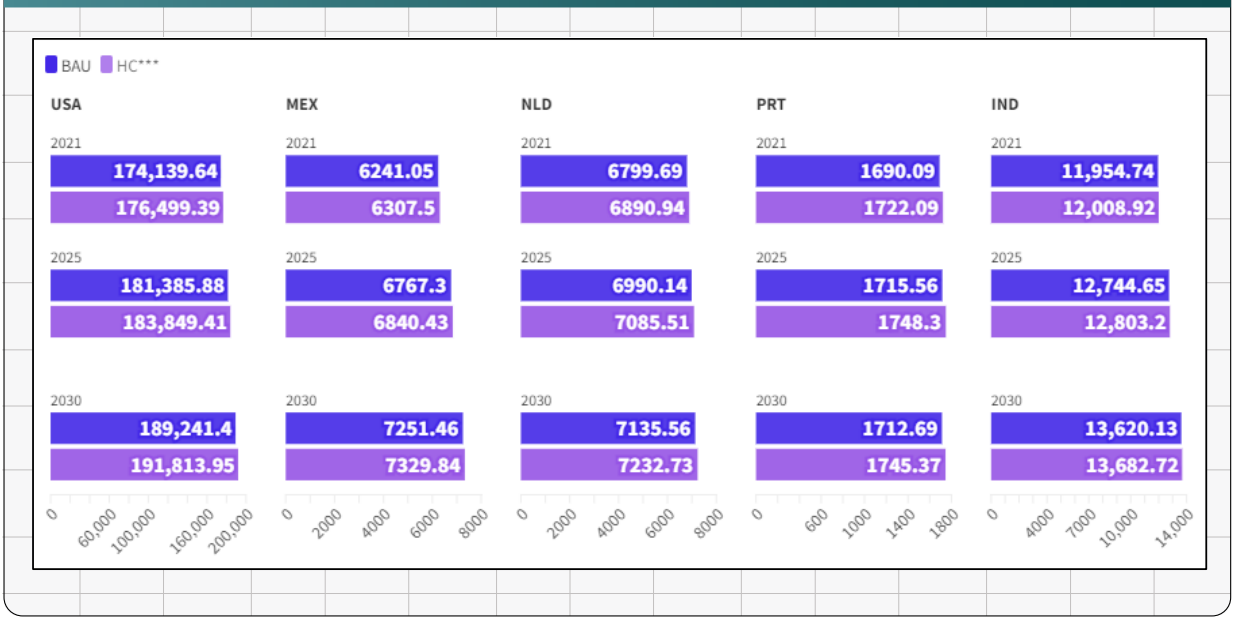

*Human capital estimates with SEL interventions (HC* or Scenario 1) and without SEL interventions (BAU) (billion US$)*

*Fig C2.*




*Human capital estimates with SEL interventions (HC** or Scenario 2) and without SEL interventions (BAU) (billion US$)*

*Fig C3.*




*Human capital estimates with SEL interventions (HC*** or Scenario 3) and without SEL interventions (BAU) (billion US$)*

*Table C1.*

Educational Attainment, EDU (years)

| Year | China | India | UK | USA | Turkiye | Mexico | Portugal | Netherlands | South Africa | Australia |
|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 14.85 | 11.31 | 16.70 | 16.46 | 18.63 | 14.50 | 16.92 | 18.60 | 13.09 | 20.68 |
| 2022 | 14.62 | 10.96 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.08 |
| 2023 | 14.66 | 10.97 | 16.84 | 16.61 | 18.57 | 14.83 | 17.03 | 18.62 | 13.21 | 21.06 |
| 2024 | 14.61 | 10.96 | 16.81 | 16.62 | 18.53 | 14.82 | 17.03 | 18.61 | 13.21 | 21.04 |
| 2025 | 14.63 | 10.96 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.06 |
| 2026 | 14.63 | 10.97 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.05 |
| 2027 | 14.62 | 10.97 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.05 |
| 2028 | 14.63 | 10.97 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.05 |
| 2029 | 14.63 | 10.97 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.05 |
| 2030 | 14.63 | 10.97 | 16.82 | 16.62 | 18.55 | 14.82 | 17.03 | 18.62 | 13.21 | 21.05 |

Population over the age of 5+EDU, Term 2 (thousands)

| Year | China | India | UK | USA | Turkiye | Mexico | Portugal | Netherlands | South Africa | Australia |
|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 1,086,959 | 995,117 | 50,098 | 251,210 | 54,498 | 85,298 | 8,149 | 13,088 | 38,553 | 17,786 |
| 2022 | 1,107,928 | 1,033,406 | 50,355 | 250,855 | 55,891 | 85,411 | 8,162 | 13,176 | 38,844 | 18,052 |
| 2023 | 1,112,918 | 1,047,817 | 50,618 | 253,037 | 56,573 | 86,788 | 8,170 | 13,268 | 39,199 | 18,311 |
| 2024 | 1,117,911 | 1,063,789 | 50,865 | 255,330 | 57,191 | 88,147 | 8,174 | 13,356 | 39,686 | 18,564 |
| 2025 | 1,122,962 | 1,079,571 | 51,113 | 257,611 | 57,800 | 89,480 | 8,177 | 13,435 | 40,264 | 18,810 |
| 2026 | 1,128,106 | 1,095,110 | 51,375 | 259,893 | 58,403 | 90,791 | 8,178 | 13,507 | 40,881 | 19,043 |
| 2027 | 1,133,425 | 1,110,294 | 51,647 | 262,174 | 58,988 | 92,085 | 8,178 | 13,571 | 41,514 | 19,265 |
| 2028 | 1,138,946 | 1,125,082 | 51,932 | 264,429 | 59,576 | 93,363 | 8,177 | 13,625 | 42,151 | 19,480 |
| 2029 | 1,144,478 | 1,139,454 | 52,235 | 266,620 | 60,180 | 94,624 | 8,171 | 13,673 | 42,794 | 19,694 |
| 2030 | 1,149,761 | 1,153,152 | 52,553 | 268,703 | 60,807 | 95,865 | 8,164 | 13,715 | 43,423 | 19,908 |

Shadow Price of Human Capital, Term 3 (in US$)

| Year | China | India | UK | USA | Turkiye | Mexico | Portugal | Netherlands | South Africa | Australia |
|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 16,051,044.39 | 4,595,143.94 | 117,385,975.53 | 172,758,364.10 | 19,695,834.53 | 21,589,105.14 | 50,068,693.54 | 108,323,607.35 | 24,592,310.15 | 87,178,877.56 |
| 2022 | 16,032,671.53 | 4,647,704.83 | 117,545,022.92 | 173,146,651.49 | 19,990,672.35 | 21,804,019.37 | 50,218,910.00 | 108,449,444.50 | 24,650,016.54 | 87,232,146.20 |
| 2023 | 16,054,369.58 | 4,634,214.41 | 117,484,401.70 | 173,157,559.27 | 19,716,411.76 | 21,641,655.39 | 50,110,793.43 | 108,256,407.55 | 24,584,449.81 | 87,073,013.44 |
| 2024 | 16,049,607.15 | 4,650,563.36 | 117,511,127.55 | 173,215,505.00 | 19,812,938.20 | 21,717,408.29 | 50,147,080.30 | 108,350,609.53 | 24,791,484.10 | 87,136,178.81 |
| 2025 | 16,049,188.06 | 4,657,586.20 | 117,523,018.23 | 173,258,224.46 | 19,846,277.95 | 21,730,429.55 | 50,167,889.49 | 108,359,350.10 | 24,811,996.55 | 87,154,432.18 |
| 2026 | 16,054,599.32 | 4,650,747.28 | 117,515,358.05 | 173,230,472.18 | 19,796,162.05 | 21,704,995.03 | 50,150,214.20 | 108,328,468.22 | 24,802,862.70 | 87,127,469.46 |
| 2027 | 16,054,617.40 | 4,656,155.47 | 117,525,870.78 | 173,255,883.89 | 19,822,303.90 | 21,725,657.82 | 50,162,774.03 | 108,352,229.84 | 24,819,653.04 | 87,145,372.74 |
| 2028 | 16,056,182.44 | 4,657,699.27 | 117,530,648.32 | 173,269,015.95 | 19,825,374.71 | 21,728,301.30 | 50,167,529.34 | 108,352,801.00 | 24,828,586.76 | 87,148,444.09 |
| 2029 | 16,058,466.87 | 4,657,482.79 | 117,533,216.48 | 173,272,848.29 | 19,818,319.36 | 21,727,499.79 | 50,166,753.41 | 108,350,316.26 | 24,833,746.08 | 87,146,460.13 |
| 2030 | 16,059,724.03 | 4,659,634.97 | 117,538,928.74 | 173,286,259.55 | 19,825,506.72 | 21,734,733.31 | 50,172,240.47 | 108,357,605.41 | 24,843,869.07 | 87,152,254.94 |

*Component-wise breakdown of human capital (best-case scenario)*

*Table C2.*

**Constituents of Human Capital: The Case of Portugal**

| Year | Term 1 (female) | Term 2 (female) | Term 3 (female) | Term 1 (Scenario 2) | Term 1 (Scenario 3) | Human Capital (Female) (BAU) | Human Capital (Female) (Scenario 2) | Human Capital (Female) (Scenario 3) |
|---|---|---|---|---|---|---|---|---|
| 2021 | 4.202 | 4386.475 | 50308372.439 | 4.213 | 4.283 | 927.216 | 929.644 | 945.224 |
| 2022 | 4.245 | 4391.588 | 50490803.802 | 4.268 | 4.329 | 941.367 | 946.274 | 959.846 |
| 2023 | 4.247 | 4393.533 | 50352989.073 | 4.282 | 4.330 | 939.604 | 947.312 | 957.971 |
| 2024 | 4.244 | 4392.876 | 50392287.487 | 4.291 | 4.327 | 939.452 | 949.837 | 957.894 |
| 2025 | 4.246 | 4391.757 | 50416375.409 | 4.304 | 4.329 | 940.039 | 953.075 | 958.466 |
| 2026 | 4.246 | 4389.529 | 50390977.096 | 4.317 | 4.329 | 939.095 | 954.808 | 957.496 |
| 2027 | 4.245 | 4386.630 | 50403485.744 | 4.328 | 4.328 | 938.588 | 956.993 | 956.993 |
| 2028 | 4.245 | 4382.876 | 50407163.474 | 4.329 | 4.329 | 937.942 | 956.328 | 956.328 |
| 2029 | 4.245 | 4377.207 | 50403746.562 | 4.329 | 4.329 | 936.655 | 955.016 | 955.016 |
| 2030 | 4.245 | 4370.782 | 50408043.672 | 4.329 | 4.329 | 935.345 | 953.684 | 953.684 |
| **Year** | **Term 1 (Male)** | **Term 2 (Male)** | **Term 3 (Male)** | **Term 1 (Scenario 2)** | **Term 1 (Scenario 3)** | **Human Capital (Male) (BAU)** | **Human Capital (Male) (Scenario 2)** | **Human Capital (Male) (Scenario 3)** |
| 2021 | 4.069 | 3762.910 | 49829014.638 | 4.082 | 4.143 | 762.877 | 765.361 | 776.868 |
| 2022 | 4.104 | 3770.100 | 49947016.202 | 4.131 | 4.180 | 772.733 | 777.841 | 787.083 |
| 2023 | 4.104 | 3776.800 | 49868597.791 | 4.141 | 4.180 | 773.029 | 779.882 | 787.227 |
| 2024 | 4.103 | 3781.380 | 49901873.104 | 4.149 | 4.178 | 774.206 | 782.940 | 788.472 |
| 2025 | 4.104 | 3785.720 | 49919403.565 | 4.160 | 4.179 | 775.523 | 786.130 | 789.836 |
| 2026 | 4.104 | 3788.920 | 49909451.306 | 4.170 | 4.179 | 776.028 | 788.468 | 790.321 |
| 2027 | 4.104 | 3791.820 | 49922062.308 | 4.179 | 4.179 | 776.778 | 791.098 | 791.098 |
| 2028 | 4.104 | 3793.830 | 49927895.205 | 4.179 | 4.179 | 777.318 | 791.651 | 791.651 |
| 2029 | 4.104 | 3793.730 | 49929760.258 | 4.179 | 4.179 | 777.326 | 791.654 | 791.654 |
| 2030 | 4.104 | 3793.340 | 49936437.262 | 4.179 | 4.179 | 777.349 | 791.681 | 791.681 |

