

SEPTEMBER 2023 Peru SDG Push

Consolidated Report



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Executive summary

Peru's convergence with high-income levels has accelerated in the last two decades with an annual average growth rate of around 5 percent, one of the highest in the Latin America and Caribbean (LAC) region. This has supported a dynamic economy and has resulted in better living conditions for the population. While the emergence of a middle-class has been one of Peru's greatest socio-economic achievements, it has also brought a whole set of new challenges. The country has been stuck in a « middle-income trap » requiring long-term structural reforms that transcend any robust macroeconomic performance. In fact, new vulnerabilities have emerged, which has meant that an increasing percentage of the population is vulnerable. In fact, the vulnerable population represented the largest socio-economic group in the country (Organisation for Economic Co-operation and Development (OECD), 2019) making them particularly sensitive to external shocks/events. The implication is that they could easily fall back into poverty following any turbulence or economic slowdown, or as a consequence of any setback in the household due to a job loss, health problems, or other issues.

The outbreak of the COVID-19 pandemic pushed the Peruvian economy into a recession in 2020 with the economy contracting by about 12 percent. The downward trends experienced during the economic recession have not occurred in Peru since the economic crisis of the 1980s (Boloña, 1993). Neither the 1998-1999 recession nor the 2008-2009 slowdown involved a crisis of such magnitude. These crises have amplified Peru's development challenges, that of poverty, inequality and poor access to basic services. For instance, due to COVID-19, in 2021 two Peruvians in five were at risk of falling into poverty, the highest rate since 2004. This high rate of vulnerability has resulted in the loss of a decade of social progress (World Bank, 2023).

To address these challenges and achieve the Sustainable Development Goals (SDGs), the adoption of an evidence-based approach is crucial to identify key areas of intervention that can drive SDG progress in the country.

The SDG Push, led by the Government of Peru, plays a critical role in implementing the SDGs. It follows a structured approach to identifying accelerators by utilizing various integrated elements. These are as follows:

- Scoping examines specific contexts and trends with data visualization via the SDG Push Diagnostic which establishes a rapid landscape of trends, current priorities, futures and interlinkages.
- Acceleration dialogues leverage sensemaking protocols to explore scoping outcomes, question previous policies and chart accelerators.
- Modelling engages new forms of participatory and economic modelling to assess the impact of potential accelerators.
- Sustainable finance estimates financing requirements and the feasibility of potential accelerators. It uses SDG finance tools, including the Integrated National Financing Framework.
- Acceleration pathways integrate insights developed through this approach with data visualizations and recommendations to advance policy interventions.

The Government of Peru invested significant time in the scoping phase, updating data on SDG trends visualized in the <u>SDG Push Di-</u> <u>agnostic</u>. It has contributed to improving the insights from the diagnostic and to building a common understanding of gaps and challenges ahead of acceleration dialogues. The main outcome of the scoping phase was the prioritization of the SDGs, with significant synergy effects on other SDGs, that Peru should pursue to advance progress on the SDGs.

Building on the outcomes of the scoping phase, acceleration dialogues interrogated the SDGs that had been prioritized further to identifying potential policy actions that could be pursued to promote progress. Through the acceleration dialogues, which were primary stakeholder consultations, a plethora of policy interventions were proposed. These policy proposals were synthesized using sensing-making protocols to identify SDG Accelerators – i.e. specific policy actions – that the government could implement.

The proposed SDG Accelerators, together with a business as usual (BAU) scenario, were the main inputs into the modelling phase of the SDG Push exercise. Under the modelling phase, an economic modelling framework that combined a dynamic Computable General Equilibrium (CGE) model with a Micro-Simulation (MS) model was used.

As suggested by the Scoping Note, SDG Push dialogues and the main drivers for achieving the SDG targets include investment in infrastructure, education and health; increasing the efficiency of public expenditure on health and education; and reducing the costs of doing business. These drivers are expected to contribute to the end goals of eliminating hunger and malnutrition, ensuring quality education and achieving more inclusive economic growth, among other objectives. The SDG Push exercise contributes to understanding both short- and long-term structural transformations by building a baseline scenario using the Computable General Equilibrium (CGE) model (SDG Push), which provides projections up to 2030. Additionally, six articulated scenarios are identified through dialogues and evidence gathered during the scoping phase. Based on a dynamic computable general equilibrium model, the modelling exercise evaluates the impact on selected SDG indicators that are directly and indirectly affected.

Five scenarios were examined, in addition to the baseline scenarios. Each one contains a different combination of public spending on education, health, infrastructure, increased efficiency of public spending and a reduction in the costs of doing business under government projections and the SDG Push scenario.

Under BAU, the country will make little or no progress in achieving several SDGs. By 2030, only 27.24 percent of students will achieve a satisfactory level in maths in the student census assessment, an increase of 10 percentage points from the baseline (2021). Productivity growth will be limited to 1.4 percent allowing a limited share of manufacturing in total GDP, a GDP growth rate of 2.9 percent, which is well below the 7 percent target. Furthermore, we note that informality would remain high if no action is taken in terms of attracting investment. In fact, by 2030, almost 74.4 percent of jobs will come from the informal sector (76.8 percent at baseline), while the poverty rate would be around 18.7 percent, an important but small change from 25.9 percent in 2021.

An overview of government projections shows that the country would move forward in reducing malnutrition but register limited progress in economic growth (3.6 percent), educational outcomes, productivity growth and poverty. For example, the report found that the prevalence of malnutrition in children under 5 years would tend to zero while the percentage of students achieving a satisfactory level in maths would reach 43.0 percent by 2030, an important but moderate change from the baseline (17 percent); and the poverty rate would approximate 17.7 percent. Therefore additional efforts are needed to fully achieve the targets in terms of poverty reduction, educational outcomes and economic growth.

Investments made within the SDG Push scenarios will help the country achieve several SDGs related to education, health, economic growth and poverty reduction, which are among the top priorities of the country's development strategy. According to this scenario, by 2030, poverty will decline to 12.6 percent, i.e. this is 50 percent lower than the reference value (25.9 percent), economic growth will stand at 6.4 percent per year and annual productivity growth will exceed 4 percent (on average) leading to lower unemployment and underemployment. The prevalence of malnutrition will tend towards zero, and the country will see a greater improvement in educational performance (100 percent).

Under the SDG Push framework public investments in infrastructure (transportation, energy, telecommunication) have a higher macroeconomic and social impact because of positive externalities on private output. Higher efficiency in public sectors under the SDG Push framework frees public resources that can then be used to fund additional investments. As a result, the country will experience higher economic and productivity growth, a decrease in unemployment and poverty reduction.

To achieve these outcomes, the additional annual cost would average 1 percent of GDP. Therefore, over the 2023-2030 period, Peru would need approximately S/13 billion to achieve the progress indicated under the SDG Push interventions.

Introduction

The SDG Push framework is a set of comprehensive and country-specific tools developed by the United Nations Development Programme (UNDP) to accelerate progress towards achieving the SDGs. The framework aims to reimagine and recalibrate how development interventions are planned and implemented to create meaningful progress in sustainable development. The framework is designed to adapt to the unique challenges and opportunities each country faces. It considers individual countries' specific contexts, priorities and development trajectories. It allows for addressing various constraints and issues countries face to achieve the SDGs.

The framework combines the power of data, state of the art modelling and finance to enhance the effectiveness of development interventions. By leveraging data and evidence-based approaches, fostering innovation and mobilizing financial resources, the SDG Push framework seeks to make interventions more impactful. The SDG Push framework recognizes the importance of a participatory approach, i.e. of collaboration and partnerships, in achieving the SDGs. It aims to bring together various stakeholders, including governments, civil society organizations, private sector entities, and international agencies, to work collectively towards common goals. The ultimate goal of the SDG Push framework is to expedite the progress toward achieving the SDGs by providing countries with a comprehensive toolkit and support. It aims to accelerate positive outcomes and to make a tangible difference in sustainable development.

This report synthesises the main findings of different stages of the SDG Push Framework in Peru. Doing so provides information and analysis of the country's context and development priorities. It summarizes the outcomes of the multistakeholder dialogues which question acceleration options that inform the modelling phase, which in turn provide inputs into the financing aspect of the exercise. Together these parts contribute to the final component termed Acceleration Pathways.

Snapshot of socio-economic and environmental challenges in Peru

The implementation of sound macroeconomic policies in the 1990s, both at monetary and fiscal levels, helped to boost investment and to improve consumer confidence, making the Peruvian economy attractive and dynamic. The combination of favourable external economic conditions and assertive internal policies has underpinned Peru's robust economic growth since the beginning of the 21st century, reaching an annual average GDP growth rate of around 5.0 percent in that period. Significant reductions in the poverty rates and the emergence of the middle-class were among the most outstanding achievements in the last decade (OECD, 2019). In 2005, only around 15 percent of the population was considered part of the middle-class (daily income of US\$13-70/day, 2011 PPP). This percentage rose to 34.3 percent of the population in 2016, on a par with the LAC average of 35.3 percent (OECD, 2019).

Additionally, Peru's growth has been strongly pro-poor. In the past few decades, the country has been particularly successful in lifting people out of poverty. The poverty rate has almost halved, from 46.7 percent in 2006 to 24.6 percent in 2016.

Yet, significant economic vulnerabilities remain, namely those associated with the development traps (OECD/Development Bank of Latin America and the Caribbean (CAF)/ United Nations Economic Commission for Latin America and the Caribbean (ECLAC)/ European Union (EU), 2019). The Peruvian economy is poorly diversified, with a heavy reliance on natural resources that makes it heavily dependent on external macroeconomic conditions. In the past, Peru profited from the boom in commodity prices and from a positive global economic landscape. Today, the country must overcome low productivity growth, which is already translating into a prolonged economic slowdown, often known as the middle-income trap.

