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# Global economic uncertainty shocks and macroeconomic dynamics before and after COVID-19: Evidence from Africa and the Americas

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ABSTRACT

Global economic uncertainty has become a central driver of macroeconomic instability, particularly during large-scale crises like the COVID-19 pandemic. This study examines how global uncertainty shocks affect key macroeconomic variables, particularly suicide rates, economic growth, unemployment, and trade openness across 62 countries in Africa, South America, and North America over the period of 2004–2023 as the countries in these regions exhibit the highest uncertainty post-pandemic. Utilising the COVID-19 pandemic as a natural experiment, the analysis distinguishes between pre- and post-pandemic uncertainty-socioeconomic dynamics to assess the bidirectional and cointegrating relationships across regions. The study employs Multiple Linear Regression to capture short-term macroeconomic responses and panel and country-level cointegration techniques to identify long-run relationships between economic uncertainty and macroeconomic variables. Global uncertainty is proxied using the World Uncertainty Index, which captures broad policy, geopolitical, and crisis-related uncertainty affecting expectations and real economic activity. Unlike, existing studies which reveal insights in a particular region or country, the current findings uncover bi-directional relationships in 21 countries post-pandemic, with notable relationships in Algeria, Botswana, Gabon, Guinea, Madagascar, Republic of Congo, Dominican Republic, Mexico, Bolivia, Paraguay. Moreover, long-run cointegration between uncertainty and macroeconomic indicators strengthens in the post-COVID-19 period, particularly in countries of Africa and North America. By analysing countries in the highest uncertainty regions the study contributes to the international macroeconomics literature by providing new evidence on how global uncertainty shocks reshape macroeconomic dynamics across regions with heterogeneous economic structures, offering important implications for macroeconomic stabilisation in an increasingly uncertain global landscape.

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## 1. Introduction

Economic uncertainty is a prominent topic in the decision-making process of organisations and individuals, as it affects investment decisions and consumer spending practices. The nature of economic uncertainty typically impacts socioeconomic factors affecting individuals and societies. The analysis in this study focuses on the COVID-19 pandemic, an infectious disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (WHO, 2025). The disease spread globally, causing an infection fatality rate of approximately 0. 0.15% (Ioannidis, 2021) and worldwide lockdowns, making it one of the most impactful events globally. Lockdown restrictions caused a sharp decline in economic activity, leading to recessions in many countries with an uneven pace of recovery across various sectors. In addition to the economic downturn, the pandemic exacerbated the deterioration of mental health among people compared to the pre-COVID-19 period (Breslau et al., 2021; Pierce et al., 2020). While there was a focus on containing the coronavirus's spread in the general population, much less attention was forthcoming to the psychiatric consequences during the COVID-19 crisis (Sher, 2020). The labour market was negatively impacted by the COVID-19 pandemic, with work severely reduced, leading to substantial income loss (Khamis et al., 2021). Work stoppage reduced working hours, resulting in a spike in unemployment rates. The pandemic was an unexpected event that simultaneously led to the disruption of economies on a global scale. To counter the effects of the pandemic, governments worldwide implemented unprecedented policies, primarily lockdowns, which led to sharp fluctuations in economic uncertainty. These factors make COVID-19 an excellent basis for a natural experiment to identify the effects of a unique and well-documented shock. Fig. 1 illustrates the trend of the World Uncertainty Index (WUI) over 20 years, showcasing significant impacts on South America, Africa, and North America during the post-COVID-19 period. These continents form the basis of this study to identify the interrelationships between economic uncertainty and socio-economic variables.

By focusing on the continent with the highest shifts in economic uncertainty, this study aims to comprehend how the relationships between economic uncertainty, suicide rates, unemployment rates, economic growth, and trade openness have evolved in continents experiencing a spike in uncertainty after the COVID-19 pandemic. Consequently, this study is structured around the following research objectives.

Objective 1: To identify the linear relationship between economic uncertainty and socio-economic variables across the South American, African, and North American continents during the pre-and post-COVID-19 pandemic periods.
Objective 2: To identify the cointegrating relationship between economic uncertainty and socio-economic variables across the South American, African, and North American continents during the pre- and post-COVID-19 pandemic periods.

This study seeks to contribute to the existing literature in the following manner. First, it independently analyses countries from South America, Africa, and North America to examine how COVID-19-related uncertainty impacts socio-economic dynamics. By considering the unique factors that shape each country's socio-economic background, this research provides insights into overcoming pandemic challenges. The study addresses a significant gap in the literature, regarding uncertainty and socio-economic variables in South American, African, and North American countries.

Second, existing studies overlook the pandemic period when analysing the impact of uncertainty on socio-economic variables. This research examines the relationship across three continents by thoroughly analysing the pre- and post-pandemic periods to assess economic disruptions on key variables.

Third, this study utilises the Multiple Linear Regression model to explore the directional relationships within the uncertainty-

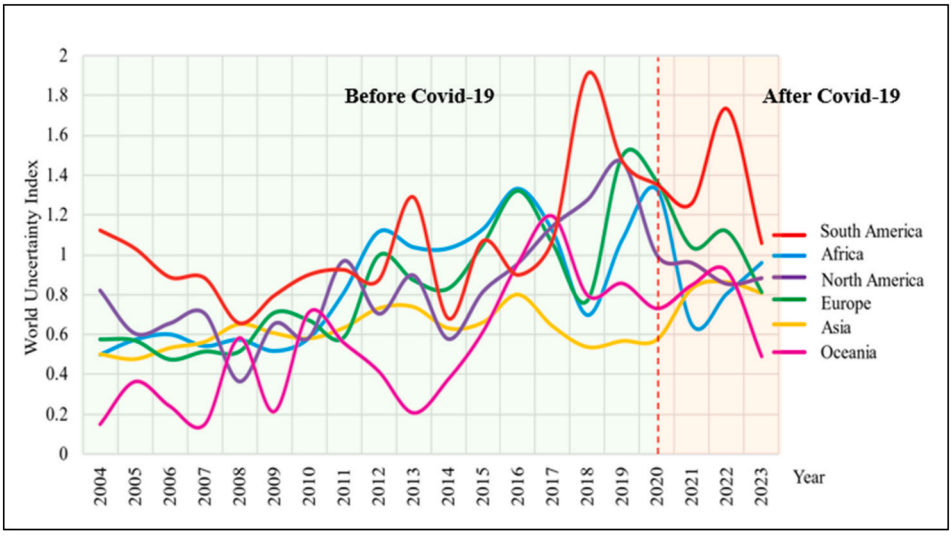


**Fig. 1.** Uncertainty in the world over the years.
Source: The authors' illustrations are based on Ahir et al. (2023) data.

socioeconomic framework across five periods. Cointegration analysis is employed to identify long-term relationships, allowing for comparing short-term and long-term dynamics while assessing structural connections between economic indicators across regions.

Finally, by identifying the directional relationships between economic uncertainty and socio-economic variables, the effect of the pandemic on countries is examined, as are the internal dynamics of countries—particularly unemployment rates, economic growth, and trade openness—which also exacerbate uncertainty. This provides valuable insights for policymakers to enhance resilience to crises and shocks while offering a blueprint for future crisis management. This study contributes to the literature on economic asymmetries by demonstrating how a common global uncertainty shock generates heterogeneous and asymmetric responses in labour markets, mental health outcomes, growth trajectories and trade openness across regions.

