

RESEARCH ARTICLE

Analysing the Impact of the COVID-19 Pandemic on the Sustainable Development Goals (SDGs) From the Perspective of Decent Work: A Comparison of the Pre- and Post-COVID-19 Periods

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ABSTRACT

This study presents a novel approach to COVID-19 impact analysis, delving into the correlation between the pandemic and the unemployment/NEET (youth not in employment, education or training) rates, labour productivity levels and practices regarding basic employee rights of UN member countries and the SDG. It juxtaposes two distinct periods: pre-COVID-19 (2017–2019) and COVID-19 (2020–2022). The study also evaluates the sufficiency/necessity levels of condition variables on SDG for both periods and aims to provide country-specific inferences. The data obtained from three different databases were analysed using symmetric (PLS-SEM) and asymmetric (fsQCA) methods to ensure that the findings are complementary to each other in order to increase the validity of the research. The study's findings unveil a significant negative relationship between NEET and SDG in both periods, with the strength of the relationship intensifying during the COVID-19 period. Importantly, the absence of NEET was identified as the sole necessary condition for the presence of SDG. These findings hold practical implications for policymakers and practitioners and enrich the sustainable development literature.

1 | Introduction

Sustainable development represents a comprehensive global strategy aimed at fostering transformative progress across economic, social and environmental domains (Clemente-Suárez et al. 2022). In recent years, it has emerged as a key priority on the agendas of both national and international policymakers (Grzebyk et al. 2023). In September 2015, the United Nations (UN) introduced the Sustainable Development Goals (SDGs)—a framework of 17 interconnected goals designed to advance sustainable development on a global scale (Siddiquee et al. 2022; Sodhi and Tang 2024). The SDGs adopt a holistic vision of

development, seeking to harmonize economic growth, social equity and environmental protection. Within this framework, the goals aim to address pressing global challenges such as poverty, climate change and environmental degradation by shaping and informing national development policies (Grzebyk et al. 2023). Moreover, they advocate for an inclusive and egalitarian approach grounded in respect for human rights, particularly in the fields of education, healthcare and labour (Anholon et al. 2022). To construct a more equitable, prosperous and sustainable world, all 193 UN member states have pledged to achieve these goals by 2030, implementing a range of strategic action plans to this end (Rai et al. 2019; Röell et al. 2024).

However, the outbreak of the coronavirus (COVID-19) pandemic in 2020 posed significant challenges to countries' progress towards achieving the SDGs (Clemente-Suárez et al. 2022; Jasni et al. 2023). The pandemic, which infected and claimed the lives of millions, placed immense strain on healthcare systems and severely limited individuals' access to essential health services. Moreover, the widespread implementation of full or partial lockdowns and social distancing measures disrupted economic activity, interrupted educational processes and exacerbated poverty and social inequality (Begum et al. 2022; Naseer et al. 2023).

The repercussions of the COVID-19 pandemic have been acutely felt in labour markets, posing a substantial threat to the realization of Sustainable Development Goal 8, which advocates for inclusive and decent work for all (Alibegovic et al. 2020; Anholon et al. 2022; Hörisch 2021; Elavarasan et al. 2022; Elsamadony et al. 2022; Shuai et al. 2024; Bieszk-Stolorz and Dmytrów 2023). Rooted in four core strategic pillars—securing fundamental labour rights, generating employment and income opportunities, extending social protection and fostering social dialogue—the decent work agenda has been severely undermined by the socio-economic disruptions induced by the pandemic (Somavia 1999; Picatoste and Rodriguez-Crespo 2021; Kuruvilla and Li 2021). The widespread contraction in economic activity and breakdowns in global supply chains (Begum et al. 2022) forced many enterprises to shut down, triggering mass layoffs and rising unemployment rates worldwide (Su et al. 2022; Quinlan-Davidson et al. 2023; Naseer et al. 2023). Vulnerable groups—including youth, women and informal workers, who are predominantly employed in pandemic-sensitive sectors—have been disproportionately affected, thereby exacerbating existing social inequalities (Fana et al. 2020; Lee et al. 2020). Meanwhile, social protection frameworks in many countries proved inadequate, leaving numerous workers excluded from unemployment benefits and other support programmes (Tham 2020). Collective bargaining mechanisms were similarly weakened, as union activities were curtailed and opportunities for social dialogue diminished (Kuruvilla and Li 2021). Additionally, declines in employment and reductions in working hours contributed to a marked decrease in labour productivity, particularly in developing countries and in labour-intensive industries that lacked the infrastructure for remote work (Elavarasan et al. 2022; Mobosi 2023).

The adverse effects of COVID-19 on labour market indicators have further distanced many countries—especially those already lagging in Sustainable Development Goal (SDG) attainment prior to the pandemic—from achieving these global targets (Gunn et al. 2022; Elsamadony et al. 2022). In this context, it has become critically important to assess the pandemic's implications for the SDGs through the lens of decent work and to develop responsive labour market policies that can accelerate progress towards these goals in the postpandemic era (Elavarasan et al. 2022; López Peláez et al. 2023). Accordingly, the primary aim of this study is to investigate the impact of the COVID-19 pandemic on the labour market indicators of United Nations member states and their subsequent performance in achieving the SDGs. Furthermore, the study seeks to draw policy inferences that can support countries in advancing decent work agendas, with a particular emphasis on identifying priority

areas for labour policy intervention in the postpandemic recovery process.

In the existing literature, empirical studies investigating the relationship between labour market indicators and the SDGs remain relatively limited. Among these, Jasni et al. (2023) demonstrated that the COVID-19 pandemic led to rising unemployment in Malaysia and adversely affected the country's progress towards achieving the SDGs. Jin (2023) explored the postpandemic status of the youth labour market in China, analysing legislative efforts to safeguard youth employment and offering policy recommendations from a sustainable development perspective. Similarly, Francis (2020), in her assessment of the pandemic's impact on workers' rights, emphasized how COVID-19 exacerbated gender inequality in South Africa and heightened women's vulnerability to precarious employment conditions. Gunn et al. (2022) revealed that nonstandard workers experienced reductions in working hours, income and social protections during the pandemic, underscoring the urgent need for expanded social safety nets for this group. In their analysis of sectoral value-added and national trade data, He et al. (2022) reported a 39.5% decline in labour productivity—equivalent to approximately 305 million jobs lost—and a 25.9% reduction in overall welfare levels in China. Mobosi et al. (2023), in a study encompassing 45 African countries, found that the pandemic diminished labour value, curtailed productivity and diverted national trajectories away from the SDGs. A notable limitation of current research is its predominant focus on the postpandemic period, which constrains opportunities for comparative analyses with the prepandemic baseline and hinders a comprehensive understanding of COVID-19's full impact on SDG progress. Moreover, existing studies tend to examine isolated labour market indicators, rather than adopting a holistic framework aligned with the four strategic pillars of decent work as outlined in International Labour Organization (ILO) conventions. Consequently, there remains a significant gap in the literature for empirical studies that systematically integrate labour market variables within the broader context of the decent work agenda.

This study conducts a comparative analysis of how selected labour market indicators—including unemployment rates, NEET rates (youth not in employment, education or training), labour productivity levels, and basic labour rights practices—have influenced SDG performance across UN member states during the prepandemic (2017–2019) and pandemic (2020–2022) periods (see Figure 1). By examining these conditional variables, the study aims to address a notable gap in the literature through a holistic framework that incorporates the four core strategic objectives of decent work (Fapohunda 2012; Georgescu and Herman 2019). Integrating these dimensions is essential for accurately capturing labour market dynamics, informing the development of inclusive policy responses and supporting long-term sustainable development efforts.

The primary motivation of this study is to uncover how pandemic-induced changes in labour market indicators have influenced countries' performance in achieving the SDGs. To this end, the study adopts a comparative approach between the prepandemic and pandemic periods, examining whether and how the effects of selected conditional variables on SDG outcomes have shifted over time. This dual-period evaluation

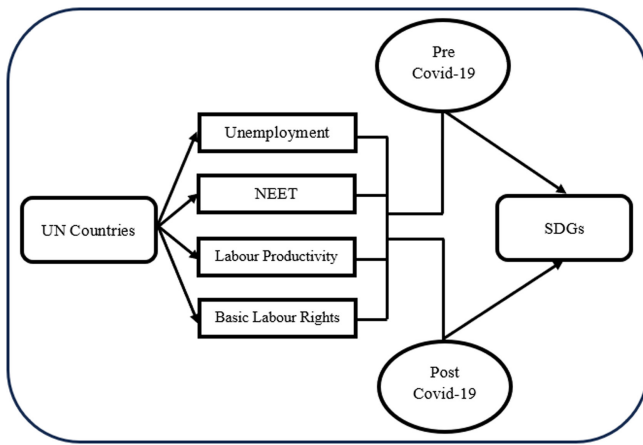


FIGURE 1 | Theoretical model of the study.

offers a comprehensive and original contribution to the literature by enabling a more nuanced understanding of the pandemic's impact on sustainable development. Additionally, the study assesses both the sufficiency and necessity of the conditional variables in shaping SDG performance before and after the pandemic. In doing so, it aims to identify which variables are most influential in facilitating—or hindering—progress towards the SDGs, thereby informing the formulation of targeted policy recommendations at both global and national levels. These insights are intended to guide UN member states—each of which is committed to fulfilling the SDG agenda by 2030—on the specific areas requiring urgent attention, policy reform or enhanced investment.

In line with these objectives, the study seeks to answer the following research questions.

1. Do UN member states' unemployment/NEET rates, labour productivity levels and practices regarding basic employee rights differ in the pre-COVID-19 and COVID-19 periods?
2. How do these conditional variables influence countries' SDG performance across the two periods?

While the direct public health impacts of the COVID-19 pandemic have gradually subsided, labour markets across the globe continue to grapple with persistent structural challenges—including high unemployment rates, inefficient sectoral employment structures and inadequate protection of fundamental labour rights (ILO 2023; Dhingra and Kondirulli 2023). These labour market deficiencies obstruct progress towards achieving the SDGs and exacerbate intercountry inequalities, particularly in relation to socio-economic objectives (Elavarasan et al. 2022; Elsamadony et al. 2022; Shuai et al. 2024; Li et al. 2023). Tjahjanto et al. (2023) contend that high unemployment not only erodes economies' long-term growth potential but also intensifies poverty and distances countries from their SDG commitments. Youth unemployment (NEETs), in particular, is associated with declines in productivity, social unrest and threats to peace and stability (Picatoste and Rodriguez-Crespo 2021; Iduseri et al. 2022). The extent to which countries perform on the SDG framework is closely tied to their compliance with and enforcement of legal standards protecting basic labour rights (Gunn et al. 2022). Nevertheless, a growing body of research suggests

that expanding social protection gaps, gender-based inequalities and the prevalence of informal and precarious employment—particularly during the pandemic—have collectively undermined SDG performance (Tham 2020; Arnania-Kepuladze et al. 2021; Murshed 2022; Kuruvilla and Li 2021). In parallel, declines in labour productivity—recognized as a cornerstone of sustainable development—pose a direct threat to countries' capacity to meet the SDGs by constraining national production and reducing household incomes (Fedulova et al. 2019; Day et al. 2019).