Additionally, socio-economic gains remain unevenly distributed and the country requires better institutional development. Inequalities are still high, and vulnerabilities are significant for a sizeable share of the population. In fact, many Peruvians still suffer from poor access to quality public services. Although access to a basic package of piped water, sanitation, electricity and the internet has doubled in the past decade, fewer than half the households have maintained such access. Moreover, geographical disparities in access to basic services are significant. More than half of urban households have access to the basic package, but only 6 percent of rural households enjoy access (World Bank, 2023).

The Peruvian economy is characterized by excessive informality given the country's GDP composition compared with other upper-middle-income countries. Informality has remained high throughout the past two decades, reaching the highest level during the pandemic. Labour productivity is low and has been stagnant for years. The high rate of informality affects the capacity of the government to collect revenue because of the narrow tax base and inefficient tax collection. As a result, many continue to face the risks associated with low levels of social protection as the transfer system has limited capacity for redistribution due to excessive reliance on regressive indirect taxes and leakages in social transfers.

Furthermore, the country requires stronger institutional capacities to improve the effectiveness of public policies and to achieve higher state legitimacy, which is critical to strengthen the social contract and to bridge the growing divide between citizens and institutions.

Peru was one of the countries most affected by the COVID-19 pandemic in terms of health and economic impacts and by the erosion of the social gains achieved in the previous decade. The economy contracted by 11 percent in 2020, its biggest decline in 30 years and the largest in Latin America in that year. As a result, the national poverty rate increased to 30.1 percent, a level not witnessed since 2010, and extreme poverty reached 5.1 percent in 2020, comparable with the rate in 2013.

By the end of 2021, the economy had recovered, but poverty and extreme poverty remained on a par with 2012 and 2015 levels. Although the trend toward the urbanization of poverty preceded the pandemic, the crisis accelerated the process. From 2013 onward, the share of the poor living in urban areas exceeded 50 percent. By 2019, urban areas were accounting for 56.7 percent of the total poor, and as a result of the pandemic the proportion rose to 68.7 percent in 2021. (World Bank, 2023).

The crisis has also intensified persistent territorial inequalities and disparities in access to productive assets and public services by minorities, women, indigenous peoples and Afro-Peruvians. Peru's indigenous and Afro-Peruvian populations have few productive assets, limiting their capacity to become productive workers. Their educational attainment is relatively lower; they have less access to the internet, electricity and financial services; and they are overrepresented in informal and self-employed jobs. Since 2016, because of the political crisis, the country has had six presidents, the political environment and the prospects for stable and sustainable governance have deteriorated and economic performance and the foundations for investments have weakened. The governance crisis and the losses caused by the pandemic have set the stage for popular discontent: social gaps have become persistent and political institutions are considered to have become blind to the country's needs. These problems have disproportionately affected the poor and most vulnerable.

Apart from socio-economic and institutional challenges, Peru is particularly exposed to natural shocks because of its location and topology, and its exposure to climate risk has increased over the past two decades, thus leaving poor and the most vulnerable disproportionally more exposed to natural disasters. In fact, the National Service of Meteorology and Hydrology of Peru estimates that by 2050 the amount of precipitation will decline by as much as 40 percent in some areas of the country. Similarly, the temperature is expected to rise by as much as 3.5°C. The sharpest increases in temperature and reductions in rainfall are expected to occur in districts with larger shares of the poor and vulnerable population.

Initial phase - scoping

The scoping note represented the initial step in the formation of Peru's SDG Push framework. To provide the Peruvian Government with a high-level overview of the development context and the challenges it faces, the first stage involved reviewing existing strategic policy and planning documents. This comprehensive examination of national development plans and strategies was crucial for gaining insights into the country's socio-economic, institutional and environmental landscape. It allowed for the identification of gaps in SDG attainment, for the assessment of progress toward SDGs and for pinpointing of potential interventions to expedite the achievement of the SDG 2030 Agenda. Furthermore, during the initial phase of developing the SDG Push framework, particular attention was accorded to assessing data availability, disaggregation and consistency in long-term monitoring. This emphasis on data is critical because having access to reliable and accurate data is essential for accurately identifying gaps in the SDGs' progress and for charting development pathways that can accelerate progress toward their attainment.

In the Peruvian case, the SDGs are linked to the axes of government policies developed by the National Agreement and are taken into account – but not incorporated – in the strategic development plans at the different levels of government, national policies, multiannual sectoral plans and in the different general government policies. In the Peruvian context, public policies are divided into the following categories:

- State policies: these define the general guidelines that guide the actions of the State in the long term in order to achieve the welfare of citizens and the sustainable development of the country.
- General Government Policy: this is the set of prioritized policies that are developed through national policies during a period of government.
- National Policies: these constitute policy decisions through which a set of objectives and actions are prioritized to solve a certain public problem of national and sectoral or multisectoral scope in a period of time.

State policies are grouped into four main spheres: (i) strengthening democracy and the rule of law; (ii) development with equity and social justice; (iii) promoting the country's competitiveness; and (iv) affirming an efficient, transparent and decentralized State. From these 4 spheres 35 state policies emerge. These are set out in Table 1.

Table 1. National Agreement: State objectives and policies

STATE OBJECTIVES	POLICIES
Strengthening Democracy and the Rule of Law	 Strengthening democratic rule and the rule of law Democratization of political life and strengthening of the party system Affirmation of national identity Institutionalization of dialogue and consultation Governance based on objectives with strategic planning, national foresight and transparent procedures Foreign policy for peace, democracy, development and integration Eradication of violence and strengthening of citizenship and citizen security Political, economic and administrative decentralization to promote the integral, harmonious and sustained development of Peru National Security Policy
Development with Equity and Social Justice	 Poverty reduction Promotion of equal opportunities without discrimination Universal access to free and quality public education and promotion and defense of culture and sport Universal access to health services and social security Access to full, dignified and productive employment Promoting food security and nutrition Strengthening the family, promotion and protection of children, adolescents and youth
Promotion of the Competitiveness of the Country	 Affirmation of the social market economy Search for competitiveness, productivity and formalization of economic activity Sustainable development and environmental management Development of science and technology Infrastructure development and housing Agricultural and rural development policy Foreign trade policy for the expansion of markets with reciprocity
Affirmation of an Efficient, Transparent and Decentralized State	 Affirmation of an efficient and transparent State Caution of the institution of the Armed Forces and their service to democracy Promotion of ethics and transparency and eradication of corruption, money laundering, tax evasion and smuggling in all its forms Eradication of illegal drug production, trafficking and consumption Full validity of the Constitution and human rights and access to justice and judicial independence Access to information, freedom of expression and freedom of the press Elimination of terrorism and affirmation of National Reconciliation Fiscal sustainability and reducing the debt burden Disaster risk management State policy on water resources

As part of the National Agreement, the Peru' National Development Vision 2050 was approvedwhose details and alignment with the SDGs is provided in Table 2. In addition, the National Agreement in session 131 agreed on six issues of national priority for the five-year period 2021-2026, namely health, education, the fight against poverty and extreme poverty, sustainable economic growth with decent employment, political reform and reform of the judicial administrative system.

Table 2. Alignment of Vision 2050, 5 pillars of SDG 2030 Agenda and SDGs

AXIS VISION 2050 PERU	AGENDA 2030	ODS
People reach their potential in equal opportunities and without discrimination to enjoy a full life	People	1, 2, 3, 4, 5 and 10
Sustainable nature management and climate change measures	Planet	6, 10, 12, 13, 14 and 15
Sustainable development with decent employment in harmony with nature	Prosperity	7,8,9,10 and 11
Democratic, peaceful society, respectful of human rights and free from fear and violence	Peace	10 and 16
Modern, efficient, transparent and decentralized state that guarantees a fair and inclusive society, without corruption and leaving no one behind	Alliances	10, 16, 17

The General Government Policy 2021-2026 contains axes, priority guidelines and lines of intervention aimed at the development and updating of national policies, plans and government interventions and are in accordance with state policies, the strategic national development plan, the Peru Vision 2050 and the SDGs:

- 1. Generation of welfare and social protection with food security.
- 2. Economic revival and productive activities with agrarian and rural development.
- 3. Promotion of science, technology and innovation.
- 4. Strengthening of the educational system and learning recovery.
- 5. Decentralization, institutional and civil service strengthening.
- Strengthening the democratic system, public security and the fight against corruption, drug trafficking and terrorism.
- 7. Efficient management of risks and threats to the rights of people and their environment.
- 8. Governance and digital transformation with equity.
- 9. Conduct of a national, autonomous, democratic, social and decentralized diplomacy.
- 10. Intercultural State for the promotion of cultural diversity

Thus, the framework for the development of the implementation of the Sustainable Development Goals is given by the Political Constitution of Peru, the State Policies of the National Agreement, the National Vision to 2050, the National Development Plan proposed to 2050 and is implemented through the different general government policies.

An integral aspect of the scoping process is the utilization of the SDG Push Diagnostic Simulator, which leverages sophisticated machine learning techniques to detect disparities in SDG advancement on a national scale. Moreover, it undertakes a preliminary, in-depth examination of accessible national data and knowledge reservoirs to pinpoint areas of paramount importance for national development.

Based on the diagnostic simulator it was possible to assess the progress Peru has made in attaining distinct SDG targets, systematically organized in accordance with the five Ps of sustainable development: People (comprising 47 targets), Peace (encompassing 12 targets), Planet (encompassing 46 targets), Prosperity (encompassing 45 targets) and Partnership (comprising 19 targets). As illustrated below, countries' national priorities are generated using machine learning in a process that reveals the most salient SDGs referenced in national policy documents.

Assessing 9 strategic documents (Política Nacional de Desarrollo Industrial; Política Nacional de Desarrollo e Inclusión Social al 2030; Informe de Análisis Prospectivo (2021-2022); Visión del Perú al 2050; Políticas de Estado 2019; Política Nacional de Empleo Decente; Políticas Generales de Gobierno 2023; Política Nacional de Igualdad de Género; Política Nacional de Productividad y Competitividad) – SDGs 16, 8, 9 and 11 seem to be the most prominent goals.