*Breaking up constituents of human capital by gender (Portugal)*

CHAPTER

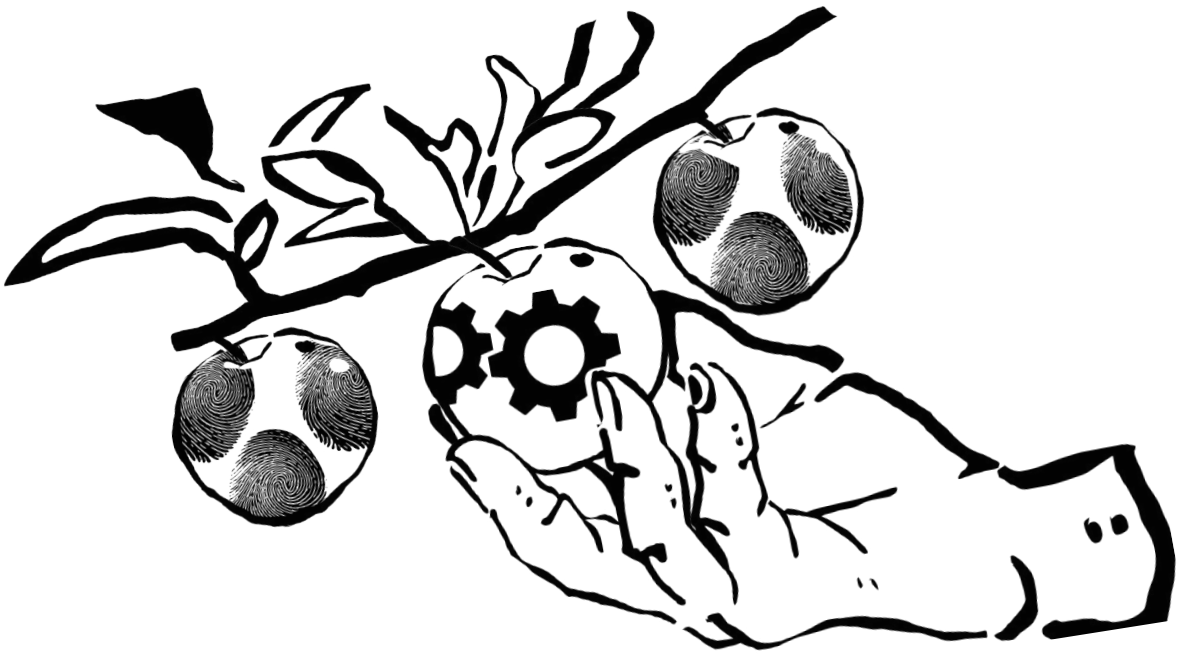
06

# Human capital and *inclusive wealth* revisited: gains from *social-emotional learning*

**T.M. Vasuprada, Jai Kamal, Shuning Chen, Shunsuke Managi, Jun Xie, and Anantha K. Duraiappah**

*abstract*

Chapter 5 described the methodology used to estimate the contribution of social emotional learning (SEL) to human capital through its impact on educational attainment and estimated it for ten countries. In this chapter, we extend human capital estimates to thirty-eight countries using cluster analysis and by evaluating their potential inclusive wealth. The cluster analysis incorporates variables such as learning poverty, education expenditure in overall government expenditure, school enrolment rates, and years of schooling to arrive at five clusters. Though modest, the gains in human capital resulting from SEL implementation and subsequent improvements in inclusive wealth suggest substantial promise, which must be explored and investigated further. We also observe a non-linear translation of the percentage change in human capital to a percentage change in inclusive wealth.



# 1

## INTRODUCTION

In Chapter 5, we estimated the potential impact of social emotional learning (SEL) on human capital across ten countries. When SEL interventions are implemented at high schools and undergraduate colleges every year from 2020, we predicted promising human capital increases ranging from 0.46% to 1.9% by 2030 across the ten countries considered. This chapter explores how SEL interventions might impact human capital across a more extensive range of countries. However, there are two significant obstacles to scaling up the number of countries: the absence of SEL interventions and the need for more data where SEL interventions have been implemented. As a first step to highlighting the potential of SEL for building human capital, we use cluster analysis to extrapolate the impact of SEL on human capital from countries where data was available to countries with no or limited data.

This chapter is organized as follows. In the next section, we present the methodology we used for the cluster analysis, to estimate SEL impact for thirty-eight countries based on our data on ten countries. In Section 3, we provide our estimates of the impact of SEL on human capital for thirty-eight countries spread across the five clusters we formulated for this report. Section 4 presents preliminary estimates of changes in inclusive wealth across the thirty-eight countries spread across the five clusters. Section 5 offers some concluding remarks.

In this chapter, we expand the research scope to thirty-eight countries using cluster analysis •

## 2. CLUSTER METHODOLOGY AND ANALYSIS

To generate human capital estimates for regions beyond the ten countries for which SEL adjustment factors are available, we expand the research scope to thirty-eight countries using cluster analysis. Unfortunately, even with cluster analysis, we could not go beyond the thirty-eight countries identified to cover 191 countries. Cluster analysis is widely used to group countries according to changes in the tourism sector (Roman et al., 2022), higher education competitiveness (Kabók, Radišić, and Kuzmanović, 2017), sustainable development goals progress (Çağlar and Gürler, 2022), and welfare states (Bambra, 2007). This allows us to generalize the results from one country to all the countries within the same cluster (Ronen and Shenkar, 1985). We used a k-means clustering algorithm described by Hartigan and Wong (1979) for the clustering process. Countries are divided into k clusters, each belonging to the nearest centroid. The centroids are formulated based on the observable characteristics of countries in an iterative manner, such that all the countries belonging to the same cluster have a single centroid. The main aim of this algorithm is to minimize the sum of the distances between the countries as data points in space and the centroid of their corresponding clusters.

We have determined the value of k using the elbow criterion, according to which the number of clusters (k) is chosen so that adding another cluster adds more information (Kijewska and Bluszcz, 2016). The variables included in the cluster analysis are learning poverty, education expenditure as a percentage of total government expenditure, gross enrolment ratio (primary, secondary, and tertiary), expected years of schooling (EYS), and mean years of schooling (MYS). The data sources for each variable used in the cluster analysis are presented in Table 1.

*Table 1.*

| Variable | Data source |
|---|---|
| Learning poverty | World Bank Education Statistics (World Bank, 2022a) |
| Expenditure on education as a percentage of the total government budget | World Bank Development Indicators (World Bank, 2022b) |
| Gross enrolment ratio (primary) | World Bank Development Indicators (World Bank, 2022b) |
| Gross enrolment ratio (secondary) | World Bank Development Indicators (World Bank, 2022b) |
| Gross enrolment ratio (tertiary) | World Bank Development Indicators (World Bank, 2022b) |
| Expected years of schooling | Human Development Report 2021–22 (UNDP, 2022) |
| Mean years of schooling | Human Development Report 2021 – 22 (UNDP, 2022) |

*List of variables used for cluster analysis*

Five clusters were obtained using k-means cluster analysis, and the representative country for each cluster is highlighted in Table 2 •

We selected ten countries for which SEL adjustment factors were available, which is discussed in Chapter 5. Coincidentally, this sample represented developed and developing countries from different regions of the world. We present the results of the cluster analysis in Table 2. Five clusters were obtained using k-means cluster analysis, and the representative country for each cluster is highlighted in bold. For example, India and Portugal are representative countries in the case of Clusters 1 and 3 respectively. Note that these clusters have only one representative country, and the educational attainment adjustment factor of the representative country is applied to the other countries in the cluster. However, Clusters 2 and 4 have multiple representative countries, and we use all representative countries' average educational attainment adjustment factors to analyse other countries in these clusters. China is kept in a separate cluster as it was separate from the original cluster analysis due to a lack of sufficient data on the variables used to construct the clusters.

*Table 2.*

| Clusters | Total members | Country list |
|---|---|---|
| Cluster 1 | 16 | Afghanistan, Burundi, Benin, Bangladesh, Cote d'Ivoire, Cameroon, Congo, Dem Rep, Ethiopia, Guatemala, **India**, Cambodia, Lao PDR, Morocco Madagascar, Myanmar, Togo |
| Cluster 2 | 32 | United Arab Emirates, Argentina, **Australia**, Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, **United Kingdom**, Georgia, Greece, Hong Kong SAR, Ireland, Iceland, Israel, Kazakhstan, Lithuania, Latvia, Malta, **Netherlands**, Norway, New Zealand, Poland, Russian Federation, Singapore, Slovenia, Sweden, **Turkiye**, **United States** |
| Cluster 3 | 23 | Albania, Armenia, Azerbaijan, Bulgaria, Bahrain, Ecuador, Egypt, Arab Rep, France, Croatia, Hungary, Italy, Jordan, Japan, Kuwait, Sri Lanka Luxembourg, Oman, Panama, **Portugal**, Romania, Serbia, Slovak Republic, Thailand |
| Cluster 4 | 19 | Belize, Brazil, Botswana, Chile, Colombia, Costa Rica, Dominican Republic, Indonesia, Iran, Islamic Rep, Kyrgyz Republic, Moldova, **Mexico**, Mongolia, Malaysia, **Peru**, Philippines, Saudi Arabia, Uruguay, **South Africa** |
| Cluster 5 | 6 | Burkina Faso, Mali, Niger, Pakistan, Senegal, Chad |
| Cluster 6* | 1 | **China** |