To enable a more comprehensive and in-depth analysis of how pandemic-induced structural changes in labour market indicators have affected SDG performance, this study adopts a hybrid methodological approach that integrates both quantitative and qualitative data analysis techniques. Specifically, partial least squares structural equation modelling (PLS-SEM) is employed to identify causal relationships among the variables in the study's theoretical framework (Figure 1) and to generate deeper insights into the underlying structural dynamics. PLS-SEM is particularly well suited for examining complex cause-and-effect relationships between latent constructs, offering high statistical power and robustness irrespective of sample size or data distribution assumptions (Hair et al. 2014; Hair et al. 2019). Complementing this, the study also utilizes fuzzy set qualitative comparative analysis (fsQCA) to investigate the causal configurations of multiple conditional variables—that is, various combinations of labour market indicators that contribute to the attainment or non-attainment of SDG targets—and to identify country-specific patterns. As noted by Pappas and Woodside (2021), fsQCA is a powerful analytical tool for capturing complex, asymmetric interrelationships and for generating context-sensitive explanatory configurations. The integration of PLS-SEM and fsQCA offers a complementary methodological structure that enhances the explanatory depth and robustness of the findings (Rasoolimanesh et al. 2021; Kang and Shao 2023). This mixed-methods framework allows for a holistic assessment of both prepandemic and pandemic periods, identifies shifts caused by the pandemic and supports the formulation of actionable, country-specific policy recommendations aimed at accelerating progress towards the SDGs.

2 | Conceptual Framework

2.1 | Fundamental Labour Rights (FLR)

The COVID-19 pandemic has had profound effects on the global labour market, exacerbating existing social inequalities (Gunn et al. 2022). Although some initially referred to the virus as 'the great equalizer'—highlighting its potential to affect individuals regardless of age, social status, race/ethnicity or gender—the pandemic's individual, social and structural consequences have, in reality, deepened disparities in access to decent work opportunities (Kantamneni 2020). Tham (2020) reports that workers' rights in Australia were adversely affected during the pandemic, including fundamental rights such as access to employment, social protection and safe working conditions. For example, the limited financial support offered through the social security system placed

substantial pressure on individuals' right to social protection. Globally, the lack of access to essential social benefits further highlighted systemic gaps: Two-thirds of employees were unable to access sickness benefits during the pandemic, and only one-fifth of those who lost their jobs were eligible for unemployment benefits (Gunn et al. 2022). These figures underscore the insufficiency of existing social protection mechanisms in responding to crisis conditions.

The COVID-19 pandemic has disproportionately affected unregistered and nonstandard workers, exposing them to heightened socio-economic vulnerabilities (Kantamneni 2020). These forms of employment are typically characterized by job insecurity, irregular income and limited legal rights and protections. While flexible employment arrangements may serve to boost job creation during periods of economic stability, such workers are particularly susceptible to adverse outcomes—such as reduced working hours, income loss, unemployment and poverty—during times of crisis. As a result, it is imperative for governments to implement additional protective measures for informal and nonstandard workers. Individuals in such employment arrangements—often engaged in part-time, temporary or contract-based roles—generally lack access to the financial and social protections available to those in permanent, full-time positions (Gunn et al. 2022). This disparity has significantly increased income insecurity and poverty risk among informal workers during the pandemic, surpassing the levels observed in previous global crises, including the 2009 financial downturn (Lee et al. 2020).

The COVID-19 pandemic has had a disproportionately negative impact on women in the labour market, exacerbating gender-based disparities in employment quality, wages and labour force participation (Lee et al. 2020). According to the ILO (2020), ensuring women's access to social security and safe working conditions is a cornerstone of the decent work agenda. However, the pandemic has significantly undermined this right, with women particularly affected by widespread job and income losses (Tham 2020). In South Africa, for example, women accounted for two-thirds of all jobs lost during the pandemic, illustrating the severity of gender inequality in labour markets (Francis 2020). The overrepresentation of women among NEETs further highlights persistent gender gaps in labour market participation (Avagianou et al. 2022). Women are also more likely to be employed in sectors that were heavily impacted by the pandemic—such as care services, retail and hospitality—and are less likely to benefit from social security coverage or legal labour protections. This structural vulnerability has placed women at a heightened risk of economic exclusion and income insecurity during the crisis (Lee et al. 2020).

Considering the adverse effects of COVID-19, particularly on vulnerable groups such as women, youth and those in nonstandard employment, the impact of countries' failure to uphold fundamental labour rights on SDG will be evaluated based on the following hypotheses.

Hypothesis 1a. *Prior to the COVID-19 pandemic, countries' failure to implement FLR had a significant negative impact on SDG.*

Hypothesis 1b. *COVID-19 moderates the relationship between countries' practices regarding FLR and SDG.*

2.2 | Youth Not in Employment, Education or Training (NEET)

According to UN and Eurostat standards, NEETs are defined as individuals aged 15–24 who are disengaged from both the labour market and formal education or training opportunities (Puiu 2020; Picatoste and Rodriguez-Crespo 2021; Ingutia 2023). The COVID-19 pandemic has had a substantial impact on the lives and well-being of young people, particularly in relation to their labour market participation. While the virus posed a relatively low risk to the physical health of youth, it significantly undermined their employment prospects, making them more vulnerable than adults in securing suitable job opportunities (Achdut and Refaeli 2020). Even prior to the pandemic, young people faced persistent barriers to labour market entry, and the crisis further exacerbated these challenges (Jasni et al. 2023). In 2020, global youth employment declined by 8.7%, compared with a 3.7% decline for adults (Collins et al. 2022). Additionally, the NEET rate in European countries rose by 1% in 2020 (Aina et al. 2021), and a similar trend was observed in OECD countries, where the proportion of NEETs increased from 13% in 2019 to 15% in 2021 (Quinlan-Davidson et al. 2023). These figures highlight the disproportionate impact of the pandemic on youth employment and underscore the need for targeted policy interventions to support young people in the transition to decent work.

One of the primary drivers behind the rise in NEET rates during the COVID-19 pandemic has been the widespread loss of employment resulting from quarantine measures imposed to curb the spread of the virus. These measures disproportionately affected sectors where young people are heavily concentrated, particularly the service industry (Collins et al. 2022). For instance, approximately one-third of young workers in EU countries were employed in service-related sectors—such as retail, hospitality and food services—which experienced severe disruptions due to lockdowns and social distancing mandates (Jasni et al. 2023). As a consequence, many young workers faced reduced working hours, job dismissals and diminished access to decent work opportunities (Lee et al. 2020). The pandemic also gave rise to more precarious employment conditions, including lower wages and deteriorating workplace standards, which further hindered young people's ability to secure stable and dignified employment (Picatoste and Rodriguez-Crespo 2021). Faced with mounting unemployment, a growing number of young individuals have been pushed towards the informal economy—taking up part-time, contract-based, freelance or gig work—as a means of economic survival (Jasni et al. 2023; Ingutia 2023).

The impact of COVID-19 on young people has been especially severe in countries where formal employment opportunities are limited, the informal sector is expanding, and labour market institutions—particularly those supporting the school-to-work transition—are underdeveloped or weak (Rinne et al. 2022). Dhingra and Kondirolli (2023) report that although India's Gross Domestic Product (GDP) began to recover in 2021, youth

unemployment rates remain significantly above their pre-pandemic levels. The authors further predict that this trend of elevated youth unemployment will persist even in the post-pandemic period. This challenge is not unique to India but reflects a broader pattern observed in many developing economies, where youth were already among the most vulnerable groups prior to the pandemic. COVID-19 has exacerbated these vulnerabilities, deepening their disconnection from the labour market and increasing the prevalence of NEET status. In light of the worsening conditions for NEETs and their growing relevance to sustainable development challenges, the following hypotheses are proposed to empirically test the impact of countries' NEET rates on SDG performance.

Hypothesis 2a. *Before the COVID-19 pandemic, the NEET rates of countries had a significant negative impact on SDG.*

Hypothesis 2b. *COVID-19 has a moderating effect on the relationship between countries' NEET rates and SDG.*

2.3 | Labour Productivity (P)

One of the major challenges currently confronting countries in the global economic landscape is the creation of high-productivity employment that supports inclusive and sustainable development (Georgescu and Herman 2019). Labour productivity—typically measured as the average output per worker or per hour worked—is a key indicator of a country's economic performance and the overall efficiency of its labour market (Bervidova 2002). The COVID-19 pandemic has significantly disrupted employment patterns, reduced working hours and caused widespread income loss, all of which have contributed to declining labour productivity, particularly in less developed economies. In African countries, the public health burden associated with the pandemic has had especially adverse effects on labour productivity. This can largely be attributed to the structural characteristics of their economies, which are predominantly labour-intensive and rely heavily on a largely unskilled workforce (Mobosi et al. 2023; Mobosi 2023).

According to Vries et al. (2021), government interventions in developed economies during the COVID-19 pandemic had a positive effect on labour productivity. Fiscal stimulus measures implemented by governments helped cushion the pandemic's impact on average output per worker. Despite a sharp contraction in overall economic activity, labour productivity—measured as GDP per hour worked—increased by an average of 1.1% in 2020 across advanced economies. For example, in the Americas, where job losses were particularly severe, labour productivity rose by 3.5% over the same period. Similarly, He et al. (2022) report that in China, labour productivity increased by 12.2% in September 2020 compared with the same month in 2019, equivalent to the productivity generated by approximately 94 million jobs. This increase is largely explained by the fact that the reduction in total working hours outpaced the decline in overall production. These trends were driven in part by business support programmes and government-sponsored leave schemes designed to mitigate short-term labour market disruptions (Vries et al. 2021). Additionally, the International Labour Organization (ILO 2021) highlights the sectoral heterogeneity of the pandemic's impact: Declines were concentrated in low-productivity sectors, which, in turn, inflated

the average labour productivity at the national level. In light of these dynamics, the impact of COVID-19 on the relationship between labour productivity rates and SDG performance will be examined through the following hypotheses.

Hypothesis 3a. *Labour productivity rates significantly and positively impacted SDG before COVID-19.*

Hypothesis 3b. *COVID-19 moderates the relationship between countries' labour productivity rates and SDG.*

2.4 | Unemployment Rate (UE)

Unemployment remains a critical obstacle for countries aiming to achieve sustainable development. Beyond long-standing structural factors—such as the transition to an information-based economy, the globalization of markets and the increasing adoption of new technologies (Rontos et al. 2015)—the COVID-19 pandemic has further exacerbated unemployment challenges on a global scale (Bermejo et al. 2023). The pandemic triggered widespread job losses, contributing to a significant rise in unemployment among men, women and young people alike (ILO 2020; Elavarasan et al. 2022). Empirical studies conducted in the United States (Beland et al. 2020) and across European countries (Su et al. 2022) confirm that the pandemic led not only to higher unemployment rates but also to reductions in average working hours and overall labour force participation.

The COVID-19 pandemic has led to a substantial rise in unemployment rates, particularly among vulnerable segments of the workforce, including informal workers, women, youth, temporary and self-employed individuals, unskilled labourers and immigrants (Fana et al. 2020). These groups are disproportionately employed in sectors that are not conducive to remote work and were therefore severely affected by lockdowns and quarantine measures (Gallacher and Hossain 2020). As a consequence, many were excluded from formal social protection schemes, resulting in greater employment losses—especially in occupations requiring physical presence. For example, Jasni et al. (2023) found that in Malaysia, women and young workers were most severely impacted by the short-term effects of the pandemic, with the service sector recording the highest number of layoffs. Overall, the COVID-19 crisis has not only exposed but also intensified pre-existing labour market inequalities, amplifying the vulnerabilities of already marginalized groups.

During the COVID-19 pandemic, part of the mass unemployment observed was, paradoxically, the result of deliberate public health measures intended to protect society from the spread of the virus. As Seccareccia (2021) notes, unemployment emerged as both a significant consequence of the crisis and an initial policy tool for managing it. The extent of layoffs and income losses varied significantly across countries, depending on the nature of their containment measures, labour market regulations and the degree of institutional commitment to workers' rights. In response, governments attempted to cushion the pandemic's socio-economic impacts on workers, families and communities through incentive packages and income transfers—tailored to their welfare state models and the robustness of their social safety nets (Gunn et al. 2022). According to Tóth et al. (2023),

while fiscal expenditures were not immediately decisive, they played a critical role in the medium to long term. In contrast, human resource interventions—such as short-time work schemes—were particularly effective in safeguarding jobs and income in the short run, though their effectiveness diminished over time. Therefore, fiscal instruments such as wage subsidies that facilitate the gradual resumption of production are essential for medium-term recovery. In developed countries such as the United States, governments implemented policies such as expanding access to unemployment insurance, adopting payroll subsidies to reduce temporary layoffs and offering free childcare support to sustain labour force participation (Lord 2020).