Figure 1. SDGs with the highest priorities



In addition, mapping SDG priorities to current SDG progress identified in trend analysis helps us to understand which SDGs are off-track, but potentially a low/high priority in national documents, thus providing an insightful starting point for national dialogues. For instance, SDG 16 has been identified as "for review" and ranks very high in national development documents together with SDG 8 (see Figure 2).



Figure 2. Matrix comparing SDG national priorities based on national development documents and SDG gaps, according to the Diagnostic Simulator Platform Additionally, SDGs 1, 3, 4, 5, 9 and 10 are of medium priority, based on the machine learning analysis, and they are also classified as SDGs that will miss the 2030 targets by a small margin if the current trend in the trajectory continues. Moreover, SDG 2 is also identified as slightly off track but is classified as low priority based on the results of the analysis.

There are potentially a large number of synergies and complementarities among the different SDGs and targets. But there are also a number of negative trade-offs with regards to specific SDGs that are conversely interrelated. The SDG Diagnostic Simulator has highlighted and visualized specific SDG targets with the most synergies and interlinkages with other SDG targets.

Through the analysis of synergies and tradeoffs, more than 70 synergy links with other targets, shared across all SDGs, have been found for indicator 16.6 which is identified as one of the priorities in the SDG Diagnostic Simulator. Target 16.6 has multiple potential multiplier effects across several SDGs and targets that are relevant to Peru, cutting across other high priority development areas, such as decent work and economic growth.

For Peru, investing in institutions must be accompanied with advancing implementation capacity and citizen engagement as a way to decrease informality and reach vulnerable populations with public services effectively. Improving institutional capacity could also lead to progress on zero hunger (target 2.2), on affordable and clean energy (targets 7.1 and 7.2), as well as to promoting inclusive and sustainable industrialization (target 9.2). Furthermore, having more efficient institutions will improve the quality of expenditures which in turn may have a positive effect on Peruvian lower productivity rates, (Peru currently has over 2,300 paralyzed public works for the equivalent of \$11.3 billions and an estimated of \$7 billions in investments to implement).

In addition, Peru is one of the LAC countries with the highest level of labour informality (above 78 percent according to the latest data). Thus advancing in decent work and productivity (SDG target 8.5) could have positive impacts on several areas of development and help advance many SDGs.

By investing in initiatives to advance on SDG 8.5, Peru can jointly address employment challenges, while also helping to close the gaps on poverty, health, well-being and inequality target indicators. The government considers all these as development priority areas. Making progress on formalization could also help to increase the tax base and improve coverage of social protection systems. Policies and reforms need to take into account the behavioural aspects and incentives that workers face when deciding between the formal and the informal sectors.

Despite progress in some dimensions, poverty remains a significant issue in Peru, with 27.5 percent of the population living below the poverty line in 2022. With the COVID-19 pandemic further exacerbating these challenges and disproportionately affecting the most vulnerable populations (e.g. indigenous people and people living in rural areas). It has been estimated that 7 in 10 Peruvians are either poor or vulnerable (World Bank, 2023).

Recent climate-related events have also demonstrated the high level of vulnerability and low coping capacity that vulnerable populations have in Peru. Thus investing in building resilience could both help the poor and vulnerable and have positive impacts on other priority areas, such as industry, innovation and infrastructure (SDG 9), and on productivity through education and overall economic growth (SDGs 4 and 8). Beyond providing a clear view of the development priorities and the SDGs' status in Peru, the scoping phase also helped to identify some initial challenges that needed to be addressed during the rest of the implementation. First, the continuous political turmoil led the bureaucracy to focus on short-term development issues, prioritizing the current situation, omitting the medium and long-term development strategy, which is what the SDG Push aims at supporting.

Secondly, Peru's complex development planning institutional infrastructure and the absence of an institutionalized governance mechanism for the SDGs made it challenging to assess the alignment of national priorities to the SDGs, which was key for the next steps of the SDG Push.

Moreover, the scoping phase identified the lack of a clear governance structure in charge of the SDGs. In Peru different entities have assumed responsibility for the implementation of the 2030 Agenda for Sustainable Development. CEPLAN, the National Centre for Strategic Planning, is responsible for the preparation of the Voluntary National Review (VNR), the National Institute of Statistics and Informatics manages the system for monitoring and follow-up of the indicators of the SDGs, and the Ministry of Foreign Affairs coordinates the support from the United Nations system. However, no entity has been designated as the SDG coordinator, instead responsibility has been assigned to an existing entity, or special commissions have been established.

Multi-stakeholder dialogues

Part of the SDG Push process is the incorporation of a series of systemic and multi-stakeholder dialogues. The UNDP SDG Push Dialogue in Peru was held from 28-29 September 2022. For Peru, eight development priorities were identified and became the primary subjects for phase 2. These were: (i) poverty; (ii) security; (iii) rural and agricultural development; (iv) public administration efficiency; (v) risk and disaster management; (vi) infrastructure and housing; (vii) access to health services; and (viii) access to quality education. These priorities were then mapped to SDGs 1, 2, 3, 4, 9, 11 and 16.

During the multi-stakeholder dialogues, participants were encouraged to collectively understand the strengths (what is working), gaps (what needs attention), trends (what are emerging risks and opportunities) and interlinkages (interconnection of issues, solutions and SDG indicators), and to then identify intervention points and optimal acceleration pathways.

The Sense-making and Accelerating Protocol methodology, initially prepared for the development dialogues, consisted of a series of exercises to discuss and prioritize development areas and specific policies based on what emerged from the scoping phase.

The dialogues were structured as a two-stage process, starting with 1.5-day in-person workshop, and finishing with a one-day virtual event. In between these stages a survey was conducted with all participants of the first dialogues to narrow down the interventions initially identified to feed the second part of the dialogues. In the initial phase of the dialogues, over 45 participants from civil society, academia, government and the UN system gathered to deliberate development priorities, the SDGs and necessary reforms. The workshop featured a diverse range of exercises with the overarching aim of aiding participants in understanding essential information and encouraging initial group interactions.

Subsequently, the participants engaged in a discussion designed to validate the list of primary priorities. These dialogues also entailed a comprehensive review of the content outlined during the scoping phase, serving a dual purpose: a) the participants were provided with an additional opportunity to absorb the information from the scoping note; and b) any emerging trends on the relative significance of each priority were identified.

Building on the session, a concise overview of the SDGs and the 2030 Agenda was presented, serving as a preparatory step that greatly assisted participants in grasping how Peru's crucial intersections and complex interrelationships could be identified (see Box 1). Following this, CEPLAN delivered a presentation on trends and horizon mapping, setting the stage for subsequent exercises in this area. During these exercises, participants took an active role in envisioning the future, mapping out the key trends likely to influence Peru's development path over the next 5-10 years.

Between phases 1 and 2 of the dialogues, a survey was prepared and administered to all participants involved in them, the aim being to create a series of interventions aligned with the SDGs and thematic priorities. This survey was thoughtfully structured into three sections: the prioritization of the SDGs, the delineation of primary subjects linked to the designated SDGs and the ranking of public policy interventions.

Box 1: Leverage points identified for Peru

- **1.2** By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
- 10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion, or economic or other status
- **10.1** By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average
- **1.5** By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
- 8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, attain at least 7 per cent gross domestic product growth per annum in least developed countries
- 3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and wellbeing
- 2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
- **10.3** Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and by promoting appropriate legislation, policies and actions in that regard

The second phase of the Development Dialogues was strategically centred on two key objectives: validating previously identified potential accelerators through collaborative work within small groups and discovering new interventions with active participation from attendees. Simultaneously, this phase aimed to collect detailed information about these interventions. This phase focused on five main spheres: (i) Poverty alleviation; (ii) Health care service provision;(iii) Advancement of education; (iv) Promotion of economic growth; and (v) Enhancement of government transparency and effectiveness. The participants were organized into groups based on their expertise and affiliations and tasked with gathering policy insights within these specific domains.

Each group then compiled a comprehensive dossier containing intricate details related to their respective interventions.

The SDG Push initiative in Peru has proven to be a valuable tool used to identify accelerator pathways to sustainable development. The evidence produced during this process has been useful for government counterparts when preparing sectoral plans and having policy discussions across different development areas. The systems lens through which development was analysed during the SDG Push has been embraced by sectoral ministries and planning entities in Peru.

Modelling phase

In order for the government and policymakers to gain insight into how interventions in specific areas can influence the desired targets, it is crucial to employ a comprehensive and systematic framework that analyses the entire economy. This framework takes into account the intricate connections among various sectors, industries and stakeholders. Such an approach enables a more holistic examination of how the economy responds to different policy measures, facilitating well-informed decision-making and the development of policies that have a higher likelihood of achieving the desired economic outcomes.

The SDG Push initiative utilizes a CGE model to assess the potential impacts of these drivers and interventions. This model serves as a foundation for advocating policy interventions and assisting policymakers in comprehending the potential effects on specific sectors of the economy. Its primary advantage lies in its flexibility, as it delves into the structure and nuances of behaviour exhibited by different agents in the economy, allowing for the capture of intricate economic relationships and connections that might be overlooked by other models. This complexity equips the model to handle a broad spectrum of "what if" scenarios.

The model establishes a baseline scenario and projects its outcomes up to 2030. Furthermore, it uses six distinct scenarios identified through dialogues and evidence gathering during the scoping phase. The CGE model then assesses the impact of these scenarios on selected SDG indicators, taking into consideration their wide-ranging effects on the economy as a whole. Based on identified priorities in the scoping phase, further validated by the Dialogue, the following main drivers of the SDG targets were recommended: investment in infrastructure, education and health; increasing the efficiency of public expenditure on health and education; and reducing the costs of doing business. These drivers are envisaged to contribute to the end goals of eliminating hunger and malnutrition, providing quality education and achieving more inclusive economic growth, among others.

The aim is to quantify the impact of policy scenarios on the SDG indicators, and thus to assess the efforts the country needs to mobilize to achieve specific targets. To this end, a CGE modeling combined with an econometric microsimulation model has been developed. The CGE model is calibrated using a country-specific social accounting matrix (SAM) that captures the recent structure of the economy and elasticity parameters drawn from the relevant literature. The framework we have developed differs from the standard CGE model in that it includes features that are essential to the policy scenarios of interest.