The COVID-19 pandemic is not just a health crisis, it was a worldwide uncertainty shock, and this elevated uncertainty amplified the economic volatility present in the studied regions. Yet, the severity of the crisis varied dramatically based on the regions and development levels, with South America facing the most detrimental effect in modern history. The focus on uncertainty on a regional basis allows in uncovering of region-specific uncertainty and how it intensified the cross-country inequalities, allowing us to identify how crisis reshapes socio-economic dynamics across varying contexts. By understanding how each of these countries react to uncertainty before and after a COVID-19 like pandemic can better help in understanding the roles played by each variable in determining economic output.

The paper's ensuing sections are structured as follows: Section 2 provides a comprehensive framework on the theoretical foundations among the studied variables and critically analyses existing literature on the interrelationship between economic uncertainty and socio-economic variables. Section 3 discusses the data and methodology of this study. Section 4 presents the empirical findings along with a comprehensive discussion. Section 5 concludes the study by providing policy implications for mitigating uncertainty.

## 2. Theoretical foundation and literature review

This section explores theories linking economic uncertainty and socio-economic variables, providing context on a theoretical standpoint for the relationships in the three regions. Subsequently followed by a comprehensive critical review of the existing research relating to uncertainty-socioeconomic dynamics.

### *2.1. Theoretical foundation*

Uncertainty and its relationship with socio-economic variables can often be explored existing theories. This study integrates several contemporary perspectives to explore how COVID-19 related uncertainty affects socio-economic dynamics across South America, Africa and North America. In context of COVID-19 pandemic, Durkheim's social integration theory (Durkheim, 1897) explains that the level of interconnectedness among the populace has a crucial impact on suicide rates, whereas during the presence of economic uncertainty, the weakening of social ties leading to the reduction of a sense of community, cause distress among individuals.

The uncertainty effect on the job market is often explored by the job search theory, suggesting that when in an uncertain economic condition, unemployed workers are more cautious in venturing into new jobs due to the instability of such future employment (Stigler, 1962). During the COVID-19 pandemic, this mechanism became pronounces due to the high risk of business closures often leading to more hesitation in pursuing new positions.

Fundamentally, Knightian Uncertainty (Knight, 1921) explores the concept of the lack of any quantifiable knowledge about the occurrence of an event, as opposed to the familiar notion of risk. Considering the COVID-19 context, rapidly evolving policy responses epitomised Knightian uncertainty, rendering available forecasting methods inadequate, leading to the amplification of behavioural responses across households and firms.

Building on this the Keynesian Economic theory suggests that economic uncertainty often leads to a decline in consumer consumption and the business investment due to its negative effect on consumer and business spending (Keynes, 1936). When exploring through a microeconomic lens the real options theory (Myers, 1977) explores the firm-level responses during higher uncertainty. The option value of waiting until uncertainty resolves often leads to delay in investment decisions which severely depresses the economic output. In developing regions, particularly the South Americas, typically these effects are magnified due to the higher irreversibility costs and weaker financial systems. The prospect theory (Kahneman & Tversky, 1979) proposes that people evaluate potential gains and losses to a relative reference point, however in uncertainty they are unable to always maximise utility.

The global trade openness had a severe impact due to the COVID-19 pandemic causing one of the biggest disruptions in modern economic context. This is explored in the transaction cost theory, which suggests uncertainty significantly increases the transaction costs often pertaining to transportation and reduces the probability of investments in foreign markets (Coase, 1937). This is also explored in Handley (2014) Trade Policy Uncertainty theory, where uncertainty creates a hesitation among firms and reduces their willingness to invest in international trade.

### *2.2. Literature review*

The subsequent section examines the discussion of relationships between economic uncertainty, suicide rate, unemployment, economic growth, and trade for the selected 62 countries across three regions, providing a comprehensive review of existing knowledge as presented in Appendix S1. While prior studies have investigated these relationships, few utilise COVID-19 as a primary driver of uncertainty.

#### 2.2.1. Relationship between economic uncertainty and suicide

Existing studies have analysed the link between economic uncertainty and suicide, which revealed a positive relationship. A survey conducted for 183 countries indicates that suicide is more widespread in lagged economies like Africa and the Middle East, with unemployment and economic growth both increasing the suicide rates (Claveria, 2022a). Economic uncertainty forces people to face a variety of difficulties, including job loss and financial problems, leading to mental stress that can result in suicide. Therefore, it's essential to implement suicide prevention strategies in countries experiencing high economic uncertainty (Er et al., 2023). According to the findings, political instability and a lack of accountability contribute to economic uncertainty, which leads to a rise in suicide rates (de Bruin et al., 2020). Economic downturns can severely impact mental health, increasing the risk of suicide.

Furthermore, uncertainty proxies serve as warning signs of potential increases in suicide rates (Claveria, 2022b). Findings reveal that, in contrast to women, men's mental health is significantly affected by economic uncertainty, which can lead to a higher number of suicides (Tao & Cheng, 2023). Investments in public health are crucial however, governments often cut health budgets in response to economic uncertainty, which can limit access to mental health services. Similarly, a study conducted in the United States reveals a context-dependent and asymmetric relationship between economic uncertainty and suicide. Extreme declines in uncertainty do not reduce suicide rates, whereas unexpected spikes in uncertainty increase suicides among men aged 25-54 and 55-64, as well as for women over 65 (Abdou et al., 2022; Antonakakis & Gupta, 2017). This trend could be driven by a lack of retirement savings, financial instability, or heightened anxiety over unstable economic conditions. Findings show that 11 to 24 additional suicides occur per month for every 1% increase in monetary policy uncertainty (EPU), which corresponds to a rise of 0.33% to 0.72% (Vandoros & Kawachi, 2021). This indicates that higher economic uncertainty is proportionally linked to higher suicide rates, however lower economic uncertainty does not cause lower suicide rates.

#### 2.2.2. Relationship between economic uncertainty and unemployment

Economic uncertainty can cause firms to delay investment and hiring because they are unsure of the state of the economy, which leads to an increase in unemployment (Claveria, 2022a). Findings in Brazil, Colombia, and Mexico-three countries most severely affected by COVID-19- reveal that frequent and stricter government lockdowns during the pandemic worsen unemployment, particularly for informal workers (Haldar & Sethi, 2022). Moreover, uncertainty shocks act similarly to drops in demand, lowering production and spending in a country and leading to increased unemployment (Caggiano et al., 2014, 2017). Another study conducted in the United States explored that the unemployment inflow is a primary factor influencing the connection between economic uncertainty and unemployment level (Ahmed et al., 2022), indicating that economic uncertainty substantially impacts unemployment inflow more than unemployment outflow. Higher EPU leads to higher unemployment rates through different channels, including decreased industrial production, less investment, and higher financing costs (Payne, 2015). Due to associated risks and expenses for the advertising, screening and training employee costs, firms tend to delay hiring employees during high uncertainty times (Schaal, 2017). However, there remains a signification gap in identifying the impact of economic uncertainty on unemployment in African countries.