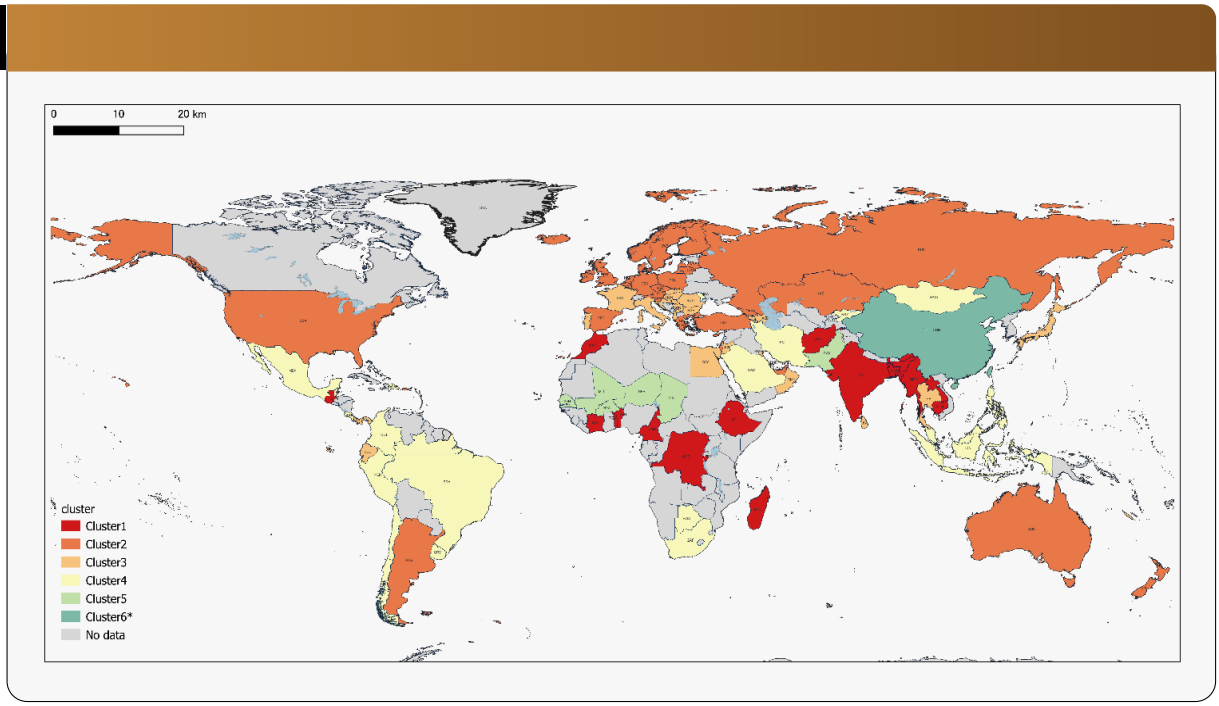
*Cluster analysis results*

We estimated country-wise adjustment factors for educational attainment.

## 3. POTENTIAL HUMAN CAPITAL

Based on Table 3 (reproduced from Chapter 5 for convenience), we estimated country-wise adjustment factors for educational attainment. We have data on SEL interventions on academic performance, which can specifically affect three parameters of human capital: educational attainment, lifetime income, and labour force participation. In this report, we focus on the impact on educational attainment.

*Fig 1.*




*Cluster analysis results: country groups*
*Note: There are no critical countries in Cluster 5. China is not part of the cluster analysis and is thus considered Cluster 6.*

To construct the SEL-related human capital change pathway, we forecast human capital growth between 2021 and 2030, by incorporating human capital adjustment parameters •

Once we have the adjustment factors for a country's average educational attainment ( $Edu^*_{(t)}$ ), we adjust the working-age population ( $P_{5+\,Edu^*\,(t)}$ ) accordingly. We use population and labour market data to factor in delayed entry into the labour market due to more years of schooling in the country. The adjustment factor for educational attainment is calculated based on improvement in academic achievement. For instance, in the case of the United States, SEL interventions increased academic performance by 10.64%. The evidence is drawn from Durlak et al. (2011), who conducted a meta-analysis of 213 school-based, universal SEL programmes involving 270,034 students from kindergarten to high school. The Durlak study found that SEL participants demonstrated significantly improved academic performance, including an 11 percentile point improvement in standardized reading and maths test scores. Similarly, we searched for evidence from other countries and found eleven such studies (see Table 2 in Chapter 3).

To construct the SEL-related human capital change pathway, we forecast human capital growth between 2021 and 2030 for the

*Table 3.*

| Adjustment Factors | Source | USA | UK | India | China | Netherlands | Mexico | Portugal | South Africa | Australia | Turkiye | Peru |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEL -> Academic performance | Multiple* | 10.64% | 11.03% | 7.14% | 7.53% | 10.26% | 13.31% | 16.28% | 19.40% | 11.03% | 11.03% | 7.53% |
| Dropout rates reduction (additional graduates) | Levin and Belfield (2009) | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% | 10.40% |
| Academic performance base (1 SD) | Levin and Belfield (2009) | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% | 34.10% |
| Additional graduates (for SEL effect sizes) | Authors' calculations | 3.25% | 3.36% | 2.18% | 2.30% | 3.13% | 4.06% | 4.97% | 5.92% | 3.36% | 3.36% | 2.30% |

*Educational attainment adjustment parameters in key countries*[1]

*Sources: USA (Durlak et al., 2011), UK (Wigelsworth et al., 2016), India (UNESCO MGIEP, n.d.), China (Wang et al., 2019), Netherlands (Sklad et al., 2012), Mexico (Adler, 2016), Peru (Adler, 2016), Portugal (Cristóvão, Candeias and Verdasca, 2017), South Africa (Clouder et al., 2013), Australia (Ashdown and Bernard, 2012), Turkiye (Alan, Boneva, and Ertac, 2019).*

We utilize scenarios two and three to learn how SEL interventions impact human capital across thirty-eight countries •

business-as-usual (BAU) scenario, with no SEL interventions. We utilize Scenarios 2 (as described in Chapter 5) and 3 (also the best-case scenario) to see how SEL interventions impact human capital across thirty-eight countries. Recalling from Chapter 5, Scenario 3, which is the best-case scenario (denoted by HC*** in this chapter), is defined as the total human capital that would have been generated if all high school and undergraduate students in the country were exposed to SEL interventions every year. Scenario 2 (denoted by HC** in this chapter) assumes the continuous yearly implementation of SEL interventions, starting with 15-year-olds in 2020 and a new cohort of 15-year-olds in 2021, who join the now 16-year-olds (who were 15-year-olds in 2020) receiving SEL interventions in 2021, and so on. Subsequently, we estimate the implementation of SEL under Scenario 3 for thirty-eight countries from 2020, and the potential gains in human capital from 2021 to 2030, by incorporating human capital adjustment parameters.

1. We refer to the eleven countries for which SEL adjustment factors have been obtained from the literature as key countries.

*Table 4.*

| | |
|---|---|
| **Cluster 1** | Afghanistan, Burundi, Benin, Bangladesh, Cote d'Ivoire, Cameroon, Congo, Dem Rep, Ethiopia, Guatemala, India , Cambodia, Lao PDR, Morocco, Madagascar, Myanmar, Togo |
| **Cluster 2** | United Arab Emirates, Argentina, Australia, Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, United Kingdom , Georgia, Greece , Hong Kong SAR, Ireland, Iceland, Israel , Kazakhstan, Lithuania, Latvia, Malta, Netherlands , Norway, New Zealand, Poland, Russian Federation , Singapore, Slovenia, Sweden , Turkiye , United States |
| **Cluster 3** | Albania, Armenia, Azerbaijan, Bulgaria, Bahrain, Ecuador, Egypt, Arab Rep, France , Croatia, Hungary, Italy, Jordan, Japan , Kuwait, Sri Lanka, Luxembourg, Oman, Panama, Portugal , Romania, Serbia, Slovak Republic, Thailand |
| **Cluster 4** | Belize, Brazil, Botswana, Chile, Colombia, Costa Rica, Dominican Republic, Indonesia, Iran, Islamic Rep, Kyrgyz Rep ublic, Moldova, Mexico , Mongolia, Malaysia, Peru, Philippines, Saudi Arabia, Uruguay, South Africa |
| **Cluster 5** | Burkina Faso, Mali, Niger, Pakistan, Senegal, Chad |
| **Cluster 6*** | China |

*Data from the highlighted countries was used to extend the coverage of the study*
*Note: There are no critical countries in Cluster 5. China is not part of the cluster analysis and is thus considered Cluster 6 due to the non-availability of data.*

Due to data challenges, we could estimate human capital under scenarios two and three for a set of thirty-eight countries •

Although we had data for a total of ninety-seven countries for all the variables that are used for the cluster analysis, six countries in Cluster 5 could not be covered as there was no representative country for the cluster (that is, SEL effect sizes were unavailable for any country in this cluster). Regarding the coverage of countries, we could potentially extend the analysis of SEL's effect on human capital to 91 countries, as we have at least one country with SEL intervention data for the remaining four clusters. Moreover, due to data insufficiency, we did not include China as part of the cluster analysis. Finally, due to data challenges, we could only estimate human capital under Scenarios 2 and 3 (the best-case scenarios) for the thirty-eight countries. These countries are highlighted in blue in Table 4.

Table A1 in Appendix A shows the human capital growth rates of the thirty-eight countries in 2030, with SEL implementation beginning in

*Fig 2.*

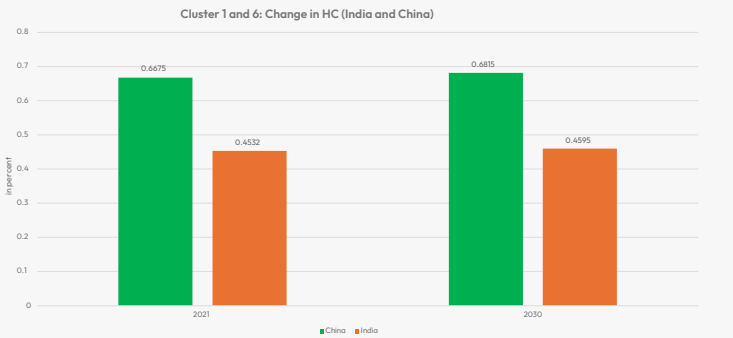

*Human capital growth rate in 2030 in descending order*

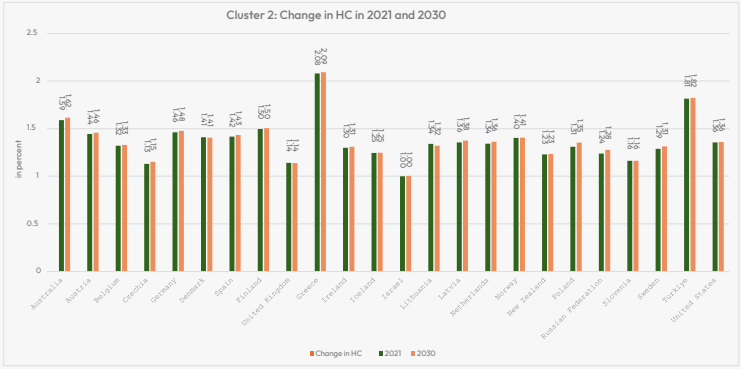
2020. Figure 2 shows the rate of change across the 38 countries in descending order. The top five countries with the highest SEL gains by 2030 were Greece, France, Italy, Portugal, and Hungary. Except for Greece, which was in Cluster 2, the remaining four countries belonged to Cluster 3. The change in human capital estimates for the 38 countries ranged from 2.09% for Greece to 0.46% for India. Figure 3 shows the change in human capital across the different clusters. These preliminary results show no significant differences across developed and developing countries.