The next section describes the methodology and data, section 5.2 presents the scenarios, section 5.3 highlights the results and the final section draws conclusions and key messages.

Methodology and data

Macro-Micro modelling for Infrastructure policy analysis

In this approach (Figure 3), first, the entry point is the macro model where the policy shock is introduced in the sectors of interest. Secondly, the outcomes from macro analysis are introduced in the micro model to gauge the impact of macro policy on social outcomes, such as poverty, malnutrition, and education. Thirdly, the outcomes from micro analysis are used to assess the changes in labour productivity, which are then fed back into the macro model.

The approach presented in Figure 3 is implemented with one iteration.





Micro-macro modelling for education and health policy analysis

In this approach (Figure 4), first, the entry point is the micro model where the policy shock is introduced. Secondly, the outcomes from micro analysis are then used to assess the changes in labour productivity, which are then fed into the macro model to explore the economic impacts.

The approach presented in Figure 4 is implemented with one iteration. The components of the macro-micro/micro-macro modelling are presented below.

CGE model

Our CGE is based on the dynamic recursive PEP model (PEP-1-t, Decaluwé et al, 2013) 3. The production nest is a Leontief aggregation of value added and the intermediate bundle. Value added is in turn a Cobb Douglas aggregation of capital and labour. Standard assumptions about utility maximization are taken into account, and household demand is modeled by the Linear Expenditure System. Household income includes income derived from factors of production (capital and labour) and from government transfers. Household disposable income is obtained by deducting savings and direct taxes from income.

In the general government account, expenditure comprises consumption of goods and services, and transfers to households and the rest of the world. Revenues are made up of taxes and income from companies and the rest of the world. The difference between government expenditure and revenue is government savings, which are determined endogenously in the model.

As in a typical CGE model, imperfect substitution is assumed between domestic and foreign goods. On the import side, the Armington function is used to capture the potential for substitution between domestic and imported goods in response to changes in relative prices. On the export side, the constant elasticity of transformation (CET) function is used to capture substitution possibilities between domestic and foreign sales.

Figure 4. Representation of macro-micro model for education and health



Market equilibrium is achieved by equalizing demand and supply through price adjustments on the commodity, factor and currency markets. In terms of macroeconomic closure, aggregate capital is fixed and fully employed, while a wage curve is used to model employment, implying the possibility of unemployment. Foreign savings are fixed and the exchange rate is flexible. In addition, public consumption is fixed and direct and indirect tax rates are fixed. The household savings rate is also assumed to be constant. The price index is considered as numeraire.

The dynamic of the model relies on capital accumulation, labour supply growth, public expenditure growth and total factor growth.

We extended the above model to analyse policy interventions related to infrastructure (transport, energy and telecommunications). The model's extensions are discussed below.

Infrastructure: Transportation, Energy and Telecommunications

Theoretically, the supply-side effects of infrastructure investment stem from two potential mechanisms: i) greater investment in infrastructure (transport energy and telecommunication sectors) means higher capital accumulation and production; consequently, the infrastructure sector is likely to increase its demand for inputs (supplied by other sectors); ii) the induced increase in infrastructure production can lead to lower costs for transport and energy services, positively affecting the output of sectors that use these goods as inputs.

Following Cetin (2022), Montaud et al. (2020) and Boccanfuso et al. (2014), we include the externality function $(\theta^{inf}_{j,l})$ in the production function to capture the impact of public investment in infrastructure on private output.

$$VA_{j,t} = \theta_{j,t}^{inf} f(LDC, KDC)$$

F(.) is the Cobb Douglas function of composite labour and capital.

$$\theta_{j,t}^{inf} = \left(\frac{KD_{inf,t}}{KD_{inf,t-1}}\right)^{\xi_{inf,j}}$$

 ξ_{infj} represents the elasticity of externality to public investment in infrastructure. We use the values from Montaud et al (2020).

Wage curve

To consider the existence of unemployment, we introduce a wage curve (Blanchflower and Oswald, 1994) as follows:

$$\frac{w}{pindex} = axl^{\tau}$$

 τ elasticity of real wage rate to unemployment rate; *w*, is the wage rate, *pindex* is the price index, *xl* is the unemployment rate and *a* is a parameter that is calibrated.

Micro econometric

We developed linear fixed effects panel data models for each SDG-related indicator of interest (dependent variable) to assess its determinants and to establish its direct and indirect relationship with aggregated macro and sectorial level data (See Figures 3 and 4 above). The prioritized SDG-indicators of interest are presented in Table 3.

Table 3. Priority SDG indicators

SDG GROUP	INDICATOR	DEPENDENT VARIABLE		
Reducing monetary poverty	Monetary poverty	Poverty headcount ratio at regional poverty lines		
Universal access to quality	Malnutrition	Prevalence of malnutrition among children under 5 years of age		
public health services	Anemia	Prevalence of anemia among children of 6-59 months		
Access to free quality public	Quality of education	Percentage of students who achieved a satisfactory level in maths in the Student Census Evaluation (2nd grade - Primary)		
education		Ratio of workers with completed secondary education or less		
Promoting sustainable, inclusive economic growth with decent job	Informality	Labour informality rate		
Efficient and transparent government	Efficiency of public expenditure in education	Ratio of 2nd grade students in primary who achieved a satisfactory level in maths in the Student Census Evaluation, expressed as a percentage of the current expenditure of education		

Models were developed based on an exhaustive international and local literature review (See appendix B) and data availability. Following the systemic nature of SDGs, models were intertwined, expressing the theoretical relationship amongst dependent variables (also noted in the literature review).

Panel data was the regional level for all 25 regions for the 2010 – 2021 period. All models were estimated using clustered standard errors.

$$\Upsilon_{it} = f(\mathbf{X}_{it}) + \varepsilon_{it}$$

Y is the set of dependent variables developed for each region *i* and each period *t*. *X* is the set of independent variables; ε_{it} is error term. Results can be seen in Appendix D.

Model for productivity assessment

A second critical modification to the PEP model pertains to the inclusion of a channel through which policy interventions impact the economy's productivity via the accumulation of human capital. This highlights the significance of the quality of education and health in driving economic growth and development by elevating the skills and capabilities of the future labour force. Specifically, as human capital increases, the productivity of the labour force improves leading to higher real incomes for workers. These higher standards of living, in turn, facilitate greater savings and investment in capital accumulation, fostering sustainable economic development (see Lucas, 1988).

To capture the significant influence of human capital, a satellite model was developed that specifically focused on human capital, leveraging the Human Capital Index (HCI) metric of the World Bank (see World Bank, 2018). The HCI quantitatively assesses the various stages of human capital development from birth to adulthood (18 years old). Thus it reflects the level of human capital of the next generation of workers entering the labour force. The HCI comprises three key components:

- Survival. This component measures the likelihood of a child surviving until they start the formal education process at 5 years.
- 2. School. The "School" component captures both the quantity and quality of education a child can expect to receive by the time they turn 18. The quantity of education is represented by the number of years of schooling a child is likely to complete by age 18, ranging from 1 to 14 years. The quality of education is assessed using standardized test scores obtained from major international student achievement testing programmes. These test scores, which range from approximately 300 to 600, provide a measure of the quality of education received. The HCI combines both the quantity and quality

indicators to convert the expected years of schooling into learning-adjusted years of schooling, presenting a more comprehensive view of educational attainment.

- Health. The "Health" component reflects the overall expected health of a child, which is measured through two key indicators:
 - Adult survival rates: This indicator assesses the share of 15-year-olds who are expected to survive until they reach the age of 60. It reflects the general health conditions and life expectancy of individuals in the given country.
 - Healthy growth among children under age 5: This indicator is measured by stunting rates, which assess the prevalence of stunted growth in children under 5 years. Stunting is an important indicator of early childhood malnutrition and can have long-term implications for health and cognitive development.

The HCI integrates the three components (Survival, School and Health) into a unified index:

HCI = Survival x School x Health

where:

Survival = 1- Under 5 Mortality Rate,

School = exp { ϕ (Expected years of school x Harmonized Test Score / 625 – 14) },

Health = exp {0.5 [γ (Adult Survival Rate - 1) + δ (Not Stunted Rate - 1)] }.



The aim is to measure the projected productivity of the future labour force in relation to a fully educated and healthy labour force. To achieve this, each component is transformed into a contribution to aggregate productivity by using appropriate values for ϕ , γ and δ . The formula assumes that survival has a direct and one-to-one mapping into productivity. The "School" component, which represents learning-adjusted years of schooling, is converted into productivity by considering the returns of education, which are fixed at 0.08 (φ). Similarly, the "Health" component is translated into productivity by using an elasticity of productivity to the not stunted rate of 0.35 (δ) and an elasticity of productivity to the adult survival rate of 0.65 (γ) (World Bank, 2018).

We transform the results from the econometric model into an HCI of Peru in all scenarios under study. One limitation is that the indicators from the econometric model do not exactly match the indicators included in the HCI. To overcome this limitation, we impose a set of assumptions. First, we assume that the Malnutrition Rate in the econometric model and the Not Stunted Rate in the HCI are perfectly and negatively correlated. Secondly, we link the quality of education in the econometric model, as measured by the percentage of students who achieved a satisfactory level in maths in the Student Census Evaluation, to the Harmonized Test Score in the HCI using the cross-country econometric relationship between the mean score of the 2018 PISA test maths score and the fraction of students above level 02 of achievement in the PISA maths evaluation. The rest of the variables of the HCI are left constant.

Having established the change in HCl in each scenario, the next step is to connect the HCl to future labour productivity. In doing so, we need to account for the mutually reinforcing interactions between human capital and physical capital accumulation. For example, a highly educated and skilled workforce tends to be more productive in utilizing and maintaining physical capital, leading businesses to make higher investments in physical capital. One way to incorporate this kind of interaction is to assume a balanced growth path equilibrium under which key economic variables, including physical capital, human capital and output grow at a constant rate over time. Under this equilibrium, if human capital per worker, HCI, increases by 1 percent, output per worker is also expected to increase by 1 percent.