In response to the COVID-19 pandemic, many countries introduced policies aimed at mitigating its impact on unemployment. However, empirical studies suggest that the unemployment crisis triggered by the pandemic is unlikely to be resolved in the short term. Ahmad et al. (2023) project that it will take at least 5 years for many European countries to recover from the pandemic-induced surge in unemployment. Similarly, Bermejo et al. (2023) emphasize that governments must recognize the long-term nature of the problem, as the pandemic has rendered unemployment more persistent and its effects on labour markets more enduring. In light of this evidence, the relationship between unemployment rates and SDG performance will be examined through the following hypotheses, focusing on both the prepandemic and pandemic periods.

Hypothesis 4a. *Before the COVID-19 pandemic, unemployment rates in countries had a negative impact on SDG.*

Hypothesis 4b. *COVID-19 moderates the relationship between countries' unemployment rates and SDG.*

3 | Research Methodology

This research is grounded in the functionalist paradigm, a sociological framework that emphasizes the regulation of society through rational structures and processes. The central aim of this paradigm is to maintain social order, integration and stability within socioeconomic systems (Günbayi and Sorm 2018, 61; Burrell and Morgan 1979). From this perspective, social developments are evaluated in terms of their contribution to systemic equilibrium and continuity, with an emphasis on sustaining stability in the face of change.

3.1 | Research Data

This study utilized secondary data from 68 countries representing various world regions and development levels. These countries were selected based on their status as UN member states and the availability of comparable data across key indicators. The analysis includes two distinct timeframes: the prepandemic period (2017–2019) and the pandemic period (2020–2022). The study was limited to 3 years before and 3 years during the pandemic, based on the most recent available data. This temporal scope was selected to enable a balanced comparison and to capture the short- to medium-term effects of the COVID-19 pandemic. It is assumed that the timeframes included in the analysis

adequately reflect the critical phases of pandemic-related disruptions and their potential impact on labour market indicators and SDG performance.

Three databases were used in the study. The study employed data from three major databases; however, all dependent and independent variables were ultimately sourced from six editions (2018–2023) of the Sustainable Development Index (SDI) Report to ensure consistency and replicability (Sachs et al. 2017, 2018, 2019, 2020, 2021, 2022). The SDI provides a composite quantitative assessment of countries' performance across social, economic and environmental dimensions. Definitions of the indicators were cross-referenced with their original institutional sources to ensure conceptual clarity. The dependent variable in the study is the overall SDI score, representing each country's level of progress towards the SDGs. Among the independent variables, the fundamental labour rights indicator was obtained from the World Justice Project Report.¹ This variable aligns with Target 8.8 of SDG Goal 8, which aims to protect labour rights and promote safe and secure working environments for all workers, including migrant workers, women and those in precarious employment.² It reflects the effective enforcement of core labour standards such as freedom of association, collective bargaining, nondiscrimination in employment and the elimination of forced and child labour. The NEET rate is another independent variable, drawn from ILO reports,³ and corresponds to Target 8.6 of SDG Goal 8.⁴ It represents a critical measure of youth exclusion from labour markets and is directly associated with sustainable development and social cohesion.⁵ The third independent variable is labour productivity, also sourced from ILO data, which corresponds to Target 8.2 of SDG Goal 8.⁶ It is calculated as the annual growth rate of output per worker and reflects the efficiency and technological advancement of the labour force.⁷ Lastly, the unemployment rate was used as an independent variable in alignment with Target 8.5,⁸ which addresses full and productive employment and decent work for all. It is measured as the ratio of unemployed individuals to the total labour force and serves as a key economic and social indicator within the SDG framework (UNSC 2018).

3.2 | Data Analysis Method

This study aims to evaluate the causal relationships between variables related to employee conditions and SDGs before and after the COVID-19 pandemic and to generate predictive insights. The research adopts both symmetric and asymmetric analytical approaches, grounded in the realist paradigm, which emphasizes uncovering the contextual mechanisms underlying causal relationships (Huberman and Miles 1985). In line with this philosophical stance, quantitative research techniques were employed—specifically, partial least squares structural equation modelling (PLS-SEM)—to explore complex causal structures among the study variables (Lowry and Gaskin 2014, 123). The analysis was conducted using SmartPLS 3.3.2, which enables covariance-based modelling for the symmetric examination of intervariable relationships (Ringle et al. 2015). In the first phase of the analysis, hypothesis testing, importance–performance map analysis and multigroup analysis were conducted through SmartPLS to assess both the strength and performance of key constructs across subgroups and time periods.

Traditional correlation-based and symmetric analysis techniques often fall short in capturing nonlinear and complex causal relationships among variables (Wu et al. 2014). In response to these limitations, researchers have increasingly adopted asymmetric analysis methods, including qualitative comparative approaches, to explore causality in a more nuanced manner (Maxwell 2004). One such technique is fuzzy set qualitative comparative analysis (fsQCA), which examines how various combinations of causal conditions influence an outcome variable (Rihoux and Ragin 2008). fsQCA enables researchers to interpret cases holistically, articulate theoretical arguments and better understand complex policy processes (Fischer and Maggetti 2017, 347). Unlike traditional methods, fsQCA employs Boolean algebra to assess complex causal configurations, including the presence or absence of specific condition variables (Invernizzi et al. 2020; Çizel et al., 2022, 558). As the application of fsQCA in the context of sustainable development remains relatively limited, this study seeks to contribute to the growing but still evolving literature on the subject (Sedita et al. 2022). While PLS-SEM is effective in testing linear, symmetric relationships and identifying the explanatory power of labour market variables on SDG performance before and after the pandemic, it is inherently limited to symmetrical associations. In contrast, fsQCA—guided by a configurational and cluster-theoretical approach—allows for the identification of multiple causal pathways, including both the presence and absence of conditions leading to the achievement or nonachievement of the SDGs. Accordingly, this study employs fsQCA 4.0 to conduct a comprehensive asymmetric analysis. This includes steps such as calibration, necessity testing, truth table construction, logical minimization and country-level analysis to test the proposed hypotheses. The combined use of both symmetric (PLS-SEM) and asymmetric (fsQCA) methods enhances the theoretical depth and explanatory richness of the findings, offering valuable configurations and insights for future research and model development. Overall, this study focuses on examining the working and employment conditions that influence SDG performance in both the prepandemic and pandemic periods through a dual-method approach.

4 | Empirical Findings

4.1 | PLS-SEM Analysis Results

The explanatory power of the proposed model—specifically its ability to account for the relationship between exogenous and endogenous variables before and during the pandemic—is assessed using the coefficient of determination (R^2). According to Hair et al. (2011), an R^2 value of 0.75 or higher indicates a substantial level of predictive accuracy, suggesting that the model provides a strong explanation of variance in the dependent variable.

Based on the results illustrated in Figures 2 and 3, the model demonstrates a strong explanatory power in the prepandemic period, with the independent variables accounting for 81.3% of the variance in the dependent variable. Although a slight decrease was observed during the pandemic period, the explanatory power of the model remained high, with the independent variables explaining 79.3% of the variance. These findings confirm the robustness of the model across both time periods.

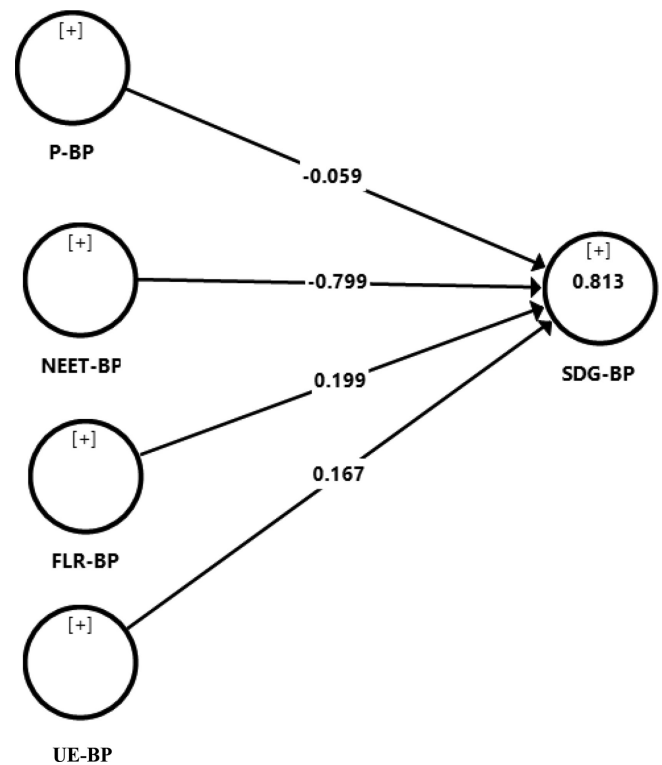


FIGURE 2 | Structural model before COVID-19.

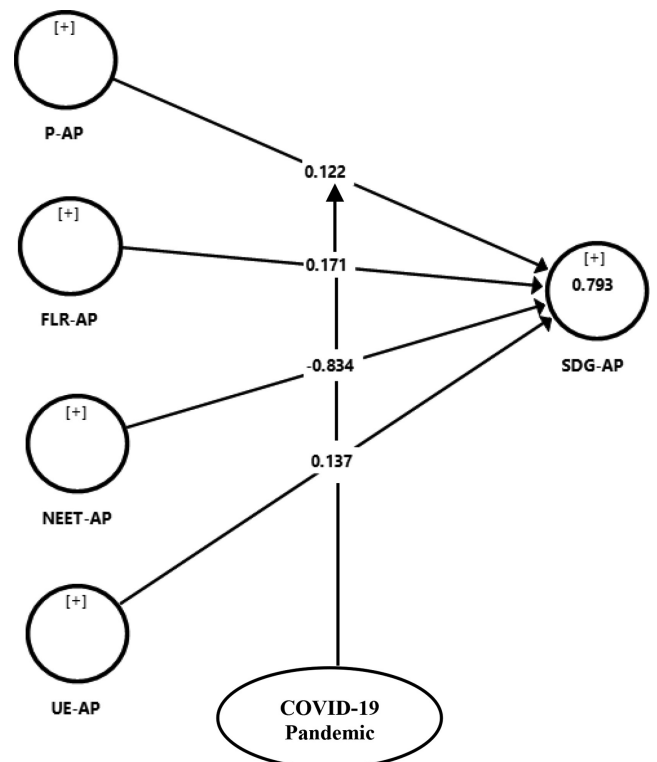


FIGURE 3 | Structural model with pandemic effect. FLR: fundamental labour rights; NEET: share of youth aged 15–24 not in employment, education or training (NEET); P: productivity (Labour); UE: unemployment rate; SDG: Sustainable Development Goals; BP: before pandemic; AP: after pandemic.

Path coefficients and hypothesis test results for the PLS-SEM model were obtained using a nonparametric resampling procedure. Specifically, the bootstrapping method with 5000 resamples was employed to estimate standard errors and test the statistical significance of the paths, based on the 0.05 significance threshold recommended by Hair et al. (2016). The results are presented in Table 1. Path coefficients play a crucial role in assessing the magnitude and direction of relationships between constructs. An Original Sample (O) value approaching -1 or 1 indicates a strong relationship between the corresponding independent and dependent variables (Garson 2016).