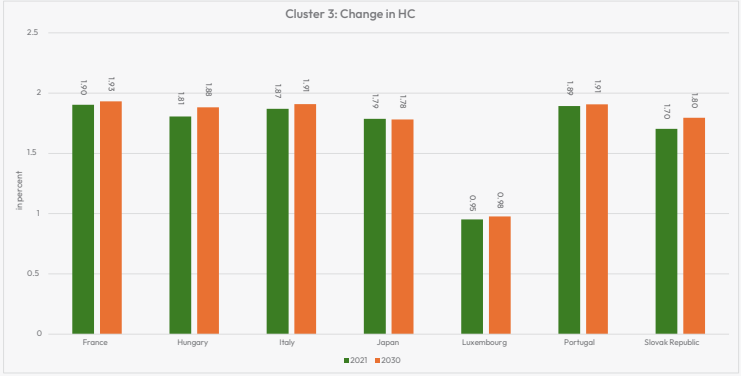
The impact of SEL on academic performance varies across countries; this can be attributed to the quality of SEL, duration of SEL interventions, and class size •

Differences across countries might arise from multiple factors. Declining enrolment rates can affect educational attainment. The impact of SEL on academic performance varies across countries; this can be attributed to the quality of SEL, duration of SEL interventions, and class size. In addition, social cohesion also determines students' levels of Social and Emotional Competencies when SEL interventions are introduced. We need more evidence to determine whether this increases or decreases the impact of SEL interventions. More research is required to learn why these differences occur and how to benefit from them to maximize the impact of SEL interventions to increase human capital in a country. A more detailed cross-analysis with

*Fig 3.*





*Cluster-wise change in human capital due to SEL: 2021–2030*

Human capital estimates for India and China show the lowest increase after implementing SEL •

socio-demographic and cultural factors might need to be undertaken to understand and explain why Brazil sees a higher impact than New Zealand or the United Kingdom.

## THE CASE OF INDIA AND CHINA

India and China show the lowest increase in human capital after implementing SEL. In the case of India, NCERT (2022) documents a decline in enrolment rates at the primary level after 2011 and predicts that from 2011 to 2025, total enrolment will fall by 14.37%. Gender-wise, enrolment of boys and girls will decrease by 13.28% and 15.54%, respectively (NCERT, 2022). Our projections also show a declining trend in enrolment rates for specific age cohorts, leading to a modest decline in educational attainment for the overall 5–24 years age group from 2021 to 2030 (see Table A2 in Appendix A). Further, estimates of the population that has spent 5+EDU years in an educational institution, the second component of human capital, show a steady increase in India and China for both male and female populations (see Table A3 in Appendix A). The shadow price of human capital, the third component of human capital, also shows an increase in 2030 compared to 2021 levels in India and China (refer to Table A3 in Appendix A). Since the final human capital figures depend on these three components, a relatively higher change in one of these terms will also be reflected in the overall human capital trend. From Table 5, we can see that although there is a modest improvement in the year-on-year change in human capital due to SEL implementation in both India and China, the estimate of human capital (in BAU and with SEL) shows an increasing trend for both countries.

Our study found that implementing SEL in targeted countries can significantly improve human capital growth by increasing educational attainment and school performance. However, the potential gains

*Table 5.*

| | Human capital (BAU) | | Human capital (SEL) | | Change in HC due to SEL (in %) | |
|---|---|---|---|---|---|---|
| Year | China | India | China | India | China | India |
| 2021 | 61,247.65 | 11,954.75 | 61,656.5 | 12,008.93 | 0.67 | 0.45 |
| 2022 | 61,182.31 | 12,166.91 | 61,596.81 | 12,222.73 | 0.68 | 0.46 |
| 2023 | 61,720.73 | 12,315.86 | 62,145.23 | 12,372.48 | 0.69 | 0.46 |
| 2024 | 61,712.24 | 12,536.2 | 62,130.94 | 12,593.72 | 0.68 | 0.46 |
| 2025 | 62,109.58 | 12,744.65 | 62,532.72 | 12,803.2 | 0.68 | 0.46 |
| 2026 | 62,425.85 | 12,911.48 | 62,851.95 | 12,970.8 | 0.68 | 0.46 |
| 2027 | 62,673.61 | 13,103.53 | 63,100.32 | 13,163.72 | 0.68 | 0.46 |
| 2028 | 63,013.3 | 13,283.44 | 63,442.8 | 13,344.48 | 0.68 | 0.46 |
| 2029 | 63,325.94 | 13,452.68 | 63,757.65 | 13,514.49 | 0.68 | 0.46 |
| 2030 | 63,616.59 | 13,620.13 | 64,050.11 | 13,682.72 | 0.68 | 0.46 |

*Human capital estimates under business-as-usual and with SEL implementation for China and India (billion US$)*

We found that implementing SEL in targeted countries can significantly improve human capital growth by increasing educational attainment •

may be limited in some countries due to the initial conditions existing in those countries. Further research is needed to disaggregate the impact of SEL on human capital from the many other factors that affect human capital. The estimates in this chapter are based on educational attainment, which is limited in scope, since spending a certain amount of time within the schooling system does not reflect the skills and competencies that may or may not have been acquired. Thus, as Chapter 5 emphasises, there is a need to shift towards a competency-based measurement of human capital.

## 4. ESTIMATING THE INCLUSIVE WEALTH FROM SEL INTERVENTIONS

### 4.1 INCLUSIVE WEALTH FRAMEWORK

Before presenting our estimates, we draw attention to the computation of inclusive wealth discussed in Chapter 1. We use the function $W(M, H, N, t)$ to define inclusive wealth with produced capital denoted as human capital $H$ and natural capital $N$. Recall

that the equivalence between inclusive wealth and well-being was expressed as:

(1) $$W(M,H,N,t) = r(t) + p_M(t)M(t) + p_H(t)H(t) + p_N(t)N(t)$$

Where $p_i(t)$ is the shadow price of capital $M(t)$, $H(t)$, and $N(t)$ at time $t$,

$r(t) = \frac{\partial V}{\partial t}$ be the shadow price of time at time $t$

and the change in each capital is referred to as inclusive investment:

(2) $$Inclusive\ Investment = p_M(t)\Delta M(t) + p_H(t)\Delta H(t) + p_N(t)\Delta N(t)$$

Inclusive wealth provides a capital measure for sustainable development. It links the discounted present value of all future consumption possibilities to the weighted sum of all capital assets, which form the productive base of the economic outcome.

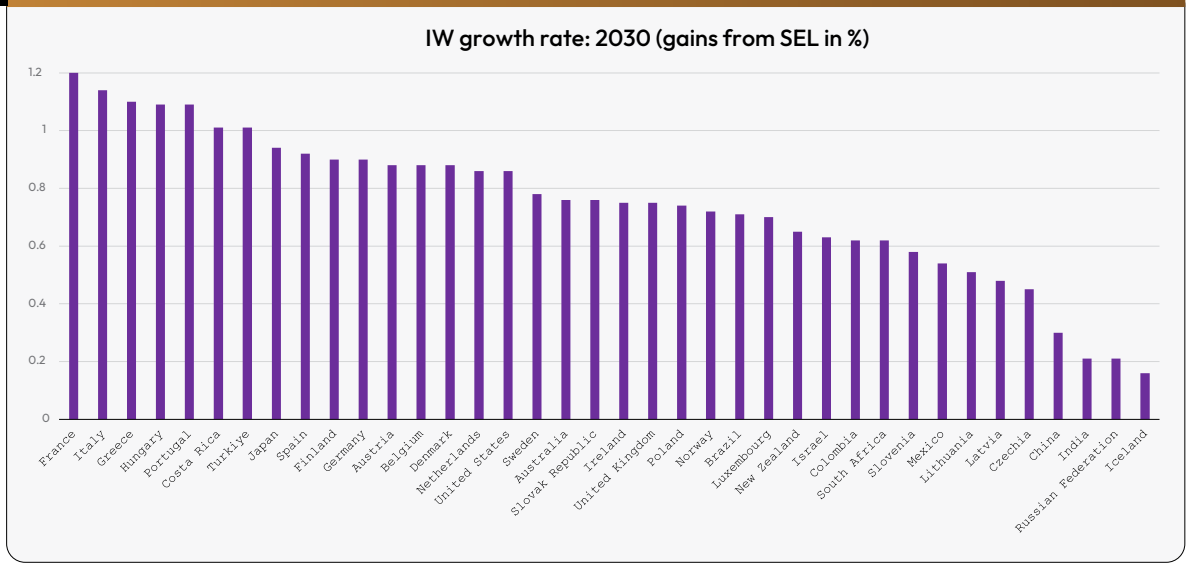
In our estimates of inclusive wealth, we keep the $N(t)$, $\Delta M(t)$ constant and study the $\Delta H(t)$ change due to SEL implementation. By keeping the change in other capital stocks constant, we focus on the change in inclusive wealth due to SEL implementation.

Inclusive wealth links the discounted present value of all future consumption possibilities to the weighted sum of all capital assets •

## 4.2 INCLUSIVE WEALTH ESTIMATES

In this section, we estimate how changes in human capital due to the implementation of SEL will impact the inclusive wealth of countries. The numbers for natural and produced capital are taken from UNEP's Inclusive Wealth Report 2023 (UNEP, 2023). We provide estimates of inclusive wealth under the BAU scenario and Scenario 3, under which SEL is implemented in high school and for undergraduate students.

*Fig 4.*




*Inclusive wealth growth rate in 2030 in descending order*

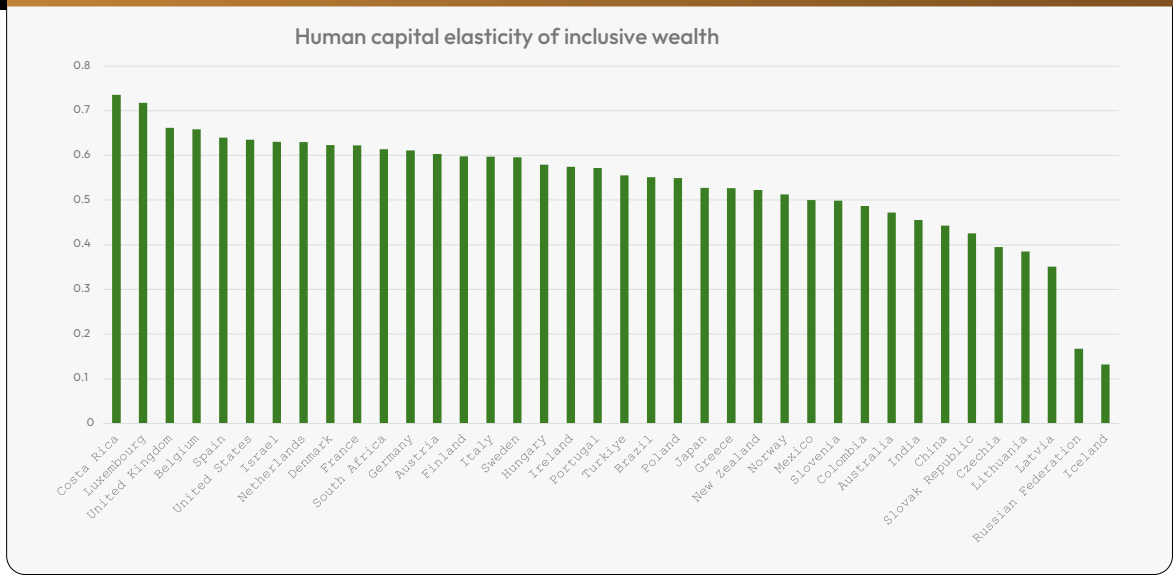
An economy-wide SEL implementation leads to growth in potential inclusive wealth that varies from 0.16% in Iceland to 1.2% in France, in 2030 •

Note that inclusive wealth when SEL is implemented changes only due to changes in human capital since the impact of SEL on produced and natural capital has yet to be studied.