Given a specific increase in labour productivity, it is crucial to account for the transitional dynamics towards the balanced growth path. To simulate the path of convergence, we rely on existing theories of exogenous growth which predict that output per worker (i.e. productivity) follows a dynamic equation of the form (see Barro and Sala-i-Martin, 2004):

$logy(t) = [1 - exp(-\beta t)]logy^* + exp(-\beta t)logy(0)$

where y(t) is the output per worker of period t, y^* is the output per worker reached at the balanced growth path and y(0) is the initial output per worker (normalized to 1). Parameter β is commonly referred to as the "speed of convergence" because it plays a pivotal role in determining the time it takes for an economy to transition towards its long-term balanced growth path. A higher value of β implies a faster convergence speed, indicating that the economy adjusts more rapidly to changes in its factors of production, including human capital.

Using the above equation, we simulate the sequence of productivity consistent with the HCl change. We estimate the balanced growth path y^* as the initial output per worker y(0) multiplied by the simulated cumulative percent gross change in HCl between 2023 to 2030. Parameter β is estimated using the approximation $(1 - \alpha)(\delta + n + x)$, where α is the elasticity of output to physical capital, δ is the depreciation rate, n is the population growth rate and x is the growth rate of the labour augmenting technology progress (see Barro and Sala-i-Martin, 2004).

The depreciation rate δ is fixed at 5 percent; the population growth rate n is fixed at 1.2 percent; and the growth rate of technological progress x is fixed at 2 percent. The elasticity of output to physical capital, a, is calibrated as the capital share in total income. We consider a value of 0.3, which is very close to the share of gross operating surplus (the average value over 2011-2019).6 This value leads to a β of 0.057. Under this speed of convergence, it takes 12 years to observe half of the gain in output per worker (and productivity).

When the changes in labour productivity are computed, we introduce them into the CGE model by using the scale parameter of the CES function of composite labour.

Data

The CGE model is calibrated using the 2021 Social Accounting Matrix (SAM) for Peru. The SAM is built using the 2021 Supply and Use Table (SUT), the 2021 National Accounts and 2021 Government Statistics. The disaggregated SAM has 482 accounts including 101 activities for 356 products, 2 factors (labour and capital) and a representative household. Given sectors of interest in SDG Push analysis, we finally aggregated to have 53 accounts, including 16 activities that produce 16 products, 4 categories of labour (unskilled, primary, secondary, tertiary) and a representative household. The elasticities for production and consumption functions are from the Ministry of Production.

We used different survey data to build a database for the estimation of the econometric model (see Appendix C for more details).

Scenarios

Based on outcomes from the dialogue, we run a Business-as- Usual scenario and two sets of scenarios namely government projections and SDG push scenario.

Business- as – Usual (BAU)

Under this scenario, public expenditure growth, population growth and GDP growth follow past trend, i.e. moving average over 1990-2022. Therefore, public expenditure grows at 2.1 percent per year, while population and GDP respectively grow at 1.4 percent and 2.9 percent.

Government projections

Under this strategy, the overall public expenditure grows at 6.7% over the period 2023-2026 as projected by the Ministry of Economy and Finance¹. The objective is to evaluate the impact on SDGs if the public expenditure growth is allocated to the areas identified during the dialogue as drivers of SDGs. Table 4 presents the estimated public expenditure growth rate according to the sectors.

- Infrastructure scenarios Public investments are expected to annually increase by 6.4%, 2.4% and 2.2% respectively in transportation, communications, and energy.
- Education Public investments in education are expected to increase by 4.9%, annually while the public investments in other sectors are kept at the BAU's levels.
- Health Public investments in health are expected to increase by 4.9%, annually while the public investments in other sectors are kept at the BAU's levels.
- Efficiency In this scenario, we increase efficiency in public expenditure on education and health. The increase in efficiency is implemented to allow a reduction in costs of government expenditure , that is equivalent to 1.4% of GDP. This reduction in costs is considered to reflect the conclusion of Public Expenditure Review for Peru , which has found that 1.4 percent of GDP in fiscal savings would be collected from efficiency reforms across areas including health and education.
- Reduction of cost of doing business In this scenario, the tax rates on economic activities are expected to decline by 50% by 2030.

Ministry of Economy and Finance, 2022

Table 4. Public investment growth rates under different scenarios

	SHARE OF PUBLIC INVESTMENT (%),2022* (A)	GROWTH RATE UNDER BUSINESS AS USUAL (%) (B)	PROJECTED CONTRIBUTION (%) (C=G X A)	GROWTH RATE UNDER POLICY SCENARIO (%) (D=B+C)
Communications	3.0	2.0	0.4	2.4
Education	20.5	2.0	2.9	4.9
Energy	1.8	2.0	0.2	2.2
Health	12.3	2.0	1.7	3.7
Transportation	31.6	2.0	4.4	6.4
Total (e)	69.2			
Average public investment growth over 2023-2030 (f) ² (%)	6.7			
Projection of public investment in sectors of interest (g=f/e) (%)	9.7			

*Shares are computed using data from Ministry of Finance

2 https://www.mef.gob.pe/contenidos/pol_econ/marco_macro/MMM_2023_2026.pdf

SDG push scenarios

As part of this strategy, the aim is to reach or come close to the targets set out in the SDG results framework by 2030. For example, the poverty rate should be halved by 2030, economic growth should be at least 7%, and the primary school completion rate should be 100%. Similar to government projections, we focus on areas identified as drivers of SDGs.

- Infrastructure scenarios Growths in public investment in the transport, energy and telecommunications sectors are 15 percentage points higher than in the government scenario.
- Education Growth in public investment in education is 7.7 percentage points higher than the government's projection.
- Health Public investment in health is maintained at the level of the government projection. This is because the objective of reducing malnutrition will be achieved in the government projection scenario (see section on results).

 SDG stimulus - In this scenario, we assume that the government is receiving transfers from Rest of world to fund the investment plan. We arbitrary choose 40% as the contribution of the rest of world.

Scenarios related to efficiency and reduction of costs of doing business are the same as in Government projection scenario.

Results

The reduced results framework is presented in Tables 5 and 6. First, we note that if the country maintains its past trends in public spending (BAU), it will make little or no progress in achieving several SDGs. For example, by 2030, only 27.24 percent of students will achieve a satisfactory level in maths in the student census assessment, which is well below 100 percent. The GDP growth rate of 2.9 percent is well below the target (7 percent), and the resulting productivity growth is limited to 1.4 percent (on average), which is very close to the population growth rate.

We also find that the BAU scenario shows limited progress in industrialization (manufacturing), with the share of manufacturing in GDP increasing by just 2.6 percent per year (on average), which is very close to the trend in manufacturing employment (2.5 percent). Furthermore, we note that informality would remain high if policies to encourage investment are absent. In fact, by 2030, almost 74.4 percent of jobs will come from the informal sector, while the poverty rate would be around 18.7 percent. In short, these results show that if the government pursues the same strategy as in the past, the country will fall behind in achieving the SDGs by 2030.

Government projections (Table 5) show that the country would make significant advancements in reducing malnutrition, but limited progress in terms of economic growth, educational outcomes, productivity growth and poverty reduction. For example, we find that the prevalence of malnutrition would tend to zero, while the percentage of students achieving a satisfactory level in maths would reach 43.0 percent by 2030 which is good but still below 100 percent. The country is likely to experience higher productivity leading to a 3.6 percent economic growth rate (on average) per year, which is still below the 7 percent target. Public investments in infrastructure result in greater improvements in macroeconomic and social outcomes because of the impact positive externalities exert on private output. Increasing the efficiency of public spending on health and education improves economic growth and reduces unemployment. This is because public sector efficiency saves government funds that can be used for investment. Thus, by combining investment in infrastructure with increased efficiency in public spending, the country should experience higher annual GDP growth, a lower unemployment rate and higher GDP per person employed. Public expenditure on health helps reduce the prevalence of malnutrition, while public expenditure on education allows improvement in education outcomes. However, the latter two factors have a limited impact on short-term GDP growth.

In sum, the takeaway from the government scenario analysis is as follows: with overall public investment set to increase by an average of 6.7 percent over 2023-2026 (Ministry of Economy and Finance, 2022), our results demonstrate that if policymakers allocate public investment to the sectors identified as drivers of the SDGs, the country is likely to make progress on those SDGs that figure among the top priorities. Specifically, if the required allocation of public investment is implemented, the country should be on track in reducing the prevalence of malnutrition; it would also experience improved educational outcomes and higher economic growth. However, additional efforts are needed to fully achieve the targets of poverty reduction and educational outcomes.

Table 5. Reduced results framework under government projection scenario

	TARGET	BASELINE VALUE (2021)	BAU	S1	S2	S3	S4	S5
GDP growth rate	7.00	2.75	2.9	3.5	3.5	3.6	3.6	3.6
Change in unemployment	<		-8.0	-10.2	-10.2	-10.6	-10.1	-10.0
Changes in manufacturing value added share of GDP	>		2.6	2.9	2.8	3.2	3.3	3.3
Changes in manufacturing employment share of total employment	>		2.5	2.9	2.8	3.1	3.4	3.4
Labour share of GDP	>	28.48	32.8	32.5	32.6	32.8	32.5	32.5
GDP per employed growth	>		1.2	1.7	1.7	1.8	1.8	1.8
Poverty rate	-50%	25.9	18.9	17.9	17.8	17.7	17.7	17.7
Prevalence of malnutrition	<	11.5	3.8	3.7	3.7	3.7	3.7	0.0
Percentage of students who achieved a satisfactory level in maths in the Student Census Evaluation (2nd grade - Primary)	100%	17.0	27.9	27.9	27.9	27.9	43.1	43.1
Ratio of workers with completed sec- ondary education or less	<	69.11	66.7	66.4	66.3	66.3	66.3	66.3
Proportion of informal employment in total employment	<	76.8	74.4	74.0	74.0	73.9	73.9	73.9
Underemployment	<	12.69	10.4	10.0	10.0	9.9	9.9	9.9

S1 = infrastructure scenario, S2=S1 + reduction of cost of doing business; S3=S2+ increase in efficiency in public sector; S4=S3+ increase in investment in public expenditure on education; S5=S4+ increase in investment in public expenditure on health.