#### 2.2.3. Relationship between economic uncertainty and economic growth

Economic uncertainty affects the economic activity in the country, influencing its expansion and contraction. Uncertainty's effects have been explored by many researchers, whom state that uncertainty act as an inhibitor for the overall economic activity (Gómez & Cándano, 2024). Furthermore, economic uncertainty has a more pronounced negative impact on financial stability in nations with smaller financial systems, higher competition, and less regulatory capital (Phan et al., 2021). High economic uncertainty diminishes business operations and erodes business confidence (Ogbonna et al., 2022) as businesses often delay or cut investments when uncertain about the future economy, and they may reduce production in response to lower consumer spending and investment (Asafo-Adjei et al., 2021; Cepni et al., 2020; Lensink et al., 1999). Studies also reveal a well-developed financial sector can mitigate the detrimental consequences of policy uncertainty (Lensink, 2001). Compared to non-pandemic periods, the adverse effect of global uncertainty on economic growth is at least four times worse during the COVID-19 pandemic (Bannigidadmath et al., 2024). However, findings indicate that a well-developed financial sector can significantly alleviate the severe impacts of uncertainty (Gomado, 2025). These institutions are vital for reducing the adverse effects of economic uncertainty on growth. Economic uncertainty leads to an environment of hesitation and fear; therefore, businesses are less willing to take risks, which might impede innovation and growth (Brida et al., 2022). Many developing countries heavily rely on foreign direct investment to boost economic growth (Ogbonna et al., 2022). However, these investments are not easily procured due to the environment in the global stage. Findings reveal that EPU shocks initially significantly impacted real GDP during the Great Inflation and the Recession, amounting to about −0.2% (Prüser & Schlösser, 2020). This indicates how economic uncertainty and growth are strongly inversely connected, with increased uncertainty tending to stifle economic activity and hinder growth.

#### 2.2.4. Relationship between economic uncertainty and trade openness

Studies also explore that uncertainty can result in a country's decreasing trade openness which can hurt the performance of firms and increase the firm's risk (Li, 2020). Similarly, findings also reveal that EPU and trade policy uncertainty negatively affect a country's trade and economic growth. The development of renewable energy can be delayed by high trade policy uncertainty (Abaidoo, 2019; Qamruzzaman, 2024), implying the extent of the negative relationship between economic uncertainty and trade openness. Economic uncertainty influences firms' decisions to prioritise foreign orders over domestic ones due to higher inventory costs (Tam, 2018). Therefore, economic uncertainty significantly impacts a country's exports and imports subsequently affecting economic growth in a macroeconomic stance.

Higher economic uncertainty makes businesses and investors more cautious and lowers trade and investment flows, as they are

unsure about the government's future policies (Kirchner, 2019). According to the findings, a 10% increase in an exporting country's uncertainty level reduces its average bilateral trade flow by approximately 0.76% (Matzner et al., 2023), illustrating the negative relationship between economic uncertainty and trade openness. Trade credit generally tightens due to higher economic uncertainty (Jory et al., 2020), with companies becoming more reluctant to extend credit and suppliers requesting quicker payments. Companies often lower their inventory thresholds during periods of high uncertainty, drastically decreasing international trade flows(Novy & Taylor, 2020). This highlights the negative relationship between economic uncertainty and trade openness, allowing uncertainty to infiltrate global markets.

## 3. Data and methodology

### 3.1. Data

The study's scope included 62 from countries across three regions, South and North Americas and the African Continent. The data file used for this study is presented in Appendix S2. Secondary data for the analysis was acquired from reliable publicly available sources from 2004 to 2023 in a global database, as detailed in Table 1.

The WUI index is generated by tracking uncertainty worldwide through text mining the country reports of the Economist Intelligence Unit, explicitly using the term 'uncertainty' or its variants. While current literature uses the EPU index to measure uncertainty, a key reason for selecting the WUI is its inclusion of global uncertainty, which accounts for various factors, particularly geopolitical events and health crises like the COVID-19 pandemic. This index also allows for capturing the heterogenous nature of countries often emphasising on the spillover effects within countries in the same region. The WUI also consists of certain limitations as the reports generated could be generated from potentially biased sources due to bureaucratic agendas.

### 3.2. Methodology

This study uses Multiple Linear Regression and Cointegration analyses to evaluate the dynamic relationships between economic uncertainty and socio-economic variables. The associations among the variables are explored using two distinct approaches: regression and cointegration. Initially, descriptive statistics were obtained for the five variables to identify general contextual trends. The entire length of time is segmented as 2004-2007, 2008-2011, 2012-2015, 2016-2019, 2020-2023 for analysis of the before and after COVID dynamics among the socio-economic variables in the 62 countries utilised in this study.

The MLR approach allows the analysis of time series data to depict how economic uncertainty affects socio-economic variables across five distinct periods. The relationship between the dependent and independent variables was modelled using the following equation:

$$EUit = \beta 0 + \beta 1SRit + \beta 2URit + \beta 3EGit + \beta 4TOit + \epsilon it \quad (1)$$

The Cointegration analysis determines whether the variables have a stable long-run relationship with each other, even amidst fluctuations in the short term. Particularly, the Westerlund cointegration test allows for the simultaneous handling of multiple variables and is less sensitive to outliers. This test verifies if the entire panel is cointegrated and provides a basis for further cointegration tests to assess whether the results are cointegrated country-wise, which was conducted using the Johansen test. The Cointegration analysis has been utilised in similar research contexts (Chontanawat, 2020; Jumbe, 2004; Ketenci, 2010), including environmental sciences (Duan et al., 2008; Khan et al., 2020), education (Babatunde & Adefabi, 2005), and engineering(Turrisi et al., 2022). Using two methodologies allows for a robust analysis of this study to provide short- and long-term insights into the relationship between the variables.

Equation (1) represents the value of the dependent variable at time $a$ and country $t$ and $\epsilon it$ represents the residual error term occurred to due varying unobservable factors for the time period $t$. $\beta 0$ represents the intercept, the predicted value of EU when all other independent variables are 0, allowing to determine the baseline level. and $\beta 1, \beta 2, \beta 3, \beta 4$ represents the regression coefficients. When a 1-unit increase in the independent variables, these coefficients determine the expected change in the dependent variable by $\beta 1, \beta 2, \beta 3,$

**Table 1**
Variable data sources.

| Variable | Acronym | Unit Of Measure | Source |
|---|---|---|---|
| Economic Uncertainty | EU | World Uncertainty Index (WUI) | World Uncertainty Index https://worlduncertaintyindex.com/data/ |
| Suicide Rates | SR | Suicide mortality rate (per 100,000 population) | World Bank https://data.worldbank.org/indicator/SH.STA.SUIC.P5 |
| Unemployment Rates | UR | Unemployment, total (% of total labour force) | World Bank https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS |
| Economic Growth | EG | GDP per capita (current US$) | World Bank https://data.worldbank.org/indicator/NY.GDP.PCAP.CD |
| Trade Openness | TO | Trade (% of GDP) | World Bank https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS |

Source: Authors' compilation.