Table B1 in Appendix B depicts the inclusive wealth estimates for 2020, 2025, and 2030 under the BAU and best-case scenarios for the thirty-eight countries. Since SEL is implemented only from 2020 onwards, we note the positive impact of SEL on potential inclusive wealth for 2025 and 2030 in Table B1.

Table B2 in Appendix B compares the estimated inclusive wealth at the end of 2030. Here, we estimate countries' inclusive wealth in 2030 when SEL is implemented versus when there is no SEL. Due to a broad-based, economy-wide SEL implementation, the growth in potential inclusive wealth in 2030 varies from 0.16% in Iceland to 1.2% in France (refer to Table B2 in Appendix B). This change may seem modest, but, as emphasized earlier, this change captures the impact of SEL on educational attainment in isolation from all the other positive externalities of SEL outlined in Chapter 5. This should be regarded as just the tip of the iceberg regarding SEL interventions and a country's inclusive wealth.

Fig 5.




*Human capital elasticity of inclusive wealth in descending order*

How much of the change in human capital translates to a change in inclusive wealth ?

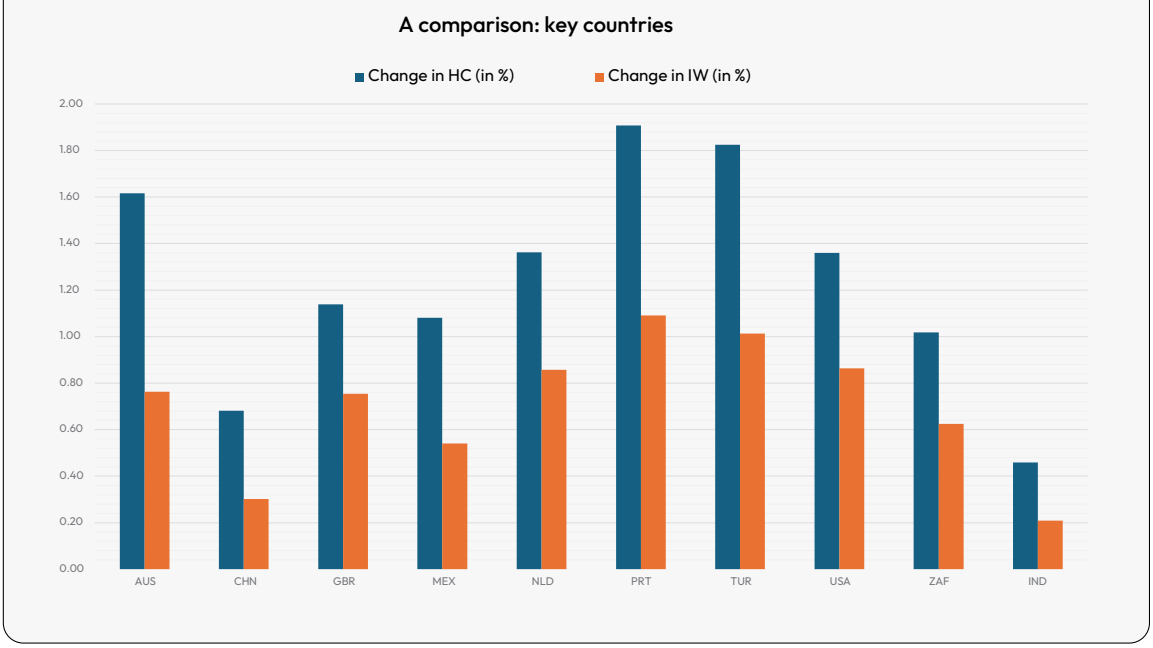
## 4.3 COMPARISON OF HUMAN CAPITAL AND INCLUSIVE WEALTH GAINS

It is imperative to assess the change in inclusive wealth resulting from the change in human capital. How much of the change in human capital translates to a change in inclusive wealth? Table B3 in Appendix B shows that the percentage change in inclusive wealth is approximately half of the change in human capital for most countries except Iceland, Russia, Latvia, Lithuania, Czechia, and the Slovak Republic. Thus, we do not see a simple monotonic linear change in inclusive wealth due to a change in human capital driven by SEL interventions. Further, in Figure 6, only half of the change in human capital is transferred to the change in inclusive wealth in all ten key countries. Figure 7, drawing from Table B3 in Appendix B, compares changes in human capital and inclusive wealth for all thirty-eight countries.

Human capital is the most significant contributor to inclusive wealth in most countries (UNU-IHDP and UNEP, 2014). From Table B2 in Appendix B and Figure 5, we can observe that the human capital elasticity of inclusive wealth ranges from 0.13 for Iceland to 0.74 for Costa Rica. Here,

$$Human\ capital\ elasticity\ of\ inclusive\ wealth = \frac{Percentage\ change\ in\ IW}{Percentage\ change\ in\ HC}$$

*Fig 6.*




*Change in human capital and inclusive wealth in critical countries in 2030*

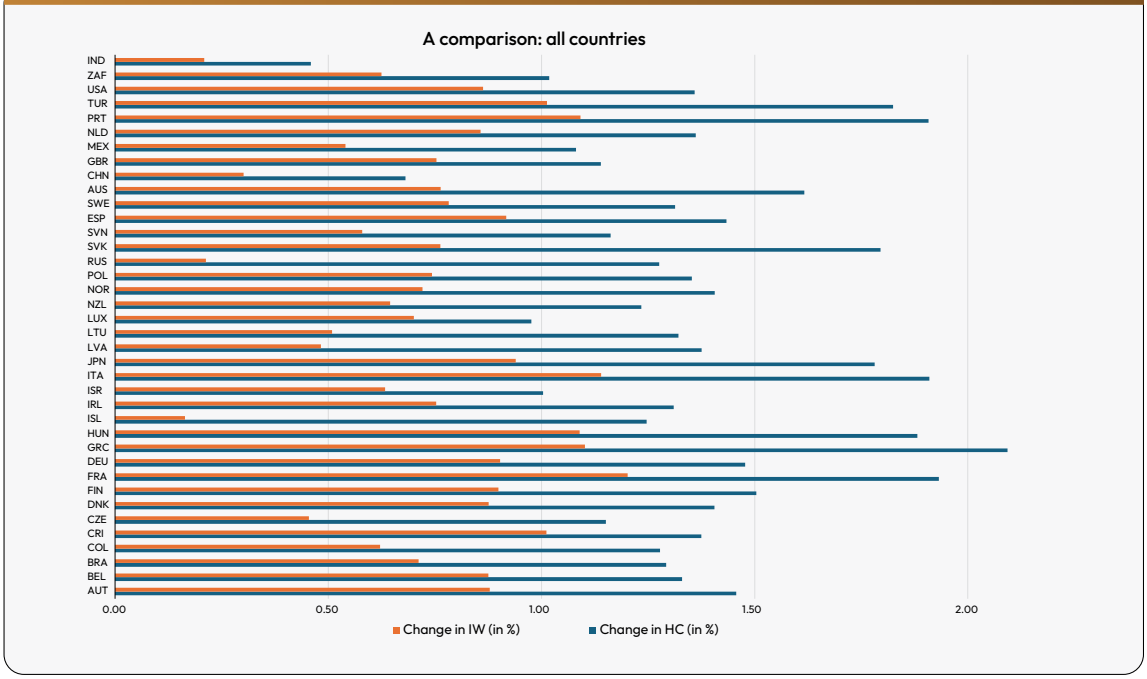
## 5.DISCUSSION

In this chapter, we investigated the potential gains in human capital that may result from implementing SEL in schools and undergraduate institutions across 38 countries. Specifically, we focus on a critical effect of SEL: increasing student graduation rates by enhancing academic performance. This effect can facilitate higher education completion rates and give students the opportunity to progress to higher levels of education. Promoting SEL can improve a country's educational attainment levels and increase the overall returns on education.

Promoting SEL can improve a country's educational attainment levels and increase the overall returns on education •

Assuming that SEL was implemented in 2020, we analysed changes in human capital under a BAU scenario without SEL and the changes in human capital that would result following the implementation of SEL under two scenarios. Our analysis of thirty-eight countries reveals that

*Fig 7.*




*Change in human capital and inclusive wealth in all thirty-eight countries in 2030*

by 2030, SEL can contribute on average to a 1.38% improvement in human capital in Scenario 3, relative to BAU projections.

For example, nations with inherently higher educational attainment levels tend to experience a higher impact of SEL on human capital because of SEL gains. Conversely, when a country has a scarcity of human capital but a sizable young population, the effect of SEL on increasing human capital is lesser due to lower initial enrolment rates. Overall, the potential gains in human capital from SEL are universal, and all countries stand to gain from implementing SEL, as it will aid most countries in enhancing their human capital levels. For countries with relatively slow growth in human capital due to their demographic structure and other socio-economic factors, the potential return on the human capital of SEL is significant. Our analysis indicates that some countries may face a slow rate of growth in human capital in the future due to ageing populations, declining populations, economic slowdowns, and lower returns to education. Implementing SEL can help compensate for these losses and enable these countries to achieve sustainable human capital growth.

All countries stand to gain from implementing SEL, as it will aid in enhancing their human capital levels •

# KEY MESSAGES

**This chapter assesses the impact of SEL implementation in schools on human capital.** We focus on a consequence of this educational approach: increased student enrolment rates through improved academic performance.

Of the three scenarios for SEL implementation defined in Chapter 5, **we focus on Scenarios 2 and 3 (or the best-case scenario),** which examine a case in which all high school and undergraduate students in a country are exposed to SEL interventions yearly.

**Extending the human capital estimates to thirty-eight countries** (including the ten key countries), we find that the human capital gains range from **0.46% for India to 2.09%** for Greece in 2030 under the best-case scenario for SEL implementation.

Similarly, extending the inclusive wealth estimates to **thirty-eight countries (including the ten key countries), we find that the inclusive wealth gains range from 0.16% for Iceland to 1.2% for France in 2030 under the best-case** scenario for SEL implementation.

We observe that the percentage change in inclusive wealth is approximately **half** of the shift in human capital for most countries, except Iceland, Russia, Latvia, Lithuania, Czechia, and the Slovak Republic.

**Implementing SEL can enhance human capital and inclusive wealth in most countries.** However, the benefits of SEL are significantly diminished in countries with adverse initial conditions, such as low educational attainment levels, high gender disparity, non-conducive demographic structures, and adverse socio-economic conditions. This suggests a holistic approach to educational reform that focuses on improving academic performance and addressing well-being with SEL skills that enable individuals to manage stress, anxiety, and conflict and reduce dropout rates from school.