Above 90% of the target, on track

Above 50% of the target and below 90% of the target, good progress

Below 50% and above 30% of the target, slow progress

Below 30% of the target, no progress

Under the SDG Push scenario (Table 6), the country will be on track in terms of educational and health outcomes, economic growth and poverty reduction, while it will make good progress on productivity growth and underemployment. Specifically, the percentage of students who achieved a satisfactory level in maths in the student census evaluation will be 75 percentage point higher than the BAU's value. In fact, GDP is likely to grow at 6.4 percent per year (on average) if the country receives the SDG stimulus; and productivity (GDP per employed person) growth will be higher than 4 percent. As a result, the decline in unemployment is 22.2 percent per year (on average) and underemployment is likely to be 23.9 percent lower than the BAU's value. Therefore the poverty rate will decrease to 12.6 percent, i.e. 50 percent lower than the baseline value (25.9 percent) and 33.3 percent lower than the BAU's value.

Similar to the government projection scenario, public investments in infrastructure have a higher macroeconomic and social impact. Increasing efficiency in the public sector and the SDG stimulus help maximize the impact of investments in SDG Push scenarios. In summary, investments under the SDG Push scenarios will help the country achieve several SDGs related to education, health, economic growth and poverty.

	BAU	S1	S2	S3	S4	S5	STIMULUS
GDP growth rate	2.9	5.6	5.5	5.7	5.9	5.9	6.4
Change in unemployment	-8.0	-20.0	-19.9	-20.5	-18.8	-18.7	-22.2
Changes in manufacturing value added share of GDP	2.6	2.4	2.3	2.4	2.5	2.5	2.6
Changes in manufacturing employment share of total employment	2.5	2.5	2.4	2.5	3.1	3.1	3.0
Labour share of GDP	32.8	32.1	32.2	32.4	31.2	31.2	31.4
GDP per employed growth	1.2	3.6	3.6	3.7	4.0	4.0	4.4
Poverty rate	18.93	14.1	14.0	13.7	13.8	13.8	12.6
Prevalence of malnutrition	3.8	3.4	3.4	3.4	3.4	0.0	0.0
Percentage of students who achieved a satisfactory level in maths in the Student Census Evaluation (2nd grade - Primary)	27.9	27.9	27.9	27.9	103.0	103.0	103.0
Ratio of workers with completed sec- ondary education or less	66.7	64.8	64.8	64.7	64.7	64.7	64.2
Proportion of informal employment in total employment	74.4	72.4	72.3	72.2	72.2	72.3	71.8
Underemployment	10.4	8.5	8.5	8.4	8.4	8.4	7.9

Table 6. Reduced results framework under the SDG Push scenario

S1 = infrastructure scenario, S2=S1 + reduction of cost of doing business; S3=S2+ increase in efficiency in public sector; S4=S3+ increase in investment in public expenditure on education; S5=S4+ increase in investment in public expenditure on health.

Above 90% of the target, on track

Above 50% of the target and below 90% of the target, good progress

Below 50% and above 30% of the target, slow progress

Below 30% of the target, no progress

Costing the SDG Push interventions

In this section, we present the costing of the SDG accelerators. Public expenditure is the sum of the government current expenditure and public investment by sector.

Table 7 below shows the required additional funding for the SDG accelerators, i.e. education, health, combined interventions in infrastructure, reduction in cost of doing business and increased efficiency of public sector, for the period 2023 to 2030. The additional public expenditure corresponds to the difference between the value of public expenditure under the scenarios and the value of public expenditure under the BAU. The additional expenditure needed to implement the SDG push is around 1% of GDP (on average).

Based on the costs estimated in Table 7, several financing options could be used to explore options (plans) for mobilizing the financial resources needed to cover the costs of the SDG accelerators. Based on the country's experience, these options could include mobilizing national public resources (tax and revenue reform), partnering with the national private sector or mobilizing external funds (public or private).

	2023	2024	2025	2026	2027	2028	2029	2030	ANNUAL AVERAGE
Government projection	405	842	1312	1819	2364	2950	3579	4254	2191
SDG Push	1744	3850	6390	9449	13131	17560	22886	29289	13038
GAP	1339	3008	5078	7630	10767	14611	19307	25035	10847
%BAU GDP	0.2	0.3	0.6	0.8	1.1	1.5	1.9	2.4	1.0

Table 7. Additional public expenditure (millions of soles, 2021 price)

SDG Acceleration Pathways

CGE modeling, combined with the econometric microsimulation model, has been used to assess the impact of policy interventions in areas that are key to achieving the SDGs in Peru. As identified in the Dialogue, these areas are poverty reduction education, health, inclusive economic growth and efficiency in the public sector.

We find that if the country maintains past trends in public spending (BAU), it will make little or no progress in achieving several SDGs. For example, by 2030, only 27.24 percent of students will achieve a satisfactory level in maths in the student census assessment, which is well below 100 percent. The GDP growth rate of 3.0 percent is well below the 7 percent target, and the resulting productivity growth is limited to 1.4 percent (on average), which is very close to the population growth rate.

We also find that the BAU scenario shows limited progress in industrialization (manufacturing), with the share of manufacturing in GDP increasing by just 2.6 percent per year (on average), which is very close to the trend in manufacturing employment (2.5 percent). Furthermore, we note that informality would remain high if nothing is done in terms of investment. In fact, by 2030, almost 74.4 percent of jobs will come from the informal sector, while the poverty rate would stand at around 18.7 percent. In short, these results show that if the government pursues the same strategy as in the past, the country will lag in achieving the SDGs by 2030. When considering government projections (Table 5), the country would make significant progress in reducing malnutrition, but limited progress in terms of economic growth, educational outcomes, productivity growth and poverty reduction. For example, we find that the prevalence of malnutrition would tend to zero while the percentage of students who achieved a satisfactory level in maths would reach 43.0 percent by 2030 which is good but still below 100 percent.

The outcomes from the government scenario analysis are as follows: with overall public investment set to increase by an average of 6.7 percent over 2023-2026 (Ministry of Economy and Finance, 2022), our results demonstrate that if policymakers allocate public investment to the sectors identified as drivers of the SDGs, the country is likely to make progress on those SDGs that are among the top priorities. Specifically, if the required allocation of public investment is implemented, the country should be on track in reducing the prevalence of malnutrition; it would also experience an improvement in educational outcomes and higher economic growth. However, additional efforts are needed to fully achieve the targets in terms of poverty reduction, educational outcomes and economic growth.

Investments implemented within the SDG Push scenarios will help the country achieve several SDGs related to education, health, economic growth and poverty reduction, which are among the top priorities of the country's development strategy. According to this scenario, by 2030, the poverty rate will be 12.6 percent, i.e. 50 percent lower than the reference value, annual economic growth will stand at 6.4 percent and annual productivity growth will exceed 4 percent (on average). The prevalence of malnutrition will tend towards zero, and the country will see a greater improvement in educational performance.

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Appendices

Appendix A

Table A1. Criteria used to assess progress

TARGET	BASELINE VALUE	INDICATORS	CRITERIA
7	2.74	GDP growth rate	>50% of target value on track;<50% and >20% good progress
<		Changes in Unemployment rate	Decrease at least by 10% per year good progress, below 10% little progress
>		Changes in Manufacturing value added share of GDP	Increase at least by 3% per year good progress, below 3% per year little progress
>		Changes in Manufacturing employment share of total employment	Increase at least by 3% per year good progress, below 3% little progress
>	28.48	Labour share of GDP	If difference with baseline is lower than 5 pp, little progress; higher than 5 pp and below 15 pp good progress
>		GDP per employed growth	Below 2%, little progress
12.95 (-50%)	25.90	Poverty rate	Below 70% of target little progess and above 70 % of target and below 90% good progress
<	11.50	Prevalence of malnutrition	Below 1% on track, >1% and < 5% good progress
1	17.00	Percentage of students who achieved a satisfactory level in maths in the Student Census Evaluation (2nd grade - Primary)	Below 30% limited progress
<	69.11	Ratio of workers with completed secondary education or less	If difference (absolute value) with baseline is lower than 5 pp, little progress; higher than 5 pp and below 15 pp good progress
<	76.80	Proportion of informal employment in total employment	Difference (absolute value) with baseline higher 3% good progress, below 3% little progress
	12.69	Underemployment	Difference (absolute value) with baseline higher 3% good progress, below 3% little progress

Appendix B

Table A2. Summaries of key determinants per selected SDG indicator according to literature review

INDICATOR	KEY DETERMINANTS	SIGN	ACADEMIC REFERENCES
	Years of education of the head of the household	-	
	Access to landline and/or cell phone at home	-	
	Agricultural income as % of total household income	+	
	Rate of households with public electricity	-	Valenzuela, I. (2013). Activos y contexto económico: Factores relacionados con la pobreza en el Perú.
	Head of household has Quechua, Aimara or another native language as mother tongue	+	
	Dependency ratio: Unemployed household members over the number of employed members	+	
	Availability of drinking water	-	
MONETARY POVERTY	Rate of individuals with completed secondary education	-	
	Rate of households with public electricity	-	
	Rate of households connected to a public sewage system inside or outside the home	-	Palomino, J., & Sánchez, T. (2021).
	Percentage of female heads of household	-	Spatial Heterogeneity Analysis of Monetary Poverty in Peru. Economia,
	Unemployment rate	+	44(87), 89-114. https://doi.org/10.18800/ economia.202101.006
	Chronic child malnutrition	+	
	Altitude	+	
	Landless	+	Laderchi, C. R., Saith, R., & Stewart, F.
	Head of household with Quechua, Aimara or another native language as mother tongue	+	(2003). Does it matter that we do not agree on the definition of poverty? A comparison of four approaches. Oxford
	Having only precarious (or no) employment.	+	development studies, 31(3), 243-274.