As presented in Table 1, the relationship between FLR and SDG was found to be significant and positive during the prepandemic period. However, this relationship became statistically insignificant during the pandemic, suggesting a disruption in the influence of labour rights on sustainable development outcomes under crisis conditions. In contrast, the NEET variable demonstrated a consistently significant and negative relationship with SDG performance across both time periods. Notably, NEET emerged as the most influential variable in the model, with its negative effect becoming even more pronounced during the pandemic. Regarding P, its association with SDG was not significant before the pandemic. However, following the onset of COVID-19, this relationship became significant and positive, indicating that productivity gains contributed more directly to sustainable development outcomes in the postpandemic context. Finally, UE showed a slightly positive and statistically significant impact on SDG performance in both time periods, suggesting that moderate levels of unemployment may not have hindered, and might even have been accompanied by, compensatory policy measures that supported SDG-related progress.

4.2 | FsQCA Analysis

4.2.1 | Calibration of Raw Data

The first step in conducting fsQCA involves the calibration of variables based on membership scores, which indicate the degree to which each case belongs to a particular set (Meuer 2014). Calibration transforms raw data into set membership values

ranging from 0 (full nonmembership) to 1 (full membership). In this study, we followed the guidelines proposed by Ragin (2009, 71) and applied three anchor points for calibration: the minimum, mean and maximum values of each variable. These thresholds allow for a standardized classification of the variables expected to influence SDG performance both before and during the pandemic, ensuring methodological consistency across conditions and time periods.

The variable values presented in Table 2 were calibrated to fall within a 0 to 1 range, enabling the construction of subset relationships based on membership scores. This transformation allows for the application of necessity, consistency and coverage analyses within a set-theoretic framework. Through this process, the extent to which specific conditions—or combinations of conditions—are linked to the outcome variable (SDG performance) can be systematically evaluated. In particular, this approach enables the identification of necessary and sufficient conditions, as well as the degree of consistency with which these conditions relate to the outcome. As noted by Kraus et al. (2018, 18), such analyses are essential

TABLE 2 | Calibration analysis.

Variables	Full membership threshold	Average value	Full membership lower limit threshold
PBP	9.39	1.470	−2.953
PAP	4.727	0.715	−2.523
SDGBP	85.2	71.284	52.267
SDGAP	85.403	73.284	53.420
UEBP	24.583	7.179	0.773
UEAP	28.87	7.624	0.967
FLRBP	0.951	0.621	0.229
FLRAP	0.949	0.625	0.233
NEETBP	36.86	17.321	3.143
NEETAP	35.069	17.390	3.0397

TABLE 1 | Hypothesis testing and path analysis.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	p values	H	Results
FLR-BP → SDG-BP	0.199	0.205	0.093	2.150	0.032	H1a	Supported
FLR-AP → SDG-AP	0.171	0.181	0.099	1.731	0.083	H1b	Not supported
NEET-BP → SDG-BP	−0.799	−0.796	0.085	9.415	0.000	H2a	Supported
NEET-AP → SDG-AP	−0.834	−0.827	0.102	8.167	0.000	H2b	Supported
P-BP → SDG-BP	−0.059	−0.058	0.069	0.854	0.393	H3a	Not supported
P-AP → SDG-AP	0.122	0.122	0.052	2.332	0.020	H3b	Supported
UE-BP → SDG-BP	0.167	0.167	0.057	2.910	0.004	H4a	Not supported
UE-AP → SDG-AP	0.137	0.136	0.061	2.258	0.024	H4b	Supported

for establishing set-theoretic consistency, a core principle in fsQCA methodology.

4.2.2 | Necessity Analysis

In fsQCA, a necessary condition refers to a factor that must be present for the outcome to occur. The method enables researchers to identify configurations of causal conditions that are either necessary or sufficient for producing the observed outcome (Greckhamer et al. 2018). A necessary condition is one that must exist within the theoretical framework for the outcome to be realized. According to Ragin et al. (2006), a consistency threshold of 0.90 is typically used to determine whether a condition is necessary, while a coverage threshold of 0.50 is considered acceptable for assessing its empirical relevance. However, some scholars propose a slightly lower consistency threshold—around 0.80—for exploratory studies (Dul 2016; Vis and Dul 2018; Woodside 2016). In this study, a necessity analysis was conducted by evaluating the presence and absence (~) of each condition relative to the presence or absence of the outcome variable (SDG performance). The results, including the consistency and coverage scores, are presented in tabular form, highlighting the variables with substantially high necessity values.

Based on the necessity analysis results presented in Table 3, the key necessary and sufficient conditions for achieving SDG performance both before and after the COVID-19 pandemic are identified as follows: the absence or low level of UE, the presence of FLR and the absence of NEET. Following the onset of the pandemic, a slight decline was observed in the necessity scores for FLR and the absence of NEET, indicating a marginal reduction in their criticality as necessary conditions. Conversely, the necessity of the absence of UE increased modestly, suggesting a slightly stronger role in explaining SDG achievement under pandemic conditions. The annual growth rate of real GDP per employed person was identified as a sufficient but not necessary condition for SDG performance. Its necessity score decreased slightly after the pandemic, indicating

that while it contributes to achieving SDG outcomes, it is not essential in all configurations. Importantly, all analysed conditions demonstrated coverage values above the established threshold, affirming their empirical relevance. With regard to the absence of SDG performance, the analysis revealed that the presence of NEET and the absence of FLR functioned as both necessary and sufficient conditions across both time periods. These findings remained stable, with no significant changes in their necessity or coverage levels after the pandemic. In contrast, the absence of UE was found to be sufficient but not necessary, and its contribution remained consistent across the prepandemic and postpandemic contexts. Additionally, a decline in the necessity value was observed for the absence of labour productivity (P) following the pandemic, suggesting a reduced explanatory role in configurations leading to the non-achievement of SDG targets.

4.2.3 | Minimization and Truth Table Analysis

The second step in conducting fsQCA is the truth table analysis, which is used to assess whether combinations of causal conditions form subsets of the outcome set. This process generates 2^n possible configurations, where n represents the number of condition variables. In this study, with four condition variables, a total of $2^4 = 16$ causal combinations were generated for each outcome condition (presence or absence of SDG), resulting in 32 configurations per time period. Because the analysis was conducted separately for the prepandemic and pandemic periods, a total of 64 configurations were evaluated. To ensure analytical clarity and parsimony, combinations with a raw consistency score below 0.80 were excluded through the default deletion and coding functions provided by the fsQCA software. Consistent with the recommendations of Rihoux and Ragin (2008), a minimum consistency threshold of 0.75 was applied to identify configurations with a reliable association between causal conditions and the outcome. This procedure allows for the identification of meaningful patterns in the data and serves as the basis for the next step: logical minimization of the configurations.

TABLE 3 | Necessity analysis.

Before pandemic			After pandemic	
Outcome variable: SDG				
Condition variables	Consistency	Coverage	Consistency	Coverage
~P	0.776	0.737	0.693	0.721
~UE	0.819	0.711	0.838	0.759
FLR	0.865	0.885	0.837	0.893
~NEET	0.903	0.890	0.877	0.908
Outcome variable: ~SDG				
Condition variables	Consistency	Coverage	Consistency	Coverage
~P	0.743	0.629	0.703	0.602
~UE	0.776	0.601	0.778	0.579
NEET	0.875	0.889	0.8921	0.857
~FLR	0.874	0.853	0.877	0.8158

The results in Table 4 show that the outcome is not solely affected by one condition, but rather by a complex combination of conditions. After applying a minimization to the truth table, 64 possible combinations were reduced to 54 combinations for analysis. The next step involves analysing the possible configurations of conditions that arise.

The results presented in Table 4 indicate that the outcome is not determined by any single causal condition, but rather emerges from complex configurations of multiple conditions. Following the logical minimization process applied to the truth table, the initial set of 64 potential configurations was reduced to 54 viable combinations for further analysis, after excluding inconsistent and empirically irrelevant cases. The subsequent step involves identifying and interpreting the causal configurations—that is, combinations of condition variables—that are associated with the presence or absence of SDG performance. These configurations form the basis for drawing set-theoretic conclusions about how different paths can lead to the same or different outcomes.

4.2.4 | Configuration Analysis

The primary aim of this study is to determine whether multiple causal configurations, rather than single conditions, influence SDG performance—consistent with the set-theoretic logic underlying fsQCA. These configurations emerge from the truth table minimization process, which enables the identification of distinct combinations of conditions associated with the presence or absence of SDG achievement before and after the pandemic. In conducting configuration analysis, particular attention was given to ensuring an appropriate minimum frequency threshold, as recommended by Ragin (2009), in order to enhance the empirical validity and reliability of the resulting configurations. The configuration analysis yields three types of solution sets: parsimonious, intermediate and complex. Among these, the

intermediate solution was selected for interpretation, as it offers a balanced representation of empirically supported and theoretically plausible combinations of causal conditions. This approach allows for the systematic identification of key paths leading to the outcome, as well as those contributing to its absence (Sedita et al. 2022).

Table 5 presents the causal configurations associated with the presence and absence of SDG performance before and after the COVID-19 pandemic. The analysis incorporates the frequency cutoff criterion to determine valid simplifying assumptions and to exclude configurations lacking sufficient empirical support. In fsQCA, solution consistency reflects the extent to which the causal configuration is a subset of the outcome, while the coverage ratio indicates the proportion of the outcome explained by the configuration. According to Ragin (2009), a solution consistency value of 0.75 or higher signifies a well-fitting model. Similarly, a minimum solution coverage threshold of 0.25 is considered acceptable, as suggested by Schneider and Wagemann (2012). In the prepandemic period, the solution generated a consistency score of 0.819, which exceeds the threshold and indicates a reliable subset relationship between the causal conditions and SDG performance. The corresponding coverage value of 0.900 suggests that the identified configurations explain 90% of the outcome, demonstrating strong explanatory power. However, in the postpandemic period, the configurations identified did not meet the necessary consistency threshold, indicating that the same causal conditions were no longer sufficient to account for SDG performance. This highlights a shift in the underlying dynamics influencing sustainable development outcomes in the aftermath of the pandemic.

The analysis reveals that while the causal conditions were appropriately specified and functionally effective in explaining SDG performance prior to the pandemic, they did not remain necessary for achieving the SDG outcome in the postpandemic

TABLE 4 | Representational truth table.

Before pandemic	P	UE	FLR	NEET	Number	SDG	Raw consistency	PRI consistency	SYM consistency
	0	1	1	0	6	1	0.979	0.917	0.917
	0	0	1	0	12	1	0.970	0.923	0.929
	P	UE	FLR	NEET	Number	~SDG	Raw consistency	PRI consistency	SYM consistency
	0	0	0	1	6	1	0.975	0.890	0.890
	1	1	0	1	3	1	0.9719	0.861	0.861
After pandemic	P	UE	FLR	NEET	Number	SDG	Raw consistency	PRI consistency	SYM consistency
	1	1	1	0	3	1	0.981	0.910	0.910
	1	0	1	0	5	1	0.981	0.948	0.948
	P	UE	FLR	NEET	Number	~SDG	Raw consistency	PRI consistency	SYM consistency
	0	0	0	1	3	1	0.963	0.842	0.844
	1	0	0	1	6	1	0.958	0.814	0.848

TABLE 5 | Intermediate solution.