$\beta 4$ units. This equation was then modified so that each variable SR, UR, EG, TO was tested as a dependent variable, keeping EU as the independent variable thus allowing for examining the bidirectional relationship. The MLR analysis is widely used in similar research contexts surrounding COVID-19 (Almalki et al., 2022; Muthugala et al., 2025; Sime, 2020). This method is also extensively employed in other fields, including medicine (Edelman et al., 2017; Huang et al., 2017; Trunfio et al., 2022), environmental sciences (Zayani et al., 2023), logistics (Yousefi et al., 2023), psychology (Tang et al., 2023), and education (Theobald & Freeman, 2014). The MLR analysis allows for determining the relationship between predicting variables using predictors and allows to ensure the robustness of the findings.

While a majority of the data was present around 15 instances of data were missing due to unavailability in the sources, hence the filling in of these specific missing data was necessary. For this, the best approach available was the use of linear regression as it helps in fulfilling missing data of a continuous and linear variable. Simpler methods particularly the mean or median imputation ignore relationships often adding bias to the dataset. To accomplish this the linear regression function was utilised in Excel software. Map illustrations were created using Map Chart; line charts were produced using Inkscape, and MLR and cointegration tests were conducted using STATA.

## 4. Results

This study examines the dynamic relationships between economic uncertainty and key socioeconomic variables, analysing the trends before and after the COVID-19 pandemic. When considering economic uncertainty, it is crucial to understand significant incidents in its trajectory; the main events leading up to the rise of global economic uncertainty include the Dot-com Bubble Burst, the 2008 Financial Crisis, the European Debt Crisis, and the COVID-19 Pandemic. Appendix S3 presents the descriptive statistics for the five variables, highlighting the dynamics of these variables across the period.

The impact of economic uncertainty before and after the COVID-19 pandemic was assessed using regression, reversing the tests of economic uncertainty and the socio-economic variables to determine a bi-directional association. The initial test indicated the presence of high uncertainty in the South and North Americas, and the African Continent, provides the preliminary warrant into investigating how the socio-economic dynamics unfold in the presence of looming uncertainty.

### 4.1. Multiple linear regression

The regression results presented in Appendix S4 showcase varying levels of association among the variables across five different periods. The findings suggest that these relationships have varied dramatically, highlighting underlying economic factors in the analysed periods. Appendix S5 explores the direction of the relationship pre-COVID-19. At the same time, Appendix S6 examines post-COVID-19 relationships among the variables. Comparing the pre- and post-COVID-19 pandemic periods reveals potential changes in the direction and strength of these relationships, providing insights into the pandemic's impact on the dynamics among the studied variables. While the analysis is conducted for 5 time periods, namely 2004-2007, 2008-2011, 2012-2015, 2016-2019, 2020-2023. The period before COVID-19 (2004-2019), was amalgamated to one, with the most significant relationships being considered for the

**Table 2**
The relationship between economic uncertainty and socio-economic variables in the South American continent before and afer COVID-19 pandemic.

| Country | Variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | WUI - SR | | WUI - UR | | WUI - EG | | WUI - TO | |
| | Before | After | Before | After | Before | After | Before | After |
| Argentina | - | - | - | - | ⇔ | ⇔/⇒ | ⇔ | ⇔ |
| Bolivia | ⇔ | ⇒ | ⇔ | ⇔/⇒ | ⇔ | ⇔ | ⇔ | ⇔ |
| Brazil | - | - | ⇔ | ⇔/⇒ | - | - | ⇐ | ⇒ |
| Chile | - | - | ⇔ | ⇔ | ⇔ | ⇔/⇒ | ⇔ | ⇔/⇒ |
| Paraguay | ⇔ | ⇒ | - | - | ⇔ | ⇔ | ⇔ | ⇒ |
| Peru | ⇔ | ⇔/⇒ | ⇔ | ⇔/⇒ | ⇔ | ⇔/⇒ | - | - |
| Venezuela | ⇔ | ⇔/⇒ | - | - | - | - | - | - |

Source: Authors' illustrations based on the test results generated.

**Notes: -** denotes there is no statistical relationship among the variables in any period, ⇐,⇒ denotes unidirectional relationships, ⇔ denotes bidirectional relationship, ⇔/⇒ denotes the relationship between the variables has downgraded compared to the adjacent period. The 'Before' consists of the time period from 2004-2019 and 'After' consists of 2020-2023.

results, this is then compared to the after COVID-19 period for analysis.

When considering Table 2, out of the 10 countries examined 3 were omitted due to the presence of no statisically significant relation pre/post pandemic. When examining the country wise relationships, Bolivia is the only country to have bidirectional

**Table 3**
The relationship between economic uncertainty and socio-economic variables in the African continent before and afer COVID-19 pandemic.

| Country | Variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | WUI - SR | | WUI - UR | | WUI - EG | | WUI - TO | |
| | Before | After | Before | After | Before | After | Before | After |
| Algeria | ⇔ | ⇔ | ⇔ | ⇔ | → | ⇔ | - | - |
| Benin | → | → | ⇔ | ↛/→ | - | - | ← | → |
| Botswana | → | → | ⇔ | ⇔ | ⇔ | ⇔ | - | - |
| Burkina Faso | - | - | ⇔ | ↛/→ | ⇔ | ↛/→ | - | - |
| Burundi | ⇔ | ↛/→ | ⇔ | ↛/→ | ⇔ | ↛/→ | ⇔ | ⇔ |
| Cameroon | ⇔ | ↛/→ | ⇔ | ↛/→ | ⇔ | ↛/→ | ⇔ | → |
| CAR | - | - | - | - | - | - | ⇔ | → |
| Chad | - | - | ↛/→ | → | - | - | ⇔ | ↛/→ |
| Côte d'Ivoire | → | → | - | - | - | - | ⇔ | → |
| DRC | ⇔ | ⇔ | - | - | ↛/→ | → | ⇔ | - |
| Eritrea | - | - | ⇔ | ↛/→ | ⇔ | ↛/→ | - | - |
| Ethiopia | - | - | - | - | - | - | ⇔ | ← |
| Gabon | - | - | ↛/→ | ← | ↛/→ | ← | ⇔ | ← |
| Ghana | ⇔ | ↛/→ | ⇔ | ↛/→ | ⇔ | ↛/→ | - | - |
| Guinea | ↛/→ | ⇔ | → | → | → | → | ↛/→ | ⇔ |
| Guinea-Bissau | - | - | ← | ↛/→ | ⇔ | ↛/→ | - | - |
| Kenya | - | - | - | - | - | - | ⇔ | ↛/→ |
| Lesotho | ← | ← | ⇔ | ↛/→ | ⇔ | ⇔ | - | - |
| Libya | ⇔ | ⇔ | - | - | - | - | - | - |
| Madagascar | ⇔ | → | - | - | ⇔ | ⇔ | ⇔ | → |
| Mali | ← | → | - | - | ⇔ | ↛/→ | - | - |
| Morocco | ⇔ | ⇔ | → | ⇔ | - | - | ⇔ | ↛/→ |
| Namibia | ← | ↛/→ | ⇔ | ↛/→ | ⇔ | ⇔ | ⇔ | ↛/→ |
| Niger | - | - | ⇔ | ↛/→ | - | - | ← | ↛/→ |
| RoC | ↛/→ | ⇔ | ⇔ | ↛/→ | ⇔ | ⇔ | ⇔ | ⇔ |
| Rwanda | - | - | ⇔ | ⇔ | ⇔ | ↛/→ | ⇔ | ↛/→ |
| Senegal | ⇔ | ↛/→ | - | - | - | - | - | - |
| Sierra Leone | - | - | - | - | ⇔ | ↛/→ | - | - |
| South Africa | - | - | - | - | - | - | ⇔ | ↛/→ |
| Sudan | - | - | - | - | - | - | ⇔ | ↛/→ |
| The Gambia | → | ↛/→ | → | ↛/→ | - | - | - | - |
| Togo | - | - | - | - | - | - | ⇔ | ↛/→ |
| Tunisia | ⇔ | ↛/→ | - | - | - | - | ⇔ | ↛/→ |
| Uganda | - | - | - | - | - | - | ↛/→ | ⇔ |
| Zimbabwe | ⇔ | ↛/→ | ⇔ | → | ⇔ | → | ⇔ | ↛/→ |