INDICATOR	KEY DETERMINANTS	SIGN	ACADEMIC REFERENCES
	Percentage of income spent on food	+	
	Inadequate care for the child and mother: excessive physical work during pregnancy, lack of time for breastfeeding or stimulation of the child.	+	UNICEF (1998). Estado mundial de la
	Insufficient health services and lack of basic sanitation	+	intancia.
	Monetary poverty	+	
	Lack of prenatal control in the mother during pregnancy	+	
	Have four or more living children	+	
	Low birth weight	+	Suárez, M. A. (1999). Determinantes de la desnutrición aguda y crónica en niños menores de 3 años: Un
	Education level of the mother: incomplete primary education or less	+	subanálisis de la ENDES 1992 y 1996. In Determinantes de la desnutrición
	Lack of bathrooms hygienic services or the possession of latrines	+	años: Un subanálisis de la ENDES 1992 y 1996 (pp. 88-88).
MALNUTRITION	Child caregiver above 40 years old	+	
	Households with dirt floors	+	
	Birth order	+	Balcázar, R., Paulini, J., Aquino, O., Cordero, L., & Figueroa, J. (2001). Política Nacional para la Reducción de la Desnutrición Crónica en el Perú. Documento de Trabajo. Lima: Instituto Apoyo.
	Education level of the mother	-	Sobrino, M., Gutiérrez, C., Cunha,
	Altitude above 2 500 m.a.m.s.l.	+	A. J., Dávila, M., & Alarcón, J. (2014). Desnutrición infantil en menores de cinco años en Perú: tendencias
	Presence of two or more children in the home	+	y factores determinantes. Revista panamericana de salud pública, 35,
	Be the third or successive child	+	104-112.
	Inadequate nutrient intake	+	
	Infectious diseases	+	Sánchez-Abanto, J. (2012). Evolution
	Education level of the mother: incomplete primary education or less	+	of chronic malnutrition in children under five in Peru. Revista Peruana de Medicina Experimental y Salud Publica,
	Inadequate health and sanitary conditions	+	29(3), 402-405.
	Low social status of the mother in decision-making within the home	+	
	Mothers having incomplete primary education or less	+	Urke, H. B., Bull, T., & Mittelmark, M. B. (2011) Socioeconomic status and
	Mothers working at home compared with mothers in professional occupations	-	chronic child malnutrition: wealth and maternal education matter more in
	Monetary poverty	+	Nutrition Research, 31(10), 741-747.

INDICATOR	KEY DETERMINANTS	SIGN	ACADEMIC REFERENCES		
	Sex	+			
	Children under 2 years old	+			
	Region	+	Sobrino, M., Gutiérrez, C., Cunha, A. J., Dávila, M., & Alarcón, J. (2014).		
	Altitude above 2 500 m.a.m.s.l.	+	Desnutrición infantil en menores de cinco años en Perú: tendencias y factores determinantes. Revista		
	Availability of public water network	-	Panamericana de salud pública, 35, 104-112.		
	Rate of households connected to a public sewage system inside the home	-			
	Presence of two or more children in the home	+			
ANEMIA	Lack of iron in blood	+	Instituto Nacional de Estadística e Informática. Encuesta Demográfica y de Salud Familiar 2016 Nacional y Regional (ENDES 2016) [Internet]. Lima: Instituto Nacional de Estadística e Informática; 2017. Disponible en: http://proyectos. inei.gob.pe/endes/resultados.asp.		
	Presence of parasites	+	World Health Organization		
	Low birth weight	+	(WHO). (2011). Intermittent Iron Supplementation in Preschool and School-Age Children. WHO: Geneva, Switzerland.		
	Frequent episodes of diarrheal infections	+			
	Place of residence outside of Lima	+			
	Low socioeconomic status	+			
	Teenage mother	+	Veléguez Hustado II. Dedríguez		
	Mothers having incomplete primary education or less	+	Y., Gonzáles, M., Astete-Robilliard, L., Loyola-Romaní, J., Vigo, W. E., &		
	Age less than 24 months	+	Rosas-Aguirre, A. M. (2016). Factores asociados con la anemia en niños menores de tres años en Perú: análisis		
	Lack of prenatal control and treatment against anemia during the pregnancy	+	de la Encuesta Demográfica y de Salud Familiar, 2007-2013. Biomédica, 36(2), 220-229		
	Home birth	+	220-223.		
	Maternal anemia	+			
	Absence of antiparasitic treatment in the minor	+			
	Age	-	Accinelli, R. A., & Leon-Abarca, J. A. (2020). Age and altitude of residence		
	Altitute	-	Peruvian 6 to 35 months old children. PloS one, 15(1), e0226846.		

INDICATOR	KEY DETERMINANTS	SIGN	ACADEMIC REFERENCES
	Recognized as indigenous	-	
	Father's education: years of study	+	Arteaga, I., & Glewwe, P. (2019). Do community factors matter? An analysis of the achievement gap between
	Mother's education: years of study	+	indigenous and non-indigenous children in Peru. International Journal of Educational Development 65, 80,91
	Early childhood nutrition: child's height-for-age z-score	+	
	Parent's literacy: Parents have some tertiary education	+	
QUALITY OF EDUCATION	Teacher experience	+	
	Pupil per teacher ratio	+	Hernandez-Zavala, M., Patrinos, H. A., & Sakellariou, C. (2006). Quality of schooling and quality of schools for
	Access to private school	+	indigenous students in Guatemala, Mexico and Peru (Vol. 3982). World Bank Publications
	Poor classroom conditions	-	
	Living in rural areas	-	
	Highest level of schooling between the care takers	+	
	Percentage teachers in the school who have completed a university degree	+	León, G., & Valdivia, M. (2015). Inequality in school resources and
	Number of operative computers in the school, divided by the number of students enrolled (*1000 for scaling).	+	from Peru. International Journal of Educational Development, 40, 71-84.
	Number of operative libraries in the school, divided by the number of students enrolled (*1000 for scaling purposes).	+	

INDICATOR	KEY DETERMINANTS	SIGN	ACADEMIC REFERENCES		
	Increase in the supply of skilled workers	-	Lustig, N., Lopez-Calva, L. F., Ortiz- Juarez, E., & Monga, C. (2016). Deconstructing the decline in inequality in Latin America (pp. 212-247). Palgrave Macmillan UK.		
	Quality of higher education	+	Castro, J., & Yamada, G. (2012). "Convexification" and "Deconvexification" of the Peruvian Wage Profile: A Tale of Declining Education Quality.		
	Education level	+	Céspedes, N., Lavado, P., & Ramírez Rondán, N. (2016). Productividad en		
	Age	+	el Perú: medición, determinantes e implicancias. Universidad del Pacífico.		
	Sex	+	Zambrano-Monserrate, M. A., &		
WAGES	Years of labour experience	+	Sanchez-Loor, D. A. (2015). Factores determinantes del salario del sector		
	Enterprise size	+	Un caso de estudio en la ciudad de Guayaquil. Cuadernos de Economía,		
	Education level	+	38(108), 139-151.		
	Years of education	+			
	Complete education levels	+	Van der Gaag, J., & Vijverberg, W. (1988) A switching regression model		
	Certificate of studies	+	for wage determinants in the public and private sectors of a developing country.		
	Years of labour experience	+	244-252.		
	Age	+			

INDICATOR	KEY DETERMINANTS	SIGN	ACADEMIC REFERENCES	
	Non-wage labour costs	+		
	Average education level achieved by the adult population	-	L_{000720} N (2008) Causas V	
	Agriculture's contribution as a percentage of GDP	+	consecuencias de la informalidad en el Perú. Revista Estudios Económicos,	
	Percentage of rural population	+	15(3), 43-64.	
	Percentage of young population	+		
	Sex	-		
	Age	-		
	Age squared	+		
	Years of study			
INFORMALITY	Percentage of independent workers	+	Tomaselli & (2021) Determinantes	
	Employees	+/-	departamentales y estimación del riesgo distrital del trabajo informal en	
	Rate of workers in the transportation sector Rate of workers in the manufacturing sector Rate of workers in the construction sector		el Peru.	
	Rate of workers in the hotel sector	+		
	Rate of workers in commerce	+/-		
	increase in the employment allocation in traditionally "informal" sectors (retail trade and transport)	+	Chong A. Galdo J. & Saavedra-	
	Increase in non-wage labour costs	+	Chanduví, J. (2007). Informality and productivity in the labor market: Peru	
	Labour productivity	-	1 1986-2001.	

Appendix C

Data Base

- After having identified the determinants of each indicator, the suggested variables were built based on the availability of regional and representative data using different surveys.
- The following table summarizes the main information regarding the sources used to build each determinant.