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# APPENDIX A

*Table A1.*

| Country | Cluster | HC growth rate in 2030 (gains from SEL in %) | HC estimates: BAU, 2030 (billion US$, 2015) | HC estimates: SEL, 2030 (billion US$, 2015) |
|---|---|---|---|---|
| Australia | 2 | 1.62 | 10,255.09 | 10,420.87 |
| Austria | 2 | 1.46 | 3,626.33 | 3,679.16 |
| Belgium | 2 | 1.33 | 4,732.74 | 4,795.67 |
| Brazil | 4 | 1.29 | 15,294.83 | 15,492.54 |
| China | 6 | 0.68 | 63,616.59 | 64,050.11 |
| Colombia | 4 | 1.28 | 2,461.92 | 2,493.40 |
| Costa Rica | 4 | 1.38 | 685.71 | 695.14 |
| Czechia | 2 | 1.15 | 1,288.32 | 1,303.15 |
| Denmark | 2 | 1.41 | 3,068.02 | 3,111.15 |
| Finland | 2 | 1.50 | 2,203.57 | 2,236.71 |
| France | 3 | 1.93 | 25,445.13 | 25,936.72 |
| Germany | 2 | 1.48 | 30,640.51 | 31,093.33 |
| Greece | 2 | 2.09 | 1,532.85 | 1,564.93 |
| Hungary | 3 | 1.88 | 982.59 | 1,001.08 |
| Iceland | 2 | 1.25 | 154.11 | 156.03 |
| India | 1 | 0.46 | 13,620.13 | 13,682.72 |
| Ireland | 2 | 1.31 | 2,039.06 | 2,065.78 |
| Israel | 2 | 1.00 | 2,363.39 | 2,387.11 |
| Italy | 3 | 1.91 | 16,717.42 | 17,036.65 |
| Japan | 3 | 1.78 | 37,444.35 | 38,111.50 |
| Latvia | 2 | 1.38 | 158.77 | 160.95 |
| Lithuania | 2 | 1.32 | 198.34 | 200.96 |

| | | | | |
|---|---|---|---|---|
| Luxembourg | 3 | 0.98 | 653.77 | 660.16 |
| Mexico | 4 | 1.08 | 7,251.46 | 7,329.84 |
| Netherlands | 2 | 1.36 | 7,135.56 | 7,232.73 |
| New Zealand | 2 | 1.23 | 1,334.48 | 1,350.94 |
| Norway | 2 | 1.41 | 3,427.22 | 3,475.41 |
| Poland | 2 | 1.35 | 2,997.04 | 3,037.59 |
| Portugal | 3 | 1.91 | 1,712.69 | 1,745.36 |
| Russian Federation | 2 | 1.28 | 9,416.97 | 9,537.17 |
| Slovak Republic | 3 | 1.80 | 503.96 | 513.00 |
| Slovenia | 2 | 1.16 | 415.66 | 420.49 |
| South Africa | 4 | 1.02 | 3,290.21 | 3,323.71 |
| Spain | 2 | 1.43 | 11,233.75 | 11,417.01 |
| Sweden | 2 | 1.31 | 4,416.34 | 4,474.33 |
| Turkiye | 2 | 1.82 | 5,749.94 | 5,854.86 |
| United Kingdom | 2 | 1.14 | 25,567.14 | 25,858.40 |
| United States | 2 | 1.36 | 189,241.23 | 191,813.77 |

*Table A2.* EDU for age group from 5 to 24 (no. of years)

| | Male | | Female | |
|---|---|---|---|---|
| Year | China | India | China | India |
| 2021 | 14.04 | 11.27 | 15.50 | 11.25 |
| 2022 | 13.79 | 10.81 | 15.30 | 11.00 |
| 2023 | 13.82 | 10.83 | 15.33 | 11.01 |
| 2024 | 13.78 | 10.82 | 15.28 | 11.00 |
| 2025 | 13.80 | 10.82 | 15.31 | 11.00 |
| 2026 | 13.80 | 10.82 | 15.31 | 11.00 |
| 2027 | 13.79 | 10.82 | 15.30 | 11.00 |
| 2028 | 13.80 | 10.82 | 15.30 | 11.00 |
| 2029 | 13.80 | 10.82 | 15.30 | 11.00 |
| 2030 | 13.80 | 10.82 | 15.30 | 11.00 |

*Educational attainment in India and China*

*Table A3.*

| | Population over 5+EDU (thousands) | | | | Shadow Price of Human Capital (US$) |
|---|---|---|---|---|---|
| | Male | | Female | | Male |
| Year | China | India | China | India | China |
| 2021 | 550,195.00 | 510,951.00 | 536,764.00 | 484,166.00 | 16,304,151.47 |
| 2022 | 561,091.00 | 530,795.00 | 546,837.00 | 502,611.00 | 16,297,304.16 |
| 2023 | 563,608.00 | 538,155.00 | 549,310.00 | 509,662.00 | 16,308,898.82 |
| 2024 | 566,177.00 | 546,362.00 | 551,734.00 | 517,427.00 | 16,308,053.11 |
| 2025 | 568,792.00 | 554,462.00 | 554,170.00 | 525,109.00 | 16,309,215.23 |
| 2026 | 571,492.00 | 562,428.00 | 556,614.00 | 532,682.00 | 16,313,132.45 |
| 2027 | 574,328.00 | 570,195.00 | 559,097.00 | 540,099.00 | 16,314,499.23 |
| 2028 | 577,280.00 | 577,731.00 | 561,666.00 | 547,351.00 | 16,316,506.21 |
| 2029 | 580,172.00 | 585,024.00 | 564,306.00 | 554,430.00 | 16,318,878.13 |
| 2030 | 582,890.00 | 591,947.00 | 566,871.00 | 561,205.00 | 16,320,748.39 |

# APPENDIX B

*Table B1.*

| | Inclusive wealth (BAU) | | | Inclusive wealth (scenario 3) | | |
|---|---|---|---|---|---|---|
| Country | 2020 | 2025* | 2030* | 2020 | 2025* | 2030* |
| Australia | 19,040.70 | 20,756.96 | 21,711.16 | 19,040.70 | 20,913.72 | 21,876.94 |
| Austria | 5,597.65 | 5,811.87 | 6,014.08 | 5,597.65 | 5,864.20 | 6,066.91 |
| Belgium | 6,577.37 | 6,896.86 | 7,187.53 | 6,577.37 | 6,958.48 | 7,250.46 |
| Brazil | 25,515.57 | 26,740.64 | 27,758.40 | 25,515.57 | 26,929.83 | 27,956.11 |
| China | 126,504.58 | 146,643.94 | 143,683.19 | 126,504.58 | 147,067.08 | 144,116.72 |
| Colombia | 4,727.74 | 4,855.93 | 5,060.67 | 4,727.74 | 4,885.81 | 5,092.15 |
| Costa Rica | 830.11 | 876.75 | 931.92 | 830.11 | 885.64 | 941.35 |
| Czechia | 2,859.98 | 3,054.18 | 3,263.57 | 2,859.98 | 3,068.88 | 3,278.40 |
| Denmark | 4,767.42 | 4,789.38 | 4,924.30 | 4,767.42 | 4,831.30 | 4,967.44 |
| Finland | 3,454.36 | 3,563.12 | 3,686.28 | 3,454.36 | 3,595.72 | 3,719.43 |
| France | 37,581.04 | 39,305.96 | 40,898.63 | 37,581.04 | 39,788.59 | 41,390.22 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Greece | 2,741.33 | 2,865.45 | 2,910.67 | 2,741.33 | 2,897.69 | 2,942.75 |
| Hungary | 1,639.87 | 1,679.54 | 1,697.01 | 1,639.87 | 1,698.42 | 1,715.51 |
| Iceland | 1,555.79 | 1,251.92 | 1,168.47 | 1,555.79 | 1,253.77 | 1,170.39 |
| India | 25,498.65 | 29,009.87 | 29,909.97 | 25,498.65 | 29,068.42 | 29,972.56 |
| Ireland | 3,291.08 | 3,300.08 | 3,547.24 | 3,291.08 | 3,325.43 | 3,573.96 |
| Israel | 3,179.40 | 3,431.96 | 3,747.67 | 3,179.40 | 3,453.79 | 3,771.40 |
| Italy | 26,352.22 | 27,402.09 | 28,005.35 | 26,352.22 | 27,722.56 | 28,324.58 |
| Japan | 70,267.86 | 70,777.76 | 70,989.03 | 70,267.86 | 71,459.26 | 71,656.18 |
| Latvia | 431.11 | 432.96 | 452.27 | 431.11 | 435.25 | 454.45 |
| Lithuania | 482.60 | 492.68 | 515.06 | 482.60 | 495.41 | 517.68 |
| Luxembourg | 795.44 | 854.04 | 911.02 | 795.44 | 860.11 | 917.41 |
| Mexico | 12,673.20 | 13,765.26 | 14,506.00 | 12,673.20 | 13,838.39 | 14,584.38 |
| Netherlands | 10,337.58 | 10,921.04 | 11,331.49 | 10,337.58 | 11,016.41 | 11,428.66 |
| New Zealand | 2,319.94 | 2,434.91 | 2,553.26 | 2,319.94 | 2,450.58 | 2,569.73 |
| Norway | 6,839.55 | 6,622.70 | 6,683.97 | 6,839.55 | 6,668.49 | 6,732.16 |
| Poland | 4,921.28 | 5,345.67 | 5,455.97 | 4,921.28 | 5,386.51 | 5,496.51 |
| Portugal | 2,788.36 | 2,881.07 | 2,993.66 | 2,788.36 | 2,913.81 | 3,026.33 |
| Russian Federation | 59,200.43 | 55,127.07 | 56,404.86 | 59,200.43 | 55,247.51 | 56,525.06 |
| Slovak Republic | 1,025.56 | 1,117.61 | 1,185.28 | 1,025.56 | 1,126.70 | 1,194.32 |
| Slovenia | 735.02 | 790.03 | 833.73 | 735.02 | 794.85 | 838.56 |
| South Africa | 5,306.56 | 5,140.74 | 5,362.84 | 5,306.56 | 5,171.76 | 5,396.34 |
| Spain | 17,987.56 | 18,943.48 | 19,645.72 | 17,987.56 | 1,9121.70 | 19,825.98 |
| Sweden | 6,928.32 | 7,075.87 | 7,412.76 | 6,928.32 | 7,131.92 | 7,470.76 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Turkiye | 8,922.33 | 10,017.39 | 10,353.80 | 8,922.33 | 10,117.15 | 10,458.72 |
| UK | 35,735.22 | 37,210.77 | 38,644.64 | 35,735.22 | 37,493.48 | 38,935.90 |
| USA | 266,947.22 | 283,553.09 | 297,945.87 | 266,947.22 | 286,016.62 | 300,518.42 |