Before pandemic				After pandemic			
Frequency cutoff: 1 Outcome variable: SDG							
Consistency cutoff: 0.826423				Consistency cutoff: 0.801587			
Config.	Raw cov.	Uniq. cov.	Consist.	Config.	Raw cov.	Uniq. cov.	Consist.
~UE*~NEET	0.782	0.0748	0.901	~P	0.693	0.012	0.721
~P*~NEET	0.710	0.0250	0.942	~UE*~NEET	0.772	0.026	0.924
P*UE*NEET	0.343	0.006	0.812	~UE*~FLR	0.542	0	0.755
P*~UE*FLR	0.540	0	0.890	FLR*~NEET	0.778	0.028	0.977
~P*UE*FLR	0.484	0.001	0.930	~FLR*NEET	0.470	0	0.658
P*FLR*NEET	0.378	0	0.838	UE*FLR	0.483	0.001	0.876
UE*FLR*NEET	0.386	0	0.886	UE*NEET	0.426	0.001	0.725
Solution coverage: 0.901				Solution coverage: 0.957			
Solution consistency: 0.819				Solution consistency: 0.687			
Frequency cutoff: 1 Outcome variable: ~SDG							
Consistency cutoff: 0.877758				Consistency cutoff: 0.809249			
Config.	Raw cov.	Uniq. cov.	Consist.	Config.	Raw cov.	Uniq. cov.	Consist.
~UE*~FLR	0.706	0.036	0.877	~UE*~FLR	0.738	0.013	0.845
~P*~FLR	0.704	0.012	0.875	~P*~FLR	0.646	0.003	0.832
P*NEET	0.613	0.037	0.946	~P*NEET	0.622	0.024	0.920
UE*NEET	0.598	0.022	0.898	P*UE*FLR	0.433	0.003	0.829
Solution coverage: 0.930				~FLR*NEET	0.792	0.020	0.911
Solution consistency: 0.840				UE*NEET	0.645	0.012	0.904
				Solution coverage: 0.945			
				Solution consistency: 0.776			

context. Although the complete set of causal conditions did not fully meet the necessity criteria after the pandemic, subsets of these conditions were still able to account for the outcome with a high consistency value of 0.950, indicating a strong predictive capacity. Regarding the absence of SDG performance before the pandemic, the identified causal configurations yielded a consistency score of 0.840 and a coverage value of 92.91%, suggesting that the selected conditions were sufficient to explain the outcome with a high degree of accuracy. In the postpandemic period, the consistency score for the absence of SDG decreased but remained acceptable at 0.776, which still exceeds the commonly accepted threshold of 0.75. The corresponding coverage value of 94.45% further confirms the explanatory strength of the identified configurations. These results demonstrate that the outcome—whether the presence or absence of SDG—is not driven by single causal factors, but rather by multiple interacting configurations of condition variables. Notably, the causal conditions associated with SDG achievement in the postpandemic period approach the threshold of necessity, yet remain sufficient rather than strictly necessary. Therefore, it is not possible to assert a universal set of conditions that guarantee SDG performance across both periods. Instead, the contextual dynamics of time play a crucial role, indicating that the relevance and impact of causal conditions are contingent on the temporal setting.

Table 6 presents a summary of the Intermediate Solution, which aims to facilitate the interpretation of causal configurations by offering a simplified visual representation. In this table, the symbol ‘●’ denotes the presence or high level of a condition in the configuration, while ‘○’ indicates its absence or low level. Blank cells represent neutrality, meaning that the presence or absence of the condition does not influence the outcome in that specific configuration. The analysis reveals a total of 24 distinct configurations associated with both the presence and absence of SDG performance, covering both prepandemic and postpandemic periods. In the prepandemic configurations for the presence of SDG, it was observed that all condition variables—except for FLR—appeared with varying states (present, absent or neutral), suggesting context-dependent roles. In

contrast, FLR consistently demonstrated a positive association with SDG across all configurations, whether through its presence or neutrality, indicating a relatively stable and favourable effect. In the postpandemic configurations, a noteworthy shift was observed regarding P. While it contributed positively before the pandemic, its presence was no longer observed in postpandemic configurations, with its absence or neutrality now playing a supportive role in achieving SDG outcomes. The results also reveal that, following the pandemic, FLR appeared in both present and absent forms, yet continued to be part of successful configurations. This suggests that while FLR had a consistently strong presence-based influence before the pandemic, its impact became more dependent on interactions with other condition variables afterward. Overall, the findings highlight the complex interplay of causal conditions and emphasize that no single variable functions as a universally dominant driver of SDG performance. Rather, contextual combinations determine outcomes and the effectiveness of specific conditions varies across time periods.

The analysis indicates that the achievement of SDG prior to the pandemic was predominantly influenced by conditions such as P and UE. In contrast, the presence or neutrality of the NEET condition emerged as a significant contributor to the nonachievement of SDG. Similarly, the absence or neutrality of FLR was associated with negative outcomes, highlighting its importance in securing sustainable development progress. In the postpandemic period, the influence of conditions became more dispersed. All condition variables—except NEET—appeared in various forms (presence, absence or neutrality) in configurations associated with SDG failure, suggesting a more complex and less predictable pattern of causality. Notably, even when FLR was present, negative outcomes were observed, indicating that the supportive effect of FLR became conditional on the configuration of other variables. The NEET factor, however, demonstrated a consistently negative influence across both time periods. In approximately half of the configurations, the presence of NEET was directly linked to SDG failure. This persistent pattern underscores NEET's role as a critical barrier to

TABLE 6 | Multifactor FsQCA analysis.

Before pandemic								After pandemic							
Solution (SDG)															
Configurations	1	2	3	4	5	6	7	Configurations	1	2	3	4	5	6	7
P		○	●	●	○	●		P	○						
UE	○		●	○	●		●	UE		○	○			●	●
NEET	○	○	●			●	●	NEET		○		○	●		●
FLR				●	●	●	●	FLR			○	●	○	●	
Solution (~SDG)															
Configurations	1	2	3		4			Configurations	1	2	3	4	5		6
P		○	●					P		○	○	●			
UE	○				●			UE	○			●			●
NEET			●		●			NEET			●		●		●
FLR	○	○						FLR	○	○		●	○		

sustainable development, regardless of the presence or interaction of other condition variables. Overall, the findings suggest that while the impact of certain conditions may vary over time, NEET remains a structurally significant determinant, consistently undermining efforts to achieve SDG goals before and after the pandemic.

The fsQCA technique is employed to cluster countries based on whether they have achieved the SDGs, enabling the identification of configurational patterns rather than isolating the impact of individual variables. This approach allows for the examination of how combinations of high or low levels (presence or absence) of specific condition variables collectively influence SDG performance.

Table 7 presents a set of configurations in which the outcome variable (SDG achievement) is clustered for the prepandemic period. These configurations illustrate the multiple, equifinal pathways through which SDG success was achieved under varying conditions:

- In Configuration 1, SDG was achieved under conditions of low unemployment (UE) and a low NEET rate, indicating favourable labour market dynamics.
- In Configuration 2, SDG success was observed even in the presence of low P, provided that the NEET rate remained low, highlighting the critical role of youth labour market inclusion.
- In Configuration 3, SDG was achieved despite the presence of high UE and NEET, due to high P, underscoring productivity's compensatory role.
- In Configuration 4, the co-presence of P and FLR enabled SDG achievement in the context of low or absent UE, emphasizing the synergistic effect of rights-based and economic conditions.
- In Configuration 5, the presence of FLR alone was sufficient to ensure SDG achievement despite low P and high UE, reflecting the foundational role of institutional labour protections.
- In Configuration 6, P and FLR together supported SDG attainment even in the presence of NEET, showing their buffering effect against youth labour market exclusion.
- In Configuration 7, SDG success was still observed despite high UE and NEET, thanks to the strong presence of FLR, again highlighting its pivotal institutional role.

Table 7 also examines the configurations associated with the achievement of SDG in the postpandemic period. The findings highlight that multiple and diverse configurations can lead to the same outcome, even when the values of individual condition variables differ across cases. This underscores the principle of equifinality in fsQCA, where different combinations of conditions can yield the same result. In the first configuration, SDG is achieved despite the absence of high P, suggesting that other conditions in the configuration compensate for the lack of productivity. In the second configuration, the absence of both UE and NEET proves sufficient for SDG success, highlighting the value of inclusive labour market structures. The third

configuration shows that SDG can still be attained despite low FLR, provided that UE remains low, indicating that employment access can offset institutional limitations. In the fourth configuration, the presence of FLR combined with the absence of NEET supports SDG performance, emphasizing the synergy between labour rights and youth labour inclusion. In contrast, the fifth configuration demonstrates that SDG is attainable even in the presence of NEET and the absence of FLR, suggesting that unmeasured or excluded conditions may still play a positive role in shaping outcomes. Similarly, in the sixth configuration, high UE does not prevent SDG achievement when FLR is present, indicating that strong institutional support may buffer structural labour weaknesses. Finally, the seventh configuration confirms that SDG performance can still emerge despite the simultaneous presence of UE and NEET, again implying that unobserved or external factors may contribute positively to sustainable development outcomes. Collectively, these configurations affirm that no single condition is either necessary or sufficient on its own, and that the interactions among variables, as well as contextual and unmeasured influences, play critical roles in shaping SDG achievements in the postpandemic era.

Table 8 shows the clusters of countries before and after the pandemic, in case SDG is not achieved. Even though the same condition and outcome variables were examined, different configurations emerged where SDG could not be achieved. Before the pandemic, countries in the first configuration had low UE, but the FLR was absent, and SDG was not met. For countries in the second configuration, P and FLR made it impossible to achieve SDG. For countries in the third configuration, despite having P, the NEET factor made it impossible to achieve SDG. Finally, for countries in the fourth configuration, the presence of both UE and NEET factors made it impossible to meet SDG.

Table 8 presents the configurational clusters of countries that failed to achieve the SDGs before and after the COVID-19 pandemic. Despite analysing the same condition and outcome variables, the results reveal distinct causal combinations that led to SDG failure across different periods, underscoring the context-dependent nature of causal complexity. In the prepandemic period, countries in Configuration 1 experienced low UE, yet the absence of FLR was a critical factor contributing to SDG failure, indicating that mere labour market access is insufficient without institutional protections. In Configuration 2, the presence of both P and FLR paradoxically coincided with the nonachievement of SDG. This suggests that, in the absence of other supportive conditions (e.g., low NEET or low UE), even favourable economic and institutional factors may not guarantee sustainable development. Configuration 3 highlights the negative role of NEET, where SDG could not be achieved despite high P. This underscores the significance of youth inclusion in the labour market as a critical component of sustainable progress. Finally, in Configuration 4, the simultaneous presence of UE and NEET created a compounded negative effect, effectively precluding SDG achievement. This configuration reflects a dual structural weakness in both general and youth employment, emphasizing the cumulative burden of labour market exclusion.

In the second stage of the analysis, Table 8 evaluates the configurations associated with the nonachievement of SDG

TABLE 7 | Analysis of countries regarding achieving Sustainable Development Goals.