Source: Authors' illustrations based on the test results generated.

**Notes:** - denotes there is no statistical relationship among the variables in any period, ←, → denotes unidirectional relationships, ⇔ denotes bidirectional relationship, ↛/→ denotes the relationship between the variables has downgraded compared to the adjacent period. The 'Before' consists of the time period from 2004-2019 and 'After' consists of 2020-2023.

relationships among economic uncertainty and socio-economic variables before COVID-19, whilst this relationship is consitent after COVID as well for economic growth and trade openess showcasing that these factors have constanly been affected by uncertainty. In addition Chile and Peru have had the next most statsically sound relationship with at least three instances of bidirectional relationships before COVID-19, this relationship has significantly deteroitred after COVID-19 in Peru, however Chile shows evidence of birdectional assocation for the WUI-UR pair indicating the looping effect of uncertainty on unemployment and vice versa. A notable observation is that before COVID trade openess had a effect on economic uncertainty and this relationship has reversed in Brazil.

Table 3 examines the relationship bewteen WUI and the socio-economic variables across 40 African countries. Out of the 40 countries analysed 5 countries did not show any association hence they were omitted from this table. The overall trends indicate that the WUI-SR and WUI-UR relationships have not been consistenly signficant in a majority of the countries, whereas the WUI-EG and WUI-TO realtionships yield a positive outlook, particularly in the pre-COVID-19 period. The WUI-EG and WUI-TO associations appear most signficant during the before COVID-19, reflecting bidirectional dynamics in stable times. Whereas most of these relationships have deteriorated, shifting towards a more weakened pattern. Indicating that many African countries demonstrated notable economic resilience in the face of heigthened global pandemic uncertainty.

Before COVID-19, Burundi, Cameroon and Zimbabwe stood out by showing bidirectional association across all variable pairs, these strong bidirectional association deteriorated in the subsequent COVID-19 period.A key takeway is the a bidirectional effects that predominated in the pre-COVID era have signficanlty diminished over time with the WUI-SR relationship has being signifcanlty affected as only only 44.44% of the original relationships still exist after COVID-19, in the contrary the WUI-UR relationship is the most consisten with a 64.70% percentage of the relationships in the before COVID-19 period still exisitng post-pandemic.

Only the Republic of Congo and Guinea maintained signifcatiant ascciations between WUI and all four variables in the post-COVID period. Mali's WUI-SR relationship and Benin's WUI-TO relationship are the only unidirectional relationships which have been reversed in the subsequent period, indicating that times of high ucnertainty can give leadway into a looping effect among variables. These relationships underscore the need for mental health investment, diversification of economies and trade policies to buffer uncertainty. The region's high WUI amplies the effects but resilience offers opportunities for targeted interventions.

Table 4 explores the socio-economic-uncertainty relationship in North American countries, in this analysis 2 countries were omitted as they did not showcase any significant associations. Further analysis reveals that the WUI-SR relationship is considered the strongest before the pandemic with 6 countries showcasing strong bi-directional linkages, whereas the WUI-TO relationship is the weakest in comparison. However, the post-pandemic analysis reveals that in the Dominican Republic, Honduras, and Mexico currently showcase strong two-way associations in the WUI-EG relationship. This indicates that the post-pandemic period has affected the economic dynamics in these countries.

**Table 4**
The relationship between economic uncertainty and socio-economic variables in the North American Continent before and afer COVID-19 pandemic.

| Country | Variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | WUI - SR | | WUI - UR | | WUI - EG | | WUI - TO | |
| | Before | After | Before | After | Before | After | Before | After |
| Costa Rica | ⇐⇒ | ⇐/⇒ | ⇐⇒ | ⇐/⇒ | ⇐⇒ | ⇐/⇒ | - | - |
| Dominican Republic | ⇐⇒ | ⇐⇒ | - | - | ⇐/⇒ | ⇐⇒ | - | - |
| El Salvador | ⇐⇒ | ⇐ | ⇐/⇒ | ⇐⇒ | ⇐ | ⇒ | ⇐ | ⇐ |
| Guatemala | ⇐/⇒ | ⇒ | - | - | ⇐⇒ | ⇒ | - | - |
| Haiti | - | - | - | - | - | - | ⇒ | ⇐/⇒ |
| Honduras | ⇐/⇒ | ⇐⇒ | ⇐⇒ | ⇐/⇒ | ⇐/⇒ | ⇐⇒ | - | - |
| Jamaica | ⇐⇒ | ⇐/⇒ | - | - | ⇐⇒ | ⇐/⇒ | - | - |
| Mexico | ⇐⇒ | ⇒ | ⇐⇒ | ⇒ | ⇐/⇒ | ⇐⇒ | - | - |
| Nicaragua | ⇐⇒ | ⇐/⇒ | ⇐⇒ | ⇒ | - | - | - | - |
| Panama | - | - | ⇐⇒ | ⇐/⇒ | ⇐⇒ | ⇐/⇒ | - | - |

Source: Authors' illustrations based on the test results generated.

**Notes:** - denotes there is no statistical relationship among the variables in any period, ⇐, ⇒ denotes unidirectional relationships, ⇐⇒ denotes bidirectional relationship, ⇐/⇒ denotes the relationship between the variables has downgraded compared to the adjacent period. The 'Before' consists of the time period from 2004-2019 and 'After' consists of 2020-2023.

### 4.2. Cointegration

The Westerlund cointegration results conducted for two timeframes, before and after the COVID-19 pandemic, illustrated in Table 5, highlight that the pandemic strengthened the long-term relationships between WUI and socioeconomic variables.