*Table B2.*

| Country | IW (BAU) | IW (with SEL) | Change in IW (%) |
|---|---|---|---|
| Australia | 21,711.16 | 21,876.94 | 0.76 |
| Austria | 6,014.08 | 6,066.91 | 0.88 |
| Belgium | 7,187.53 | 7,250.46 | 0.88 |
| Brazil | 27,758.40 | 27,956.11 | 0.71 |
| China | 143,683.19 | 144,116.72 | 0.30 |
| Colombia | 5,060.67 | 5,092.15 | 0.62 |
| Costa Rica | 931.92 | 941.35 | 1.01 |
| Czechia | 3,263.57 | 3,278.40 | 0.45 |
| Denmark | 4,924.30 | 4,967.44 | 0.88 |
| Finland | 3,686.28 | 3,719.43 | 0.90 |
| France | 40,898.63 | 41,390.22 | 1.20 |
| Germany | 50,139.58 | 50,592.40 | 0.90 |

| | | | |
|---|---|---|---|
| Greece | 2,910.67 | 2,942.75 | 1.10 |
| Hungary | 1,697.01 | 1,715.51 | 1.09 |
| Iceland | 1,168.47 | 1,170.39 | 0.16 |
| India | 29,909.97 | 29,972.56 | 0.21 |
| Ireland | 3,547.24 | 3,573.96 | 0.75 |
| Israel | 3,747.67 | 3,771.40 | 0.63 |
| Italy | 28,005.35 | 28,324.58 | 1.14 |
| Japan | 70,989.03 | 71,656.18 | 0.94 |
| Latvia | 452.27 | 454.45 | 0.48 |
| Lithuania | 515.06 | 517.68 | 0.51 |
| Luxembourg | 911.02 | 917.41 | 0.70 |
| Mexico | 14,506.00 | 14,584.38 | 0.54 |
| Netherlands | 11,331.49 | 11,428.66 | 0.86 |
| New Zealand | 2,553.26 | 2,569.73 | 0.65 |
| Norway | 6,683.97 | 6,732.16 | 0.72 |
| Poland | 5,455.97 | 5,496.51 | 0.74 |
| Portugal | 2,993.66 | 3,026.33 | 1.09 |
| Russian Federation | 56,404.86 | 56,525.06 | 0.21 |

| | | | |
|---|---|---|---|
| Slovak Republic | 1,185.28 | 1,194.32 | 0.76 |
| Slovenia | 833.73 | 838.56 | 0.58 |
| South Africa | 5,362.84 | 5,396.34 | 0.62 |
| Spain | 19,645.72 | 19,825.98 | 0.92 |
| Sweden | 7,412.76 | 7,470.76 | 0.78 |
| Turkiye | 10,353.80 | 10,458.72 | 1.01 |
| United Kingdom | 38,644.64 | 38,935.90 | 0.75 |
| United States | 297,945.87 | 300,518.42 | 0.86 |

*Table B3.*

| Country | Country Code | Cluster | Change in HC*** (in %) | Change in IW*** (in %) | Human capital elasticity of IW |
|---|---|---|---|---|---|
| Australia | AUS | 2 | 1.62 | 0.76 | 0.47 |
| Austria | AUT | 2 | 1.46 | 0.88 | 0.60 |
| Belgium | BEL | 2 | 1.33 | 0.88 | 0.66 |
| Brazil | BRA | 4 | 1.29 | 0.71 | 0.55 |
| China | CHN | 6 | 0.68 | 0.30 | 0.44 |
| Colombia | COL | 4 | 1.28 | 0.62 | 0.49 |
| Costa Rica | CRI | 4 | 1.38 | 1.01 | 0.74 |
| Czechia | CZE | 2 | 1.15 | 0.45 | 0.39 |

| | | | | | |
|---|---|---|---|---|---|
| Denmark | DNK | 2 | 1.41 | 0.88 | 0.62 |
| Finland | FIN | 2 | 1.50 | 0.90 | 0.60 |
| France | FRA | 3 | 1.93 | 1.20 | 0.62 |
| Germany | DEU | 2 | 1.48 | 0.90 | 0.61 |
| Greece | GRC | 2 | 2.09 | 1.10 | 0.53 |
| Hungary | HUN | 3 | 1.88 | 1.09 | 0.58 |
| Iceland | ISL | 2 | 1.25 | 0.16 | 0.13 |
| India | IND | 1 | 0.46 | 0.21 | 0.46 |
| Ireland | IRL | 2 | 1.31 | 0.75 | 0.57 |
| Israel | ISR | 2 | 1.00 | 0.63 | 0.63 |
| Italy | ITA | 3 | 1.91 | 1.14 | 0.60 |
| Japan | JPN | 3 | 1.78 | 0.94 | 0.53 |
| Latvia | LVA | 2 | 1.38 | 0.48 | 0.35 |
| Lithuania | LTU | 2 | 1.32 | 0.51 | 0.39 |
| Luxembourg | LUX | 3 | 0.98 | 0.70 | 0.72 |
| Mexico | MEX | 4 | 1.08 | 0.54 | 0.50 |
| Netherlands | NLD | 2 | 1.36 | 0.86 | 0.63 |
| New Zealand | NZL | 2 | 1.23 | 0.65 | 0.52 |
| Norway | NOR | 2 | 1.41 | 0.72 | 0.51 |
| Poland | POL | 2 | 1.35 | 0.74 | 0.55 |
| Portugal | PRT | 3 | 1.91 | 1.09 | 0.57 |

| | | | | | |
|---|---|---|---|---|---|
| Russian Federation | RUS | 2 | 1.28 | 0.21 | 0.17 |
| Slovak Republic | SVK | 3 | 1.80 | 0.76 | 0.43 |
| Slovenia | SVN | 2 | 1.16 | 0.58 | 0.50 |
| South Africa | ZAF | 4 | 1.02 | 0.62 | 0.61 |
| Spain | ESP | 2 | 1.43 | 0.92 | 0.64 |
| Sweden | SWE | 2 | 1.31 | 0.78 | 0.60 |
| Turkiye | TUR | 2 | 1.82 | 1.01 | 0.56 |
| United Kingdom | GBR | 2 | 1.14 | 0.75 | 0.66 |
| United States | USA | 2 | 1.36 | 0.86 | 0.64 |

# ANNEXURE:

# HUMAN CAPITAL CALCULATIONS[1]

## ESTIMATION OF HUMAN CAPITAL FROM 1990 TO 2020

Human capital estimates are based on the conventional approach followed in IWR 2012 and 2014, but with certain noteworthy departures. In this annexure, we outline the approach used to arrive at the human capital figures in Chapters 5 and 6 of this special issue on human capital. The conventional approach to calculating human capital in the inclusive wealth reports follows Arrow et al. (2012) and Klenow and Rodriguez-Clare (1997):

(1)

$$HC = \underbrace{e^{(Edu \cdot \rho)}}_{Term\ I} \cdot \underbrace{P_{5+edu}}_{Term\ II} \cdot \underbrace{\int_{t=0}^{T} \bar{r} \cdot e^{-\delta t} dt}_{Term\ III}$$

Where Edu = years of schooling attainment calculated as a sum of cohort-wise years of schooling attainment for the age cohorts 5 to 9, 10 to 14, 15 to 19, and 20 to 24.

ρ = additional compensation over time for the education level attained, which is fixed at 8.5% (Klenow and Rodriquez-Clare (1997))

$P_{5+edu}$ = total population of the country that has attained '5+Edu' years of education

$\bar{r}$ = average compensation per unit of human capital over the period from 1990 to 2020

T = expected working life

δ = discount rate

$SP_{HC\ (t)} = \int_{t=0}^{T} \bar{r} \cdot e^{-\delta t} dt$

1. This method of estimation of the different components of human capital has been developed by researchers at the Urban Institute, Kyushu University. We thank Professor Managi and Dr. Chen Shunning from Kyushu University for providing support with human capital estimations.

The shadow price per unit of human capital, $SP_{HC(t)}$, is the present value of the average compensation per unit of human capital, $\overline{r}_t$, received by workers over the expected working life, T.

## 1A. ESTIMATION OF EDU:

We consider two distinct life stages of which the first represents childhood and youth, that is, the period up to the age of 24. This is the stage in which education is primarily acquired. The second stage comprises the adult population engaged in productive activities. These stages are denoted by i = 1 and 2 respectively.

Note that the estimates of Edu are calculated by gender-denoted by k = 1 and 2 respectively, and by life stages.

Using the classic Sullivan-based method, the average years of life expectancy for both life stages can be estimated. This method was first applied to estimate expected years of schooling by Stockwell and Nam (1963) and later by Land and Hough Jr (1989) and Land et. al (1994).

The life expectancy $\boldsymbol{e^i_{k,x}}$ at age x (note that x is the **lower bound of an age interval**) for each life stage 'i', is given by:

$$e^i_{k,x} = \sum_x^{100} \frac{ns^i_{k,x} * nL^i_{k,x}}{l_{k,x}}, k = 1,2 \; and \; i = 1,2. \quad (2)$$

Where $nL^i_{k,x}$ = Number of person-years lived within the age interval (x, x+n)

$l_{k,x}$ = Numberof survivors at the beginning of the age interval (x, x+n)

$$ns^{i}_{k,x} = \begin{cases} \text{school enrollment rate when i=1} \\ \text{labour force participation rate when i=2} \end{cases}$$

(3)

Here, $\text{Edu} = e^{1}_{k,x} = \sum_{x=5}^{20} \frac{ns^{1}_{k,x} * nL^{1}_{k,x}}{l_{k,x}}$

which is an estimate of the number of person-years lived and enrolled in educational institutions for the age group from 5 to 24 years belonging to gender k. This is an estimate of the educational attainment of a country.

## 1A.1. ESTIMATION OF SCHOOL ENROLLMENT RATE, $ns^{i}_{k,x}$ BY AGE INTERVAL

To calculate enrollment rate by age cohorts 5 to 9, 10 to 14, 15 to 19 and 20 to 24, we need to compile data on the following variables:

| Variable | Data Source |
|---|---|
| School enrolment, primary, male (% gross); school enrolment, primary, female (% gross); school enrolment, secondary, male (% gross); school enrolment, secondary, female (% gross); school enrollment, tertiary, male (% gross); school enrolment, tertiary, female (% gross | World Bank (n.d.) |
| School age population, primary education (female); school age population, primary education (male); school age population, secondary education (female); school age population, secondary education (male); school age population, tertiary education (female); school age population, tertiary education (male) | UNESCO Institute for Statistics (n.d.) |
| Population by 5-year age groups – male (that is, age cohorts 5–9, 10–14, 15–19, and 20–24), Population by 5-year age groups – female | United Nations Population Division (n.d.) |
| Primary school starting age (years); primary education, duration (years); secondary education, duration (years); lower secondary school starting age (years) | World Bank (n.d.) |

Now, we illustrate the method used to calculate the enrolment rate for the age cohort 5–9 (female).

(a)

$$\textbf{\textit{Total enrollment in primary education}} = School\ enrollment\ rate, primary * School\ age\ population, primary$$

Note that all the figures in the above formula are for the female gender.

Say the primary school starting age is 6 years, and the primary education duration is 6 years, then ages 6 to 11 are enrolled in primary education. Since primary education starts only at age 6, enrolment for the age group 5–9 is the same as the enrolment for the age group 6–9. Next, we weight the total enrolment in primary education by 4/6 to obtain the enrolment for the age group 5–9 years.