Sustainable development goals						
Before pandemic						
~UE*~NEET	~P*~NEET	P*UE*NEET	P*~UE*FLR	~P*UE*FLR	P*FLR*NEET	UE*FLR*NEET
Czechia	Japan	Georgia	Romania.	Spain	Senegal	Rwanda
Japan	Belgium	Rwanda	Estonia	Costa Rica	Rwanda	Argentina
Germany	Australia	Türkiye	Hungary	Argentina	Sri Lanka	Costa Rica
Norway	Bolivia	Egypt	Poland	Uruguay	Mauritius	Uruguay
Poland	Spain		Czechia	Serbia		South Africa
Netherlands	New Zealand		Senegal	Finland		
United Kingdom	Finland		Sri Lanka	France		
Bolivia	Netherlands		Mauritius	Canada		
United States	Norway		Croatia	Portugal		
Hungary	Germany		Slovenia	South Africa		
Vietnam	Greece					
Malaysia	Canada					
New Zealand	United Kingdom					
Belarus	Portugal					
Austria	Bulgaria					
Estonia	Denmark					
Australia	Austria					
Denmark	Sweden					
Slovenia	United States					
Croatia	Chile					
After pandemic						
~P	~UE*~NEET	~UE*~FLR	FLR*~NEET	~FLR*NEET	UE*FLR	UE*NEET
Zambia	Czechia	Philippines	Norway	Pakistan	Spain	South Africa
Jamaica	Japan	Belarus	Denmark	Iran Islamic Republic	Rwanda	Jordan

(Continues)

TABLE 7 | (Continued)

~P	After pandemic					
	~UE*~NEET	~UE*~FLR	FLR*~NEET	~FLR*NEET	UE*FLR	UE*NEET
Sri Lanka	Germany	Pakistan	Finland	Egypt	Panama	Colombia
Ecuador	Netherlands	Mexico	Germany	Zambia	South Africa	Rwanda
Spain	Norway	Moldova Republic	Netherlands	Türkiye	Canada	Albania
Mauritius	Poland	Peru	Belgium	Colombia	Chile	Brazil
Mexico	Belarus	El Salvador	Japan	Honduras	Argentina	Türkiye
Jordan	United Kingdom	Thailand	Sweden	Albania	Serbia	Georgia
Kyrgyzstan	Hungary	Bolivia	France	Brazil	Uruguay	Iran Islamic Republic
Belarus	Slovenia	Kyrgyzstan	Slovenia	India	Bosniaand Herzegovina	Bosniaand Herzegovina
Argentina	Australia	India	Austria	Peru	Sweden	Costa Rica
France	Croatia	United States	Spain	Jordan		North Macedonia
Thailand	Denmark	Ecuador	Czechia	El Salvador		Honduras
Philippines	New Zealand	Mongolia	New Zealand	Georgia		Italy
Malaysia	Austria	Dominican Republic	Australia	Dominican Republic		Panama
Bolivia	Malaysia	Malaysia	Uruguay	Italy		Sri Lanka
Moldova Republic	United States	Bulgaria	Croatia	North Macedonia		Argentina
New Zealand	Belgium		Canada	Mexico		Egypt
Greece	Vietnam		Estonia	Philippines		Zambia
Japan	Bulgaria		Portugal	Sri Lanka		Mauritius

TABLE 8 | Analysis of countries regarding failure to achieve Sustainable Development Goals.

~Sustainable Development Goals			
Before pandemic			
~UE*~FLR	~P*~FLR	P*NEET	UE*NEET
Philippines	Iran Islamic Republic	Rwanda	South Africa
Pakistan	Zambia	Egypt	Jordan
Moldova Republic	Albania	Georgia	Bosniaand Herzegovina
Belarus	Jordan	India	Georgia
El Salvador	Honduras	Sri Lanka	Albania
Bolivia	Greece	Türkiye	Brazil
Honduras	Bolivia	Pakistan	North Macedonia
Mexico	Mexico	Philippines	Iran Islamic Republic
Peru	Peru	Indonesia	Türkiye
Kyrgyzstan	Brazil	Dominican Republic	Rwanda
Thailand	Italy	Mauritius	Egypt
Ecuador	Ecuador	Senegal	Colombia
United States	North Macedonia	Mongolia	Argentina
Zambia	United States	Kyrgyzstan	Italy
India	Jamaica		Costa Rica
Malaysia	Colombia		Uruguay
Jamaica	El Salvador		
Vietnam	Bosnia and Herzegovina		
Indonesia			
Mongolia			
After pandemic			
~UE*~FLR	~P*~FLR	P*UE*FLR	~FLR*NEET
Philippines	Zambia	South Africa	South Africa
Belarus	Philippines	Chile	Jordan
			Pakistan
			Iran Islamic Republic

(Continues)

TABLE 8 | (Continued)

After pandemic					
~UE*~FLR	~P*~FLR	~P*NEET	P*UE*FLR	~FLR*NEET	UE*NEET
Pakistan	Belarus	Jamaica	Serbia	Egypt	Colombia
Mexico	Mexico	Mauritius	Bosnia and Herzegovina	Zambia	Rwanda
Moldova Republic	Moldova Republic	Brazil	Sweden	Türkiye	Albania
Peru	Jordan	Sri Lanka		Colombia	Brazil
El Salvador	Bolivia	Italy		Honduras	Türkiye
Thailand	Brazil	North Macedonia		Albania	Georgia
Bolivia	Thailand	Mexico		Brazil	Iran Islamic Republic
Kyrgyzstan	Kyrgyzstan	Panama		India	Bosnia and Herzegovina
India	Greece	Philippines		Peru	Costa Rica
United States	North Macedonia	Argentina		Jordan	North Macedonia
Ecuador	Ecuador	Ecuador		El Salvador	Honduras
Mongolia	Italy	Rwanda		Georgia	Italy
Dominican Republic	Sri Lanka	Senegal		Dominican Republic	Panama
Malaysia	Malaysia			Italy	Sri Lanka
Bulgaria				North Macedonia	Argentina
				Mexico	Egypt
				Philippines	Zambia
				Sri Lanka	Mauritius

in the postpandemic period. The findings reveal a variety of causal pathways that differ from the prepandemic configurations, further emphasizing the temporal dynamics of causal complexity in fsQCA. In Configuration 1, despite low UE, the absence of FLR was sufficient to prevent SDG achievement, underscoring the enduring role of institutional labour protections. Configuration 2 demonstrates that the simultaneous absence of both P and FLR leads to SDG failure, suggesting that economic efficiency and institutional support are both necessary—though not individually sufficient—for sustainable development in a postpandemic context. In Configuration 3, low P combined with high NEET levels emerges as a key barrier to SDG achievement, reinforcing the importance of productivity and youth employment as joint determinants. Configuration 4 shows that even when P and FLR are present, the persistence of high UE can still prevent SDG success, indicating that macro-level institutional and economic factors may be insufficient without inclusive employment outcomes. In Configuration 5, SDG is not achieved under conditions of NEET presence and FLR absence, a combination that reflects both structural and institutional labour market deficiencies. Finally, Configuration 6 reveals that the joint presence of NEET and UE is consistently associated with the nonachievement of SDG, reaffirming their cumulative negative effect. Collectively, these postpandemic configurations differ in significant ways from their prepandemic counterparts. While some patterns persist—particularly the negative influence of NEET—others shift, indicating that the causal architecture underlying sustainable development outcomes is sensitive to changing global contexts, such as those introduced by the pandemic.

5 | Discussion and Conclusion

This study aimed to identify the key factors contributing to the achievement of the SDGs in UN member states, with a specific focus on comparing pre- and post-COVID-19 periods. The findings indicate that the explanatory power of the model—based on the selected variables—slightly declined from 81.3% before the pandemic to 79.3% during the pandemic period. In the prepandemic context, the cluster-theoretic configurations explained 90% of SDG presence and 92% of SDG absence. Interestingly, these explanatory rates increased in the postpandemic period, reaching 95.6% for the presence and 94.4% for the absence of SDG. However, despite the increase in overall explanatory capacity, the study reveals that the causal conditions that were sufficient to account for SDG success before the pandemic lost their explanatory adequacy during the pandemic. This suggests a temporal shift in causal dynamics, whereby pre-existing configurations are no longer sufficient in the face of global crises such as COVID-19. As a result, the study underscores the necessity of incorporating alternative or additional condition variables to fully capture the postpandemic realities affecting SDG outcomes. The findings emphasize the importance of context-sensitive, dynamic analyses in understanding the evolving determinants of sustainable development.

One of the additional factors that warrants consideration in the context of SDG performance is the rate of working

poverty across countries. The share of the working poor in total employment is widely recognized as a critical indicator of inclusive and productive employment (Fapohunda 2012; Georgescu and Herman 2019). Working poverty refers to a condition in which individuals, despite being employed, earn incomes insufficient to lift themselves and their households above the poverty line and to secure decent living standards (Joassart-Marcelli 2005). In the literature, poverty is consistently identified as a key obstacle to the successful realization of SDG targets. Even the environmental dimensions of sustainable development—such as those related to climate action and ecosystem preservation—can be adversely affected by poverty-related pressures, as limited resources may constrain environmentally responsible behaviours and policy implementation (Schleicher et al. 2018). In this regard, poverty alleviation is widely considered a prerequisite for sustainable development and global justice (Cimadamore 2016; Liu et al. 2015). Although the SDGs ambitiously aim to eradicate extreme poverty by 2030, evidence suggests that the COVID-19 pandemic has reversed much of the progress made in previous years, intensifying the negative impact of poverty on sustainable development (Zhu et al. 2022). Interestingly, however, the structural results of our study reveal a positive—albeit modest—relationship between poverty and SDG performance in the postpandemic period. This paradox may be attributed to several factors. First, the findings suggest that the role of poverty as a determining factor in SDG achievement may have been eclipsed by other, more urgent postpandemic challenges. Second, a temporary increase in poverty rates might coincide with reduced inflationary pressures, which can stimulate short-term economic activity—particularly in growth-centred SDG indicators. Nevertheless, this relationship must be interpreted with caution, as inflation disproportionately affects the poorest segments of society and can ultimately undermine progress across multiple SDG domains (Paul and Sharma 2019). Additionally, cluster-theoretic results show that the positive effect of low poverty on SDG performance weakened after the pandemic, indicating a changing causal structure. These findings reinforce the importance of incorporating additional labour market and social protection variables—such as job security, working conditions and access to benefits—into postpandemic analyses of sustainable development. Since the early 2000s, global working poverty rates had been on the decline; however, the COVID-19 crisis marked the first reversal of this trend, with a noticeable rise in working poverty levels (ILO 2022). Scholars argue that this increase is strongly associated with vulnerable and insecure employment, including informal, temporary and part-time jobs lacking adequate social protection (Georgescu and Herman 2019; Arnanía-Kepuladze et al. 2021). Pandemic-induced disruptions—such as job losses, informalization and unsafe working environments—further contributed to this trend. Moreover, given the direct relationship between labour productivity, national income and individual earnings (Day et al. 2019), declining productivity during the pandemic likely exacerbated working poverty. Therefore, in the postpandemic recovery period, ensuring decent work conditions—including adequate earnings, regulated working hours, job security and social protection—is essential. Such measures will not only reduce working poverty rates but also position countries to make meaningful progress towards achieving the SDGs (ILO 2022).

The findings of this study revealed an unexpectedly positive relationship between unemployment rates and SDG performance both before and during the COVID-19 pandemic. However, the magnitude of this effect declined during the pandemic period. In the pre-COVID-19 period, the set-theoretic necessity/sufficiency analysis indicated that the absence of unemployment was not a necessary condition, but it was sufficient for the presence of SDG. Although this appears to contradict the structural model, the observation that the absence of unemployment is also sufficient (but not necessary) for the absence of SDG serves to reconcile this inconsistency. This dynamic persisted during the COVID-19 period, albeit with reduced sufficiency of the unemployment condition in explaining the absence of SDG, which aligns more closely with the findings of the asymmetric (fsQCA) model. These results partially contrast with the dominant view in the literature, which emphasizes that high unemployment typically exerts a negative effect on SDG performance—especially in times of crisis. For example, Shulla et al. (2021) note that the pandemic threatens progress towards the 2030 SDG targets, particularly SDG 8 and call for robust employment protection policies. Similarly, Fagbemi (2021) finds that COVID-19 intensified Nigeria's existing unemployment challenges, further hindering sustainable development. Tjahjanto et al. (2023), in a study on Indonesia, show that reducing unemployment directly contributes to SDG advancement, while Siddiquee et al. (2022), drawing from Okun's law, recommend long-term policy strategies in Asian countries to address the inverse relationship between unemployment and sustainable development. Notably, this latter study also highlights that country-specific differences must be taken into account—an observation that supports the country-level clustering and configurational logic used in the present research. The unexpected positive effect of unemployment on SDG performance in this study may be attributed to two primary factors. First, unemployment rates may be underreported or distorted for political reasons, leading to data inaccuracies that compromise the validity of the observed relationships. Second, high levels of informal and unregistered employment—common in many developing economies—may result in misleading unemployment statistics, thereby skewing the actual link between employment conditions and SDG outcomes (ILOSTAT 2019; Sun 2023). Therefore, to ensure accurate and reliable assessments of sustainable development, it is essential to address the issue of informal employment. Eliminating or reducing unregistered work not only improves data quality but also contributes to achieving more inclusive and equitable labour markets—key pillars of sustainable development.