Economic uncertainty has a more significant impact on socio-economic variables, as evidenced by the increased significance of the Gt and Ga tests after COVID-19 pandemic. Furthermore, the Pt and Pa tests consistently demonstrate strong evidence of cointegration before and after COVID-19, and the relationships among them are robust at the panel level. While the socio-economic variables exhibit stronger cointegration post-pandemic, EG in South Africa shows a marginal increase, suggesting a moderate impact of uncertainty. In contrast, Africa and North America experienced a significant rise in Cointegration, indicating that uncertainty had a notable effect on

**Table 5**
Results of the Westerlund based on Panel Cointegration Tests.

| Variables | Tests | Before COVID-19 (2004-2019) | | | After COVID-19 (2004-2023) | | |
|---|---|---|---|---|---|---|---|
| | | Value of the test | Z Value | P Value | Value of the test | Z Value | P Value |
| South America | | | | | | | |
| WUI & SR | $G_t$ | −1.436 | −1.399 | 0.081 | −1.659 | −2.074 | 0.019 |
| | $G_a$ | −5.406 | −1.115 | 0.133 | −4.838 | −0.720 | 0.236 |
| | $P_t$ | −5.881 | −3.655 | 0.000 | −5.157 | −3.035 | 0.001 |
| | $P_a$ | −4.978 | −4.316 | 0.000 | −5.167 | −4.523 | 0.000 |
| WUI & UR | $G_t$ | −1.288 | −0.949 | 0.171 | −1.806 | −2.523 | 0.006 |
| | $G_a$ | −3.398 | 0.281 | 0.611 | −6.644 | −1.976 | 0.024 |
| | $P_t$ | −4.391 | −2.378 | 0.009 | −5.424 | −3.264 | 0.001 |
| | $P_a$ | −3.460 | −2.659 | 0.004 | −6.158 | −5.605 | 0.000 |
| WUI & EG | $G_t$ | −1.475 | −1.517 | 0.065 | −1.503 | −1.601 | 0.055 |
| | $G_a$ | −3.644 | 0.110 | 0.544 | −5.290 | −1.035 | 0.150 |
| | $P_t$ | −3.512 | −1.626 | 0.052 | −4.790 | −2.720 | 0.003 |
| | $P_a$ | −2.537 | −1.650 | 0.050 | −5.129 | −4.481 | 0.000 |
| WUI & TO | $G_t$ | −1.216 | −0.728 | 0.233 | −1.801 | −2.508 | 0.006 |
| | $G_a$ | −4.223 | −0.293 | 0.385 | −6.663 | −1.989 | 0.023 |
| | $P_t$ | −4.756 | −2.692 | 0.004 | −5.890 | −3.663 | 0.000 |
| | $P_a$ | −4.291 | −3.566 | 0.000 | −6.611 | −6.100 | 0.000 |
| **Africa** | | | | | | | |
| WUI & SR | $G_t$ | −1.881 | −5.502 | 0.000 | −2.105 | −6.859 | 0.000 |
| | $G_a$ | −3.535 | 0.372 | 0.645 | −5.404 | −2.227 | 0.013 |
| | $P_t$ | −9.034 | −4.974 | 0.000 | −11.313 | −6.926 | 0.000 |
| | $P_a$ | −2.901 | −4.096 | 0.000 | −4.670 | −7.959 | 0.000 |
| WUI & UR | $G_t$ | −1.876 | −5.470 | 0.000 | −2.055 | −6.555 | 0.000 |
| | $G_a$ | −3.962 | −0.222 | 0.412 | −5.483 | −2.337 | 0.010 |
| | $P_t$ | −10.239 | −6.006 | 0.000 | −12.168 | −7.658 | 0.000 |
| | $P_a$ | −3.167 | −4.677 | 0.000 | −4.969 | −8.612 | 0.000 |
| WUI & EG | $G_t$ | −2.245 | −7.715 | 0.000 | −2.387 | −8.577 | 0.000 |
| | $G_a$ | −5.247 | −2.009 | 0.022 | −7.309 | −4.876 | 0.000 |
| | $P_t$ | −12.353 | −7.817 | 0.000 | −13.390 | −8.706 | 0.000 |
| | $P_a$ | −4.327 | −7.211 | 0.000 | −6.192 | −11.284 | 0.000 |
| WUI & TO | $G_t$ | −1.853 | −5.327 | 0.000 | −1.874 | −5.457 | 0.000 |
| | $G_a$ | −4.116 | −0.436 | 0.331 | −6.058 | −3.137 | 0.001 |
| | $P_t$ | −9.617 | −5.473 | 0.000 | −11.036 | −6.689 | 0.000 |
| | $P_a$ | −3.310 | −4.989 | 0.000 | −5.122 | −8.948 | 0.000 |
| **North America** | | | | | | | |
| WUI & SR | $G_t$ | −1.605 | −2.093 | 0.018 | −2.166 | −3.962 | 0.000 |
| | $G_a$ | −4.137 | −0.255 | 0.399 | −5.353 | −1.181 | 0.119 |
| | $P_t$ | −5.228 | −2.964 | 0.002 | −6.489 | −4.045 | 0.000 |
| | $P_a$ | −3.924 | −3.467 | 0.000 | −4.967 | −4.715 | 0.000 |
| WUI & UR | $G_t$ | −1.599 | −2.075 | 0.019 | −1.643 | −2.221 | 0.013 |
| | $G_a$ | −4.372 | −0.434 | 0.332 | −5.350 | −1.179 | 0.119 |
| | $P_t$ | −5.327 | −3.049 | 0.001 | −5.504 | −3.200 | 0.001 |
| | $P_a$ | −4.749 | −4.454 | 0.000 | −5.488 | −5.338 | 0.000 |
| WUI & EG | $G_t$ | −1.717 | −2.467 | 0.007 | −2.193 | −4.052 | 0.000 |
| | $G_a$ | −4.698 | −0.682 | 0.248 | −6.373 | −1.958 | 0.025 |
| | $P_t$ | −5.495 | −3.193 | 0.001 | −7.334 | −4.768 | 0.000 |
| | $P_a$ | −4.109 | −3.689 | 0.000 | −6.419 | −6.453 | 0.000 |
| WUI & TO | $G_t$ | −1.572 | −1.983 | 0.024 | −1.891 | −3.047 | 0.001 |
| | $G_a$ | −4.473 | −0.511 | 0.305 | −6.212 | −1.835 | 0.033 |
| | $P_t$ | −5.847 | −3.494 | 0.000 | −6.521 | −4.072 | 0.000 |
| | $P_a$ | −4.853 | −4.578 | 0.000 | −6.331 | −6.346 | 0.000 |

Source: Authors' illustration based on Cointegration results.

economic growth. The cointegration tests conducted at the country level, as illustrated in Appendix S7, reveal the existence of cointegration in 46 of the tested countries pre-COVID-19 and all countries during the post-pandemic period.

The subsequent section provides a comprehensive discussion of the empirical results obtained from this study.

## 5. Discussion

### 5.1. Discussion on Multiple Linear Regression results

The COVID-19 pandemic amplified global uncertainty, however the effect on the socio-economic variables varied by countries due to individual structural differences in economies, social safety nets and pre-existing vulnerabilities. Theories, particular the Keynesian economies, explore on the uncertainty induced investment slowdown. The pandemic's economic shock was an asymmetrical one across countries, with the WUI spiking in 2020 due to lockdowns, supply chain disruptions leading to higher UR and lower EG.