(b)

$$Enrollment\ for\ age\ group\ 5-9, female\ = a * 4/6$$

(c)

$$Enrollment\ rate\ for\ age\ group\ 5-9, female\ = \frac{b}{Female\ population\ for\ the\ ages\ 5–9}$$

**Thus, we obtain our estimate of $ns^1_{k,x}$ where k = female and x = 5. Similarly, we can estimate $ns^1_{k,x}$ for x =10, 15 and 20 and for the case when k= male.**

## 1B. ESTIMATION OF T

The calculation of $T$ from $e^2_{x,k}$ requires us to account for trade-offs due to child labour and loss in wages due to higher education. If the average expected education attainment for a country is less than 10 years, the working population includes individuals under the age of 15 years. Further, child labour–related mortality needs to be deducted in the calculation of $T$. If the average expected education attainment for a country is greater than 10 years, the working population includes individuals over the age of 15, (that is, greater than 5 + 10). In this case, the population aged 15 to 24 is confronted with the decision of either continuing education or joining work. Thus, the working years lost due to education need to be deducted from the age interval (15,24). Therefore, the value of $T$ is calculated as follows:

(3)

$$T = \begin{cases} \frac{1}{l_{k,x}}\left(\sum_{x}^{100} ns_{k,x}^{2} * nL_{k,x}^{2} - \frac{D_{k,x}}{l_{k,x}} \sum_{x}^{15} ns_{k,x}^{2} * nL_{k,x}^{2}\right), \text{if } x \leq 15. \\ \frac{1}{l_{k,x}}\left(\sum_{15}^{100} ns_{k,x}^{2} * nL_{k,x}^{2} - \sum_{15}^{x} ns_{k,x}^{2} * nL_{k,x}^{2}\right), \text{ otherwise.} \end{cases}$$

Where $ns_{k,x}^{2}$ = labour force participation rate by gender k and age interval (x, x+n)

$nL_{k,x}^{i}$ = Numberof person-years lived within the age interval (x, x+n)

$l_{k,x}$ = Numberof survivorsat the beginning of the age interval (x, x+n)

$D_{k,x}$ = Number of deaths by gender k and age interval (x, x+n)

## 1.B.1 ESTIMATION OF $ns_{k,x}^{2}$ OR LABOUR FORCE PARTICIPATION RATE

We calculated labour force participation rate by 5-year age cohorts starting from 15–19 till over 65 years of age:

$$Labour\ force\ participation\ rate\ = \frac{Labour\ force\ by\ sex\ and\ age\ (thousands)}{Working\ age\ population\ by\ sex\ and\ age\ (thousands)}$$

| Variable | Data source |
|---|---|
| $nL_{k,x}^{i}$ ; $D_{k,x}$ ; $l_{k,x}$ | United Nations Population Division (n.d.). |
| Labour force by sex and age (thousands) | ILO(n.d.) |
| Working-age population by sex and age (thousands) | ILO(n.d.) |

## 1C. ESTIMATION OF AVERAGE COMPENSATION PER UNIT OF HUMAN CAPITAL

The annual per unit return on education can be computed using the labour compensation in GDP, the total legal labour force, and the level of educational attainment. We calculate the average price of labour compensation, $\bar{r}$ ,for the given, period, as follows:

(4)

$$\bar{r} = \frac{\sum_{1990}^{2019} \sum \frac{W_s}{\sum_k h_{s,k} * l_{s,k}}}{\text{Length of Time Period}_{1990\text{-}2019}}$$

where $W_s$ = Total employee compensation

$h_{s,k}$ =the human capital per individual by gender $k$ in year $s$.

$l_{s,k}$ = labour force by gender $k$ in year $s$.

Length of time period= 30 (since we are estimating average compensation over a 30-year period from 1990 to 2019)

Note that for OECD countries, total employee compensation is calculated as:

$$W_s = \textit{Employee compensation by activity } (\%\ \textit{of total value added}) * \textit{Gross Value Added by Kind of Economic Activity}$$

| Variable | Data source |
|---|---|
| Employee compensation by activity | OECD (n.d.); Lenzen et al (2012) and Lenzen et al (2013) |
| Gross value added by kind of economic activity at constant (2015) prices | United Nations Statistics Division. (n.d.) |

For non-OECD countries, we use the compensation of employees' data from the World EORA database.[2]

Although in real-world scenarios, compensation for education is impacted by cultural norms,social backgrounds, and type of employment, due to the absence of detailed data, weprovisionally assume equal returns to education for both genders.

2. Full Eora (worldmrio.com)

## 2. EXTENDING HUMAN CAPITAL ESTIMATES TO 2030: A BUSINESS-AS-USUAL SCENARIO

To forecast human capital in the business-as-usual scenario for the period from 2021 to 2030, we estimate the cohort-wise labour force participation rates needed to calculate the expected working life, T, defined in equation (3). Both educational attainment, Edu, represented by the school enrollment rate, $ns^{1}_{k,x}$, and average compensation per unit of human capital, $\bar{r}$ are held constant at the pre-pandemic (2019) level.

### 2A. ESTIMATION OF AGE COHORT LABOUR FORCE PARTICIPATION RATE BY GENDER

Assuming the labour participation rate remains the same as in 2019, we determine the labour force participation rates at two levels. First, as depicted in equation (a), we calculate labour force participation by gender for all years in our dataset. Second, we calculate age cohort-wise labour force participation rate by gender for all the years in consideration.

(a)

$$Labour\ force_{k} = \underline{s}_{k} P_{k,15-69} \sum_{x=15-19}^{X=65-69} nb_{k,x} n\omega_{k,x}$$

(b)

$$Labour\ force_{k,x} = \underline{s}_{k}\, P_{k,15-69}\, nb_{k,x}$$

Where $\underline{s}_{k}$ = average of labour force participation rate by gender,

$P_{k,15-69}$ = the total workingage population,

$$nb_{k,x} = \frac{ns^{2}_{k,x}}{\underline{s}_{k}}$$

$$n\omega_{k,x} = \frac{P_{k,x}}{P_{k,15-69}}$$ represents the weight of the population.

To forecast these rates for the period from 2021 to 2030, we estimate the average value of theprevious three years to calculate $nb_{k,x}$(for instance, $nb_{k,x}$ for the year 2021 is an average of the years 2018, 2019, and 2020) and $n\omega_{k,x}$ from population predictions to estimate $\underline{s}_k$, $ns_{k,x}$, and $T(t)$. Similarly, $\underline{s}_k$ estimates for the years 2021 to 2030 are calculated as an average of the previous three years. Subsequently, based on $\bar{ns}^{-1}_{k,x}$, $ns^{2}_{k,x}(t)$, $\bar{r}$ and $P_{k,x}(t)$ we forecast human capital for the period from 2021 to 2030.

## 3. ADJUSTMENT OF HUMAN CAPITAL ESTIMATES TILL 2030 ASSUMING A COUNTRY-WIDE IMPLEMENTATION OF SEL INTERVENTION

The potential human capital after implementing nation-wide SEL interventions can be estimatedusing the following equation:

(5)

$$HCW(t) = e^{(Edu*(t)\cdot\rho)} \cdot P_{5+Edu*(t)} \cdot \int_0^{T(t)} \bar{r} \cdot e^{-\delta \cdot t} \, dt$$

We estimate the impact of SEL on human capital by calculating the change in educational attainment. Since SEL interventions have been proven to result in additional graduates to a smaller extent in the immediate period and to a larger extent over time, we consider the impact of an intervention this year on enrolment rates the next year. In the first period$(t + n)$, we consider only the first cohort of the 15-year age group, anticipating additional graduates due to the implementation of SEL. In the second period $(t + 2n)$, we propose that, besides the additional graduates for the 15-year age group due to SEL interventions, the increase in graduates in the preceding period would boost the progress rate of students from one age group to the next, thus increasing the number of additional graduates for the 16-year age cohort; this will go on until the students graduate from an undergraduate programme at a university. Consequently:

(7)

$$ns^{*1}_{k,16}(t + 2n) = n\bar{s}^{1}_{k,16}(t + n)(1 + Additional\ graduates * Progress\ rate)$$

(8)

$$ns^{*1}_{k,17}(t + 2n) = n\bar{s}^{1}_{k,17}(t + n)(1 + Additional\ Graduates * Progress\ rate)$$

And so on.

With $ns^{*1}_{k,16}(t+n)$ = school enrolment rate for the 16-age cohort for gender k in the BAU scenario

$ns^{*1}_{k,16}(t+2n)$ = school enrolment rate for the 16-age cohort for gender k, in the scenario where SEL is introduced in the first period

$$\textbf{Progress rate} = \frac{Number\ of\ students\ in\ a\ particular\ age\ group}{Number\ of\ students\ in\ the\ previous\ age\ group} * Survival\ rate$$

By substituting $ns^{*1}_{k,x}$ into the calculation of Edu* in equation (5), we estimate the SEL-adjusted human capital projection $HC^*(t)$ for the period 2021– 2030. The potential SEL benefit to human capital can then be obtained by deducting the original $HC(t)$ from this projection.

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# KEY TERMS

**Gross domestic product:** the market value of all final goods and services produced within an economy within a year.

**Human capital:** the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being.

**Human Development Index:** a measure of development designed by the United Nations Development Programme that combines indicators of life expectancy, educational attainment, and income.

**Inclusive wealth:** measure of a society's productive base based on capital assets such as produced, human and natural capital.

**Natural capital:** everything in nature capable of providing human beings with well-being, either directly or through the production process.

**Produced capital:** capital consisting of roads, buildings, ports, machinery, and equipment.

**Shadow prices:** the social value of a good or service that is not reflected in market prices.

**Social Emotional Learning:** process of developing competencies, abilities, and attitudes necessary to recognize and control emotions, develop caring and concern for others, form positive relationships, make responsible decisions and deal with challenging situations.

**Sustainable development:** development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

**System of National Accounts:** internationally agreed-upon standard statistical framework that provides a comprehensive, consistent, and flexible set of macroeconomic accounts suitable for measuring, monitoring, and analyzing the economy and its constituents, to assist national policy planning processes.

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The basic premise of the inclusive wealth index is that three essential capitals, namely human capital, natural capital and produced capital describe the inclusive wealth of a country. Past IWR reports have estimated human capital to be nearly 60% of most countries' inclusive wealth. However, human capital, as it is now computed, cannot be limited to economic productivity, alone. It must also measure human well-being. Accumulating research shows human well-being can be cultivated through social emotional skills. The main objective of the special issue of the IWR 2024 is to account for Social and Emotional Capital as part of the human capital component of inclusive wealth and estimate its contribution to overall inclusive wealth. This is achieved by studying the impact of Social Emotional Learning (SEL) interventions, implemented under different scenarios, on human capital.

This report draws from recent literature in educational psychology and neurosciences to demonstrate why SEL in education is critical to building the human capital of a country and its role in ensuring the sustainability of societies worldwide. This report provides an empirical basis for incorporating SEL within school curricula at the country level and strives to initiate a discussion on establishing and improving the quantitative measurement of the impact of SEL interventions on human capital.

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