One of the key findings of this study is the identification of a negative relationship between the NEET and SDG performance. This result is well aligned with the existing literature, which widely acknowledges the inverse association between high NEET levels and the realization of SDGs. The increasing prevalence of evidence-based research examining the role of NEET in shaping sustainable development outcomes is viewed as a positive step (Berigel et al. 2024). Mussida and Sciulli (2023) emphasize the need to understand the fragile socioeconomic status of NEET youth in relation to SDG 8 (Decent Work and Economic Growth) and propose tailored policy interventions. Likewise, Quinlan-Davidson et al. (2023), in a study on Canada, document how the COVID-19 pandemic has disrupted education and labour market opportunities, leading to an increase in

NEET rates and further threatening sustainability outcomes. Verick (2024) warns that the deterioration of youth labour market participation during the pandemic could have long-term consequences, including a spike in NEET prevalence. In line with this, Puiu (2020) and Cieslik et al. (2022) highlight the importance of monitoring NEET trends and devising country-specific responses to mitigate their effects on sustainable development, particularly in vulnerable regions like sub-Saharan Africa. The findings of this study reinforce these concerns. The absence of NEET emerged as the only necessary condition for the achievement of SDG, a result that was consistently confirmed through asymmetric fsQCA analysis. Although the necessity of NEET absence slightly decreased during the COVID-19 period, its sufficiency increased, confirming its central role. Moreover, the presence of NEET was found in all configurations associated with SDG failure, both before and during the pandemic. This indicates that NEET is a structurally embedded obstacle to sustainable development and must be prioritized in both policy and academic discourse. From a macroeconomic perspective, high NEET rates represent a waste of human capital and hinder the long-term growth potential of economies (Picatoste and Rodriguez-Crespo 2021). Adeosun et al. (2022) argue that youth should be viewed as a strategic investment, and reducing NEET rates can be an effective path to economic growth and poverty reduction. Aina et al. (2021) propose active labour market policies (ALMPs) as a promising tool to combat NEET, and the ILO (2022) recommends a range of postpandemic strategies including:

- wage subsidies targeting young workers,
- public employment programmes,
- social protection and income support,
- expanded access to education and reskilling programmes,
- investment in youth entrepreneurship.

In addition to economic measures, improving social cohesion and fostering inclusive development are essential for reducing NEET rates (Ruesga-Benito et al. 2018). Youth-focused programmes, such as the European Youth Guarantee, offer a model by providing employment, training or apprenticeship opportunities to individuals under 25 within four months of leaving formal education or becoming unemployed (Tamesberger and Bacher 2020). However, as Aina et al. (2021) note, such programmes must be part of a systemic transformation in how countries manage the school-to-work transition. The costs of inaction are significant. If left unaddressed, high NEET rates can lead to chronic unemployment, persistent poverty, social exclusion, mental health issues and delayed independence (Cieslik et al. 2022; Ruesga-Benito et al. 2018). Furthermore, NEET youth are often linked to rising crime rates, illegal activities and social instability (Adeosun et al. 2022), posing serious challenges to social safety and long-term sustainability.

Another key finding concerns the role of FLR in promoting the achievement of SDGs. According to the structural model, there was a significant and positive relationship between FLR and SDG performance prior to the COVID-19 pandemic. This result aligns with the literature, which highlights the critical importance of strengthening labour rights—originally

emphasized in the Millennium Development Goals—as a central component of the UN 2030 Agenda. Rather than focusing solely on market-oriented economic growth, the promotion of decent work and labour protections is viewed as a vital strategy for realizing the SDGs (Frey and MacNaughton 2016). Particularly during periods of economic crisis, recession or health emergencies, state-level protection of labour rights plays a vital role in closing development gaps and ensuring inclusive recovery (MacNaughton and Frey 2015). Supporting this view, Arthanti and Pramudhita (2020) found that the COVID-19 pandemic adversely affected labour rights in Indonesia, thereby undermining the country's progress towards sustainable development. Similarly, ensuring occupational safety and securing employee rights—especially during times of instability—has been recognized as a crucial factor in advancing SDG targets (Singla et al. 2023). The literature widely agrees that the realization of labour rights not only addresses essential human needs but also contributes indirectly to the broader sustainability agenda (Akram 2019). In this regard, our finding reinforces established scholarly perspectives, while also offering empirical insights into how this relationship evolved with the onset of the pandemic. As revealed in the analysis, the previously significant link between FLR and SDG performance lost its effect during the COVID-19 period. In other words, FLR ceased to be a meaningful predictor of SDG outcomes under pandemic conditions. The cluster-theoretic analysis confirms this shift: while FLR was previously close to the sufficiency threshold for SDG presence, its necessity value declined notably during the pandemic. From an asymmetric (fsQCA) perspective, the absence of FLR consistently approached the necessity threshold for SDG failure, both before and during COVID-19. Although FLR was not a strong necessity in the symmetric model, fsQCA revealed that its absence frequently appeared in configurations where SDG outcomes were not achieved. Before the pandemic, FLR was generally observed as neutral or absent in both positive and negative configurations. In contrast, during the pandemic, configurations emerged where FLR appeared in all three states—present, absent and neutral—within both SDG success and failure pathways, reflecting a more diffuse and unstable pattern. While previous studies predicted that strengthening labour rights would have a positive effect on SDG progress (MacNaughton and Frey 2015; Frey and MacNaughton 2016), it was also anticipated that the pandemic would exacerbate labour rights violations and reduce institutional capacity, potentially reversing this relationship (Osundina 2020). Although our findings do not confirm a statistically significant reversal, they suggest that the role of FLR in promoting SDGs weakened under the pressures of the pandemic. Going forward, it is essential for countries to reinforce their commitment to SDG Target 8.8 by aligning domestic policies with the rights and protections articulated in international labour conventions. The implementation and enforcement of these rights depend on binding legislative frameworks, supported by transparent accountability systems. Such systems should ensure regular monitoring and public reporting of labour rights violations by both state and private actors, enabling workers to claim and protect their rights. Legal safeguards are especially critical in crisis contexts, where they help to stabilize incomes, prevent job losses and maintain safe working environments. Ultimately, embedding labour rights into national

SDG strategies is not only a matter of social justice but a strategic necessity for building resilient and equitable societies (Gammage and Stevanovic 2019; Ahsany et al. 2020).

The findings regarding P reveal a noteworthy shift between the pre- and post-COVID-19 periods. Before the pandemic, labour productivity exhibited an insignificant—and even slightly negative—relationship with SDG performance. However, during the COVID-19 period, this relationship transformed into a significant and positive one. From a set-theoretic perspective, the absence of labour productivity was not a necessary condition for achieving SDGs before the pandemic, yet it was deemed sufficient—a somewhat counterintuitive finding. During the pandemic, this sufficiency weakened, and there was also a marked decrease in the necessity value, indicating that the explanatory role of labour productivity evolved under the pressures of the global crisis. In the prepandemic period, the absence of labour productivity aligned more consistently with configurations associated with the absence of SDG performance, and again, this was observed as a sufficient condition. During the pandemic, however, the sufficiency and necessity values of this condition slightly declined, suggesting a more nuanced and less stable relationship. Several factors may explain this shift. One explanation is the change in average working hours, which likely influenced the dynamics of labour productivity. According to Vries et al. (2021) and He et al. (2022), reduced working hours during the pandemic may have increased productivity per employee by concentrating output among a smaller, more efficient workforce. This is consistent with Fitzgerald's (1996) labour demand model, which proposes that shortening average working hours can lead to increased productivity per unit of labour. Another key factor is the temporary suspension of activity in low-productivity sectors—such as hospitality, retail and informal services—during the pandemic. As these sectors ceased operations, national averages for productivity increased due to a shift in workforce composition (ILO 2021). However, by late 2022, as these sectors gradually resumed activity, this composition effect began to reverse, and productivity growth slowed down (ILO 2023). Looking ahead, postpandemic recovery strategies should focus on long-term productivity enhancements. Countries and enterprises should invest in workforce upskilling, technological innovation, infrastructure improvements and organizational efficiency (ILO 2021). This approach aligns with the perspective that stable labour productivity growth constitutes an economic law of sustainable development (Fedulova et al. 2019). By increasing labour productivity, countries can not only foster sustainable economic growth but also enhance their resilience against external shocks, particularly in a volatile global economy (Day et al. 2019). Thus, productivity gains must be viewed not merely as a consequence of structural changes during crises, but as a strategic objective for SDG success in the postpandemic world.

5.1 | Theoretical Implications

This study offers valuable insights into the impact of the COVID-19 pandemic on the progress of the SDGs, which UN member states have committed to achieving by 2030. Specifically, the research examines the causal relationships

between SDG performance and key decent work indicators—namely NEET rates, fundamental labour rights and labour productivity. These indicators are widely recognized by international organizations such as the UN and ILO as essential components of inclusive and sustainable development. By comparing these relationships across two distinct time periods—the pre-COVID-19 period (2017–2019) and the COVID-19 period (2020–2022)—the study reveals how the pandemic has reshaped the dynamics between labour market conditions and sustainable development outcomes. Through this comparative and causal lens, the study identifies both continuities and structural shifts in the effectiveness of labour-related indicators in contributing to SDG achievement. Overall, the findings contribute meaningfully to both the theoretical understanding of SDG-labour linkages and the practical policy agenda, offering evidence-based guidance for shaping postpandemic development strategies.

The structural results presented in Table 2 reveal a notable shift in the influence of employee rights on SDG performance: while labour rights had a significant impact prior to the pandemic, this relationship became statistically insignificant during the COVID-19 period. This finding offers a compelling avenue for future research, highlighting the need for deeper inquiry into the evolving role of employee rights in sustainable development. Similar temporal variations were observed in the effects of labour productivity and unemployment rates. Labour productivity, which was insignificant before the pandemic, gained statistical significance in the postpandemic period, indicating its growing relevance to SDG advancement. Likewise, unemployment rates—previously unimportant—emerged as a more prominent variable after the pandemic. Interestingly, the finding that rising unemployment may positively correlate with SDG outcomes in the postpandemic context represents a novel contribution of this study, challenging conventional theoretical assumptions. Furthermore, the analysis suggests a shift in emphasis from the quantity of employment to the quality of employment, as reflected in the increased significance of labour productivity. This underscores the rising importance of employee efficiency and skill level—rather than sheer employment numbers—for the realization of SDG targets, and sets the stage for a new research agenda focused on human capital development. In contrast, NEET rates have continued to rise following the pandemic, presenting a growing barrier to SDG progress. As a result, theoretical work on reducing NEET levels must translate into practical interventions, particularly in light of its consistent negative effect on sustainable development. According to the necessity and sufficiency analysis reported in Table 3, each of the variables under consideration warrants further theoretical exploration. Meanwhile, the configurational findings presented in Tables 7 and 8 provide comparative insights into the conditions that supported or hindered SDG performance across countries before and after the pandemic. These findings offer a valuable foundation for future regional and country-specific studies, particularly in identifying the contextual determinants of SDG achievement. They also highlight the need for more nuanced, theoretically grounded investigations into why certain countries succeed or fall behind in meeting their SDG commitments, thereby opening new pathways for both scholarly research and policy development.