Table /	A3. Data	availability pe	r determinant

VARIABLE	TIME PERIOD	SOURCE
Population in a situation of monetary poverty, by region (Percentage of the total population)	2004-2021	ENAHO anual
Malnutrition prevalence in children under 5 years of age	2009-2021	ENDES
Prevalence of anemia in girls and boys from 6 to 59 months of age	2010-2021	ENDES
Percentage of students who achieved a satisfactory level in maths in the 2nd grade of secondary school	2015-2019	ECE
Percentage of students who achieved a satisfactory level in maths in the 2nd grade of primary school	2007-2016	ECE
Average total monthly salary (main and secondary occupation) of full-time workers and private dependents	2004-2021	ENAHO anual
Labour informality	2004-2021	ENAHO anual
Current expenditure allocated to education	2009-2022	SIAF
Head of household has Quechua, Aimara or another native language (ashaninka, awajún, shipibo, shawi, machiguenga, achuar or another) as mother tongue	2004-2021	ENAHO anual
Public schools in good conditions (Percentage of the total)	2001- 2021	Censo Escolar
Ratio of workers with completed secondary education or less	2004-2021	ENAHO anual
Percentage of independent workers	2004-2021	ENAHO anual
Average educational level of heads of household in the region	2004-2021	ENAHO anual
Average ratio of household members with completed basic education	2004-2021	ENAHO anual
Percentage of households with landline, cell phone or internet	2004-2021	ENAHO anual
Percentage of households with electricity	2004-2021	ENAHO anual
Percentage of households with drinking water from a pipe	2004-2021	ENAHO anual
Dependency ratio: Unemployed household members over the number of employed members	2004-2021	ENAHO anual
Unemployment rate	2004-2021	ENAHO anual
Average spending on food as a percentage of GDP	2004-2021	ENAHO anual
Average age of workers	2004-2021	ENAHO anual

VARIABLE	TIME PERIOD	SOURCE
Average squared age of workers	2004-2021	ENAHO anual
Percentage of households located in rural areas	2004-2021	ENAHO anual
Percentage of women who were or are pregnant and who did not have their prenatal check-up	2004-2021	ENDES
Percentage of households with two or more children	2004-2021	ENDES
Percentage of households where the mother has incomplete primary school or less	2004-2021	ENAHO anual
Percentage of households with bathrooms inside the house	2004-2021	ENAHO anual
Number of students per teacher, in basic education	2000-2022	Censo Escolar
Percentage of households where at least one parent has completed secondary education or higher education	2004-2021	ENAHO anual
Teachers with a pedagogical career at the University, in basic education (% of the total)	2000-2021	Censo Escolar
Proportion of workers in micro and small enterprises	2004-2021	ENAHO anual
Ratio of women of the total labour force	2004-2021	ENAHO anual
Percentage of the labour force that are young (15-29 years)	2004-2021	ENAHO anual
Progress ratio in the execution of the public budget allocated for education, by region as of the third quarter of the year	2009-2022	SIAF
Average degree of public workers, by region	2004-2021	ENAHO anual
Average ratio of public workers hired as "locadores de servicio" in the local educational management institution, by region	2016-2022	Censo DRE/ GRE - UGEL
Average ratio of professors appointed in a public educational institution, with respect to the total	2004-2022	Censo Educativo
Progress ratio in the execution of the public budget allocated for the National Programme against Anemia, by region	2008-2022	SIAF
Average expenditure per household	2004-2021	ENAHO anual
Public schools with basic services (drinking water, electricity, and drainage)	2006-2022	Censo Educativo
Percentage of teenagers who are mothers or pregnant for the first time (Percentage of the age group 15-19)	2009-2021	ENDES

Appendix D

The results of the literature review and availability of data allowed the setup of different models for each SDG indicator. These models are intertwined, representing a dynamic system.

The model was recursively adapted to analyse which determinants were statistically significant for each indicator.

All models used panel data to estimate the parameters using data from 2010-2021, considering Peruvian regions as individuals and using Clustered standard errors.

The models for each selected SDG indicator are detailed in the following section.

- 1. Model N°1: Reducing Monetary Poverty -Monetary poverty.
- 2. Model N°2.1: Universal access to quality public health services Malnutrition
- 3. Model N°2.2: Universal access to quality public health services Anemia
- 4. Model N°3.1: Access to free quality public education Quality of education
- 5. Model N°3.2: Access to free quality public education Quality of education
- Model N°4: Promoting sustainable, inclusive economic growth with decent job – Informality.
- Model N°5: Efficient and transparent government – Efficiency of public expenditure in education

Table A4. Micro econometric model results

	POV HEADCOL	ERTY JNT RATIO	PREVAL MALNU AMONG (UNDER 5 A(ENCE OF TRITION CHILDREN YEARS OF GE	% STUE WHO AC SATISFACTO IN MATHS NATIONAL E (2ND PR SCHO	DENTS HIEVED DRY LEVEL S IN THE VALUATION MARY DOL)	RATIO OF WITH CO SECOI EDUCATIO EXPENDI EDUC	WORKERS MPLETED NDARY IN OR LESS TURES IN ATION	LABOR INFORMALITY RATE		INCOME UNDER- EMPLOYMENT RATE		EFFICIENCY OF PUBLIC EXPENDITURES IN EDUCATION	
	MODEL 1		MODEL 2		MODEL 3.1		MODEL 3.2		MODEL 4.1		MODEL 4.2		MODEL 5	
Average educational level of heads of household in the region	0.0014						-0.0209	***						
% of households with landline, cell phone or internet (at least one)	-0.0060				0.5111	**	-0.0440	**						
% of households with native language other than Spanish	0.0533													
% of households with electricity	-0.4056	***												
Dependency ratio	0.1413	***												
Average unemployment rate in the region	0.9593	***												
Average annual household expenditure (thousands of soles)	-0.0155	***					-0.0446	***	-0.0046	***	-0.0043	***	0.0129	*
% of households with drinking water from a pipe			-0.2205	**										
% of the population in monetary poverty			0.1533	***										
% households with bathroom inside the house			-0.2346	***										

	POV HEADCOU	ERTY JNT RATIO	PREVALI MALNU AMONG C UNDER 5 AC	ENCE OF TRITION CHILDREN YEARS OF GE	% STUE WHO AC SATISFACTO IN MATHS NATIONAL E (2ND PR SCHO	DENTS HIEVED DRY LEVEL S IN THE VALUATION IMARY DOL)	RATIO OF WITH CO SECOI EDUCATIO EXPENDI EDUC	WORKERS MPLETED NDARY N OR LESS TURES IN ATION	LABOR INFORMALITY RATE		INCOME UNDER- EMPLOYMENT RATE		EFFICIENCY OF PUBLIC EXPENDITURES IN EDUCATION	
	MODEL 1		MODEL 2		MODEL 3.1		MODEL 3.2		MODEL 4.1		MODEL 4.2		MODEL 5	
Budget for the National Anemia Program (NAP) (billions of soles)			-0.4441	***									0.1843	***
NAP squared			0.5115	***										
Budget education per-capita (millions of soles)					105.7965	***							0.0413	***
c.(Budget education per-capita)#c.(Budget education per-capita)					-9208.3280	***								
Ratio of workers with completed secondary education or less									0.3281	***	0.2290	***		
% of independent workers									0.3444	***	0.1973	***		
Average age of workers									-0.1689	***	-0.1527	***		
c.(Average age of workers)#c.(Average age of workers)									0.0021	***	0.0020	***		
% households in rural areas									-0.2293	***	-0.1212	***		
Public schools with basic services (drinking water, electricity, and drainage)													0.4647	

Appendix E

Table A5. External data used for calibration of CGE model

Substitution between categories of labor	2.00	https://repositorio.pucp.edu.pe/index/handle/123456789/47013	Peru
Substitution between imports and domestic production	3.50	https://doi.org/10.1016/j.econmod.2006.12.002	average
Transformation between domestic production and exports	2.00	https://www.taylorfrancis.com/chapters/ edit/10.4324/9780203965832-11/peru-impact-analysis-trade- liberalization-poverty-inequality-alonso-segura-vasi-juan- garc%C3%ADa-carpio	Peru
Substitution among imports from different exporters	7.00	https://doi.org/10.1016/j.econmod.2006.12.002	average
Export demand elasticity	0.50	https://doi.org/10.1016/j.econmod.2006.12.002	Peru
Income elasticity of demand for imports	2.21	https://www.tandfonline.com/doi/abs/10.1080/01603477.2016.11 36565	Peru
Substitution between value added and intermediate demand	0.60	https://www.taylorfrancis.com/chapters/ edit/10.4324/9780203965832-11/peru-impact-analysis-trade- liberalization-poverty-inequality-alonso-segura-vasi-juan- garc%C3%ADa-carpio	Peru
Elasticity for investment demand	2.00	https://www.taylorfrancis.com/chapters/ edit/10.4324/9780203965832-11/peru-impact-analysis-trade- liberalization-poverty-inequality-alonso-segura-vasi-juan- garc%C3%ADa-carpio	Peru
Frish parameters	-2.4	https://www.cepal.org/sites/default/files/events/files/ documento_cristian_mardones_universidad_de_concepcion_ chile.pdf	
Output PIB elasticities			
Agriculture and fishing	0.74	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490	Peru
Mining	0.79	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490_	average
Manufacturing	0.33	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490_	Peru
Electricity, gas and water	0.76	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490_	average
Construction	0.67	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490	Peru
Trade	0.89	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490_	Peru
Other services	0.75	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2649490_	Peru
Elasticity of real wage to unemployment rate- Wage curve	-0.06	(Yamada, 2008) for Peru https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467- 9361.2008.00469.x	

Table A6. Elasticities used for calibration of CGE model

ELASTICITY IN EXTERNALITY FUNCTION (INFRASTRUCTURE)		MONTAUD AND AL (2020) FOR PERU
TELECOMMUNICATION	MEAN	SE
Agro-industry	1.6	0.4
Commerce	2.0	0.1
Construction	0.6	41.7
Energy and water	0.9	125.4
Oil and mining	2.6	0.7
Manufacture	1.7	0.1
Fishing	0.8	41.2
Other services	0.2	0.0
ENERGY	MEAN	SE
Agro-industry	0.0	0.0
Commerce	0.0	0.0
Construction	0.0	18.3
Energy and water	0.1	18.3
Oil and mining	0.3	42.0
Manufacture	0.0	
Fishing	0.6	20.7
Other services	0.1	8.7
TRANSPORTATION	MEAN	SE
Agro-industry	0.7	0.2
Commerce	0.6	0.1
Construction	0.4	0.2
Energy and water	0.5	21.8
Oil and mining	0.0	
Manufacture	0.7	0.1
Fishing	0.4	33.5
Other services	0.7	0.1

Table A7. Other external data

GDP growth rate (average over 2010-2019)	0.045	World Development Indicators
Unemployment rate (average over 2010-2019)	0.035	World Development Indicators
Interest rate (average over 2014-2019)	0.034	Central bank of Peru
Population growth rate (average over 2010-2019)	0.012	World Development Indicators
Depreciation rate	0.05	