In South America, the association between WUI and SR is minimal, with only Bolivia and Paraguay indicating any relationship, marking a devolution from the previous bidirectional link. This relationship is often not explored in contemporary literature. Despite the COVID-19 pandemic's significant impact on the region's economic and health aspects, other factors likely contributed to the elevated suicide rates, as the descriptive statistics show the highest SR during the 2020-2023 period across seven countries in the entire analytical timeframe.

In the African context, Algeria's WUI-SR relationships have fluctuated in the past but re-established a bidirectional relationship between 2020 and 2023. This suggests a more intertwined relationship due to pandemic-induced economic stability. Côte d'Ivoire and Mali exhibit a unidirectional relationship in which WUI affects suicide rates for the first time in these countries. Guinea and the Republic of Congo have developed a newly established bidirectional relationship, indicating that WUI and SR mutually influence each other during this period. Libya and Morocco showcase a sustained bidirectional relationship throughout the years. Benin, Botswana, Lesotho, and Madagascar had an intermittent WUI-SR connection earlier but maintained a unidirectional trend during COVID-19. WUI, reflecting policy and trade uncertainties, likely transmitted to SR through amplified UR and EG slowdowns, invoking Okun's law: a 1% GDP drop raises UR by 0.5%, indirectly boosting SR via hopelessness and migration disruptions.

In North America, Guatemala, Honduras, Jamaica, Mexico, and Panama exhibited a new unidirectional relationship after 2020, suggesting that the COVID-19 period strengthened the association between WUI and SR. Furthermore, Honduras shifted from a unidirectional to a bidirectional relationship, indicating that the connection between the two variables grew stronger over time. Costa Rica, the United States, and Nicaragua showed no relationship changes.

The COVID-19 pandemic triggered the sharpest downturn in the world economy since the Great Depression, with global GDP declining by 3.0 per cent in 2020 compared to an increase of 2.8 per cent in 2019 (International Monetary Fund, 2022). While the impact of WUI is more prominent towards SR, UR, and EG in North American countries, a limited relationship exists between WUI and TO. El Salvador exhibits a bidirectional relationship between WUI and UR, while EG and TO, influence an increase in WUI. Honduras demonstrates a unidirectional relationship where UR affects WUI and a bidirectional relationship between EG and WUI. Mexico shows a unidirectional relationship with WUI impacting UR and a bidirectional relationship between EG and WUI. Nicaragua displays a unidirectional relationship where WUI affects UR. Guatemala has a unidirectional relationship where WUI influences EG. The Dominican Republic maintains a bidirectional relationship between WUI and UR.

### 5.2. Discussion on cointegration results

The comparison of continent-wise cointegration between the pre-and post-pandemic periods reveals a significant increase in cointegration. South America had 21 out of 40 instances, Africa had 78 out of 160, and North America had 21 out of 48 cases of Cointegration before the COVID-19 period concerning WUI and socio-economic variables. However, during COVID-19, the numbers increased significantly, with South America rising to 36 out of 40, Africa increasing to 140 out of 160, and North America reaching 41 out of 48. This significant increase highlights the pivotal role of the COVID-19 pandemic as a crucial factor in determining the effects of uncertainty on socio-economic variables.

Country-level cointegration analysis reveals the following associations: a positive relationship between the WUI and SR in 31 countries, a positive relationship between the WUI and UR in 20 countries, a negative relationship between the WUI and EG in 31 countries, and a negative relationship between the WUI and TO in 24 countries. While these countries demonstrate relationships that align with existing literature, several nations exhibit unusual findings.

In the case of Argentina, Costa Rica, Jamaica, Togo, and Tunisia, a significant negative relationship between WUI and SR emerged during the COVID-19 period, whereas these countries showcased a positive relationship in the prior period. This finding is unusual, as studies typically indicate that uncertainty leads to increased suicide rates (Claveria, 2022a; de Bruin et al., 2020; Er et al., 2023; Vandoros & Kawachi, 2021). However, pandemic-specific factors, including new coping mechanisms, policies, and the global expansion of interconnectivity through the internet, provided people with platforms to mitigate the psychological impacts of uncertainty.

When considering the link between economic uncertainty and unemployment rates, Angola, Canada, Rep. of Congo, and Rwanda show a dramatic shift from a statistically significant positive relationship to a statistically significant negative relationship during the before and after COVID-19 periods. This contrasts with existing studies, where economic uncertainty increases unemployment rates (Ahmed et al., 2022; Caggiano et al., 2014, 2017; Claveria, 2022a; Dajčman et al., 2023; Haldar & Sethi, 2022; Payne, 2015). One potential explanation is the rise of informal work during COVID-19 due to strict lockdown regulations. Additionally, changes in the

labour markets are made due to government policies for the betterment of workers or due to a lack of traditional unemployment data.

For countries like Algeria, Burundi, Eritrea, Kenya, Mauritania, Nicaragua, and Senegal, a negative relationship between WUI and EG was observed in the pre-COVID period, in line with contemporary literature (Asafo-Adjei et al., 2021; Bannigidadmath et al., 2024; Cepni et al., 2020; Gómez & Cándano, 2024; Lensink et al., 1999; Ogbonna et al., 2022; Phan et al., 2021). However, during the COVID-19 period, this relationship becomes positive, which provides a unique perspective current studies do not explore. The pandemic brought many shifts, including to economies, primarily increased industries' digitalisation with increased technological and healthcare innovations. This may lead to the belief that while uncertainty has a generally adverse effect on economic growth, in crises like COVID-19, It can also stimulate potential growth opportunities.

Finally, Costa Rica, Eritrea, Kenya, Lesotho, Madagascar, Sierra Leone, and Uganda exhibited a negative association between WUI and TO, as explored by various existing literary sources (Abaidoo, 2019; Jory et al., 2020; Kirchner, 2019; Li, 2020; Matzner et al., 2023; Novy & Taylor, 2020; Qamruzzaman, 2024; Tam, 2018). However, this was only in the pre-pandemic period. During COVID-19, this relationship changed, with WUI and TO showing a positive association, indicating that these countries might have adapted to global uncertainty. Typically, countries rely on their domestic markets, which struggled due to the pandemic, leading them to diversify their trade partners and increase their trade openness.

## 6. Conclusion

This study explored the impact of COVID-19 related economic uncertainty on SR, UR, EG, TO, and vice versa over 20 years using MLR analysis for three of the continents with the highest uncertainty during COVID-19 pandemic: South America, Africa, and North America. These regions are prone to the most economic volatility. Hence, economic uncertainty has strongly penetrated shaping the economic context of the regions. The findings of this study explore how countries could benefit from understanding uncertainty and its associated risks.

Accordingly, the MLR analysis revealed that COVID-19 caused significant bidirectional and unidirectional associations between economic uncertainty and socio-economic variables across the American continents and Africa. The results indicate substantial short-term fluctuations in these variables during the pandemic's peak, reflecting immediate economic disruptions caused by COVID-19. The cointegration analysis shows that while cointegrated relationships existed in prior periods, those associations were more prominent across more countries during COVID-19. Compared to MLR, cointegration analysis reveals a stable long-term relationship, suggesting that despite short-term fluctuations, these variables move together over extended periods in all three continents explored in this study.