This study makes a significant theoretical contribution by identifying the necessary and sufficient conditions for achieving the SDGs both before and during the COVID-19 pandemic. In doing so, it goes beyond the conventional approach in the literature, which often relies on directional hypotheses or linear predictions (Edwards and Berry 2010). Instead, it adopts a configurational perspective, revealing how specific condition variables—such as unemployment, NEET rates, labour rights and productivity—either facilitate or inhibit SDG attainment. By analysing these conditions through both structural and asymmetric (fsQCA) models, the study uncovers how their impact varies across different causal configurations, depending on contextual and temporal dynamics. It not only identifies which variables are necessary or sufficient for SDG achievement, but also delineates how certain combinations of these variables lead to SDG failure, thus offering a more nuanced understanding of sustainable development pathways. Moreover, the study makes a country-level contribution by applying these findings to individual UN member states included in the sample. Through this, it constructs a systematic framework for identifying country-specific conditions that either support or hinder progress towards the SDGs. This enables policymakers and scholars to determine which variables should be prioritized in national SDG strategies, especially in the postpandemic recovery period. Finally, by revealing multiple viable configurations—rather than a single best path—for achieving the SDGs, the study underscores the importance of contextual sensitivity in development planning. It highlights that external structural factors may interact in complex ways to either promote or obstruct sustainable development, thus expanding the theoretical lens through which SDG success can be understood and advanced.

5.2 | Practical Implications

This study offers both theoretical contributions and practical insights for policymakers, practitioners and international organizations—including UN member states. By identifying the critical and priority conditions necessary for achieving the SDGs, the study provides a strategic framework for countries to assess their current performance and address existing gaps. The country-specific configurations developed in the analysis offer a broader understanding of the factors that require targeted attention, enabling each nation to clearly visualize the structural enablers and barriers to sustainable development. These insights can support governments in revising and aligning their national action plans and policy strategies with the SDG commitments they aim to fulfil by 2030. In doing so, the study not only advances academic understanding of the conditions for SDG success but also serves as a practical roadmap for evidence-based decision-making in the postpandemic development landscape.

First and foremost, employee rights, which were significantly and positively associated with SDG performance before the COVID-19 pandemic, were found to lose their significance in the postpandemic period. This shift suggests a weakening of institutional protections and indicates that restoring and reinforcing labour rights may be necessary to recover their role in sustainable development efforts. The NEET variable, in contrast, maintained its strong and negative impact on SDG outcomes throughout both periods. This persistent

relationship underscores the importance of targeted national policies aimed at reducing NEET rates. Policymakers should prioritize education-to-work transitions, youth employment programmes and social inclusion strategies to mitigate the disruptive effects of youth disengagement on sustainable development. In terms of labour productivity, which was previously insignificant, the postpandemic period marked a clear transition towards a positive and significant relationship with SDG performance. This indicates a shift in focus from the quantity of employment to the quality and efficiency of the workforce. Policymakers should respond by investing in skills development, technology adoption and workforce upskilling, thereby enhancing overall productivity and long-term resilience. A similar pattern was observed with unemployment rates. Although traditionally assumed to be negatively associated with SDG progress, the findings suggest that higher unemployment—when accompanied by shifts in sectoral composition and efficiency—may correlate positively with SDG outcomes in the postpandemic context. This unexpected result supports the view that employee productivity and job quality matter more than simply maximizing employment numbers. Taken together, the study suggests a reorientation of policy strategies: rather than focusing solely on expanding the size of the workforce, greater emphasis should be placed on improving the effectiveness, rights and skills of existing and future workers to accelerate progress towards the SDGs.

While previous studies in the literature have typically analysed variables in a general context, our research offers a novel contribution through its cluster-theoretic approach, enabling regionally differentiated insights into SDG performance. Tables 7 and 8 present country-specific results, capturing how the relationships between labour market variables and SDG outcomes evolved before and after the COVID-19 pandemic. The key advantage of this approach lies in its recognition that each country follows a unique SDG pathway, which requires tailored policy responses. These configuration-based findings allow policymakers to design context-sensitive strategies by examining their respective national profiles. For example, in Table 7, the first configuration, composed largely of developed and developing countries, indicates that progress towards SDGs was achieved primarily by reducing unemployment and NEET rates. Similarly, the second configuration highlights how reductions in poverty and NEET levels supported SDG advancement, reinforcing the need for continued attention to these variables in the postpandemic period. In the fifth configuration, which also includes both developing and developed countries, SDG progress was achieved despite high unemployment, provided that poverty was low and labour rights were upheld. This suggests that robust institutional protections can mitigate the adverse effects of other structural challenges. Interestingly, the third configuration, composed solely of developing countries, shows that even in the presence of high unemployment, high NEET rates and concentrated poverty, SDG progress was still observable—indicating that alternative enabling factors may be at play and warrant further exploration. In the fourth configuration, some developing countries achieved SDG progress through a combination of low unemployment, adequate labour rights and resilience in the face of poverty, suggesting that focusing on employment quality and rights-based governance yields positive development outcomes. The seventh configuration

offers another compelling case: in certain developing countries, high unemployment and NEET rates were counterbalanced by strong labour protections, which supported SDG advancement. Likewise, in the sixth configuration, composed of several underdeveloped countries, SDG progress was driven primarily by ensuring labour rights, even in the presence of high poverty and NEET levels. Taken together, these prepandemic configurations provide a valuable reference for postpandemic policymaking. Countries must examine not only the reasons for SDG stagnation or regression but also identify the leverage points—such as labour rights, NEET reduction or employment quality—that can reactivate SDG momentum. By doing so, they can design more resilient, inclusive and contextually relevant strategies to meet their 2030 commitments.

In the medium to long term, the extent to which the COVID-19 crisis affects national economies and labour markets will depend largely on factors such as economic specialization, the strength of social protection systems, and the robustness of labour market regulations (Fana et al. 2020). According to Georgescu and Herman (2019), sustainable economic development can be achieved by investing in modern sectors and enhancing the productivity of each economic activity through technological innovation, skills development and corporate talent management. In the postpandemic era, Elavarasan et al. (2022) emphasize the importance of prioritizing renewable energy investments and sustainable technologies. This aligns with the view of Shuai et al. (2024), who argue that economic recovery strategies should target sectors that support long-term growth while minimizing environmental harm. Indeed, the New Climate Economy report predicts that transitioning to more sustainable systems could generate up to 65 million new jobs globally by 2030 (Shulla et al. 2021). A green economic development agenda, centred on a low-carbon growth strategy, is considered essential for simultaneously fostering economic expansion, green job creation and poverty reduction (Pradhan et al. 2021; Shulla et al. 2021; Amin et al. 2023). To effectively address unemployment and rising NEET rates, countries must adopt modern employment policies that promote green jobs within the framework of a green economy (Aceleanu et al. 2015). Recent empirical findings further support this direction. Naqvi et al. (2022) demonstrate that renewable energy production significantly reduces unemployment in European countries over the long run. Similarly, studies by Abbass et al. (2022) and Amin et al. (2023) show that increased investment in renewable energy not only boosts production but also contributes to employment growth and sustainable development. To accelerate this transition, governments can implement policy instruments such as tax incentives, price guarantees, subsidies and accessible financing mechanisms targeting the green energy sector (Naqvi et al. 2022; Abbass et al. 2022). By integrating employment and environmental policies, countries can unlock the potential of the green economy to serve as a major driver of inclusive and sustainable employment growth (Aceleanu et al. 2015).

According to Georgescu and Herman (2019), countries can enhance labour productivity by investing in environmentally friendly, innovation-driven sectors and technologies. Such improvements in productivity and job quality are closely linked to broader processes of structural transformation,

which involve reallocating resources from traditional, low-productivity sectors—such as agriculture and low-value manufacturing—towards modern, high-productivity sectors, including high-value manufacturing, service industries, green jobs and renewable energy. By leveraging their knowledge capital, countries can transition from a factor-driven development stage to one that is efficiency- and innovation-oriented, a critical evolution for achieving the SDGs (Georgescu and Herman 2019). Rather than attempting to restore pre-COVID-19 economic structures, it is both more pragmatic and effective for socio-economic systems to adopt sustainable development pathways that can mitigate the long-term impacts of the pandemic (Pradhan et al. 2021). Ultimately, this transformation depends on countries' collective motivation and political will to truly 'build back better', embracing the opportunity to reshape their economies around sustainability, resilience and inclusion (Lee et al. 2020).

As countries move towards post-COVID-19 economic recovery, it is essential to re-evaluate prevailing employment practices. The pandemic has accelerated the adoption of nontraditional forms of employment, including contract-based work, part-time jobs and gig economy roles. While these arrangements offer flexibility, they are frequently linked to informal labour practices, limited social protection, precarious working conditions and unequal access to opportunities. Such trends pose significant challenges to the realization of decent work for all, one of the core pillars of the SDGs. In this context, it is imperative that governments adopt policies that promote job security, ensure income stability and encourage formal employment registration, thereby fostering more inclusive and resilient labour markets (Webb et al. 2020).

In the aftermath of the COVID-19 pandemic, it is essential for countries to adopt a comprehensive and multidimensional recovery strategy. Such a strategy should encompass not only economic growth and job creation, but also gender equality, poverty alleviation, environmental sustainability and the strengthening of public health systems. As emphasized by Fenner and Cernev (2021), progress towards SDGs must not come at the expense of the health of the planet or the well-being of people. Moreover, the effectiveness of recovery efforts depends on the extent to which policies and programmes are tailored to regional realities, acknowledging the distinct economic, social and environmental contexts of each country or locality (Bieszk-Stolorz and Dmytrów 2023). One-size-fits-all approaches are unlikely to succeed in addressing the nuanced challenges posed by the pandemic and its aftermath. To ensure meaningful and resilient recovery, integrated policy frameworks are required. These should include a well-calibrated mix of monetary, fiscal and labour market interventions that respond to the concrete conditions within each national economy (ILO 2022). Ultimately, the COVID-19 crisis should serve as a catalyst for rethinking development models and investing in more resilient, inclusive and shock-proof societies for the future (Mukarram 2020).

6 | Limitations and Recommendations for Future Studies

Despite the theoretical and practical contributions of this study, it is important to acknowledge its limitations. Findings from

both the structural model and the asymmetric (fsQCA) analysis indicate that the explanatory power of the selected condition variables for achieving the SDGs was reduced during the COVID-19 pandemic. Specifically, the Intermediate Solution in the cluster-theoretic analysis suggests that while the causal conditions were adequate for explaining SDG success in the prepandemic period, they became insufficient under pandemic conditions. This shift underscores the need to consider additional or alternative variables in order to better capture the dynamics influencing SDG outcomes during times of global crisis. In this regard, future research may explore working poverty—a condition that has notably increased during the pandemic—as a critical determinant of sustainable development progress (Georgescu and Herman 2019; Usman and Abubakar 2020). Incorporating such variables could enhance the explanatory robustness of models seeking to understand the evolving landscape of sustainable development in a post-COVID world.

This study analysed data from 68 countries during the prepandemic period (2017–2019) and the COVID-19 period (2020–2022). However, given that there are 193 United Nations member states committed to achieving the SDGs, the findings cannot be considered fully generalizable to all member countries. To obtain more comprehensive and reliable insights, future research should aim to expand the sample size by including a broader range of countries and extending the time frame for analysis. Moreover, future studies could benefit from categorizing countries based on their development status (i.e., developed vs. developing) to assess the differential economic, social and environmental impacts of the pandemic on SDG performance. Such comparative analyses would allow for a deeper understanding of how condition variables operate under varying levels of institutional capacity and economic resilience. As highlighted by Li et al. (2023), the COVID-19 pandemic is likely to exacerbate inequalities between developed and developing countries, particularly with regard to the socio-economic dimensions of the SDGs. Developed countries—armed with stronger policy tools and greater capital reserves—have proven more capable of withstanding external shocks. For instance, Japan and Italy allocated 54.9% and 30.4% of their GDP, respectively, to fiscal stimulus packages in response to the pandemic. By contrast, many African nations, which often lack modern industrial infrastructure and remain vulnerable to global economic interdependencies, were severely constrained. Due to the sharp decline in international demand, these countries were forced to suspend resource exports, leading to substantial setbacks in their progress towards the socio-economic targets of the SDGs. These disparities underscore the need for context-sensitive policy design and further research that takes into account structural asymmetries among countries in global SDG assessments.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

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