In conclusion, a significant causal association among economic uncertainty and the socio-economic variables are identified in this study, thereby country specific policy interventions could enhance the chances for mitigating uncertainty risks, often arising from pandemics like the COVID-19 pandemic.

### *6.1. Policy implications*

This study confirms existing relationships and introduces novel findings; hence, targeted policy interventions can enhance the country's performance on the global stage. The results are incorporated into the policy implications section, offering key insights on mitigating the effects of pandemics like COVID-19, which are explored in the following section.

#### *6.1.1. Policy recommendations for South American countries*

In Bolivia and Paraguay, expanding psychiatric care in rural and urban areas can prove to be a paradigm shift when considering the effects of COVID-19-related uncertainty on the economy. Policymakers should also encourage individuals in distress to seek help and break the stigma surrounding mental health, as during times of isolation and uncertainty, mental health often becomes a secondary priority, however strong institutions can help mitigate this effect greatly.

When considering the South American region, Bolivia and Chile strongly associate unemployment with economic uncertainty. Both countries could benefit from examining the labour market needs post-pandemic and making the necessary facilitations to get the labour economy up and running in areas that require crucial development, whilst also facilitating online jobs through the provision of internet facilities for rural areas.

Bolivia and Paraguay must understand the relationship between uncertainty and economic growth. To achieve sustainable economic growth, these countries must offer incentives for local production, which is often their strength in times of uncertainty, and as they countries often consist of a rural based economy, the expansion of value-added processing of raw materials for export can significantly boost the chances of mitigating economic uncertainty.

Argentina and Bolivia are most associated with economic uncertainty in South American trade. Three recommendations can be made to recover from uncertainty shocks. First, countries can expand trade beyond the Americas, including untapped markets globally allow for a much better connection and back-up options during an uncertain event. Second, they should implement policies that stabilise the currency, particularly by focusing more on fiscal and monetary policy as this allows the economy to operate more efficiently even when there are events causing a disruption of the global financial market. Finally, a significant digital transformation in trade is needed, encouraging businesses to shift to online trade to reduce the need for physical interactions, which is helpful in case of a pandemic where lockdowns are in mass-effect.

#### *6.1.2. Policy recommendations for African countries*

Algeria, Guinea, Libya, Morocco, and the Republic of Congo have a bidirectional relationship between economic uncertainty and

suicide rates. Policymakers should develop crisis response plans when making budget allocations to mitigate the effects of future pandemics. Increasing funding for mental health infrastructure and integrating mental health services into primary healthcare is crucial as it allows to deal with both mental and physical suffrage in a cohesive manner. In African countries, suicide is generally considered a taboo topic; therefore, reducing the stigma around mental health by promoting open discussions and ensuring proper education is essential for overcoming barriers related to suicide. As strong communities can mitigate the effects of uncertainty, particularly the breaking down of social ties due to isolation during COVID-19 like pandemics.

Employment is a factor significantly affected by the COVID-19 pandemic in Algeria, Botswana, Libya, Morocco, and Rwanda. Overcoming the challenges of unemployment is achievable through two crucial factors. Firstly, local entrepreneurship can be stimulated by providing low-interest loans and tax incentives as this helps business to take risks even when the future holds uncertainty. Second, these countries can invest in burgeoning sectors relevant to the current world context, particularly tourism and AI technology, thereby creating more job opportunities and ensuring stability across the regions which in turn can reduce any effect of uncertainty shocks. Expanding internet access to rural areas and promoting digital literacy enables global work opportunities allowing to seek jobs even in international job markets.

For Algeria, Botswana, Lesotho, Madagascar, and Namibia, economic growth had been significantly hindered by the pandemic. Two significant recommendations are provided to overcome external shocks and build a consistently growing economy. First, as discussed, the diversification of the economy is crucial to keeping pace with the rapidly changing global dynamics and allows for stability in one sector even when another sector collapses due unexpected uncertainties. Second, a knowledge-based economy must be developed, with greater emphasis on developing education and innovative research to ensure long-term sustainability in hopes of being able to deal with the pandemic like global uncertainties.

Trade has been severely limited due to the lockdown and travel restrictions imposed by global governments; this does not mean trade has been stopped entirely, as many countries depend on international trade but rather there is a definite disruption in a global scale caused by the COVID-19 pandemic. In the context of Burundi, Guinea, the Republic of Congo, and Uganda, these countries could take advantage of expanding their trading partners and strengthening their participation in the African Continental Free Trade Area (AfCFTA) and the Economic Community of Central African States (ECCAS). Like the European Union, African countries could benefit from the free movement of goods within the region. While it may not be practical to get the entire African region to open their borders, it is possible to create blocs consisting of fewer countries, which allows for mitigating the impacts of spillover events like COVID-19 through superior trade efficiency.

#### *6.1.3. Policy recommendations for North American countries*

For the Dominican Republic and Honduras, it is essential to boost funding for mental health services while also integrating the community with counselling and support and providing greater access to psychological care through primary healthcare methods, whilst bolstering the capability of medical institutions to handle mental healthcare even through global pandemics.

El Salvador should promote digital literacy to equip workers with skills for remote work, thus incentivising businesses to invest in digital technologies for flexibility. Moreover, El Salvador should collaborate with the private sector to create apprenticeships and internships in emerging industries thus reducing the need for government dependence in dealing with uncertainty of the job markets.

When considering economic growth and its association with financial uncertainty in the Dominican Republic, Honduras, and Mexico, it is essential to mitigate these effects to enhance the resilience of key sectors by investing in critical infrastructure enabling the expansion of economic trade even during uncertainty shocks.

### *6.2. Limitations and future research*

The study's scope was limited to 62 countries and a 20-year timeframe due to data availability constraints. While the World Uncertainty Index provides a comprehensive measure of uncertainty, its nature may not fully capture the subtle trends over the period. The Multiple Linear Regression analysis has its limitations, as it assumes that the relationships are linear in nature, and multicollinearity could obscure individual results. Future research should focus on expanding the study to additional variables, particularly inflation rates and foreign direct investment, to provide a more comprehensive understanding of the effect of uncertainty. Methodological enhancements, particularly Wavelet Coherence Analysis and Granger Causality analysis, are recommended to capture causal relationships and address linearity assumptions.

All data generated or analysed during this study are included in this published article and its supplementary information files.

## Ethics approval statement

This study did not require an ethical approval as it involved the analysis of publicly available, anonymized data.

## Authors' contributions

RJ conceptualised the study. RM, PN, DG, SH and RJ contributed to the design and conduction of the study. DG and SH curated the data. RM, PN, DG and SH undertook data analysis and interpreted the data. RM and PN writing and reviewing. RJ supervised the study. All authors critically reviewed, edited, and approved the final manuscript.

## Declaration of use of AI

We acknowledge the use of Grammarly for making the language in the study concise, however, we have not used any AI tools or technologies to prepare analysis or for our methodology.

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## Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.iref.2026.105200.

## Data availability

All data generated or analysed during this study are included in this published article and its supplementary information files.

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