

Impact of political and security stability on food security in developing countries: Case of Africa, Asia, Latin America and the Caribbean

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Abstract: Political and security stability have the potential to support developing countries' efforts to achieve Sustainable Development Goals, as this region is home to the majority of the global population. This study examines the impact of political and security stability and other factors on food security [as measured by the prevalence of undernourishment (PUN)] in developing countries. We analysed 2002–2020 data from 83 developing countries across Africa, Asia, and Latin America and the Caribbean, using the system General Method of Moment (sys-GMM). Our study indicates that political and security stability and the use of the internet can increase food security or reduce PUN in developing countries. Other factors contributed to an increase in PUN: the previous year's PUN, the cereal import dependency ratio and the unemployment to total population ratio. Meanwhile, other factors have varying effects on the PUN in developing countries.

Keywords: cereal import dependency; internet; system General Method of Moment; the prevalence of undernourishment; unemployment

Every state tries to promote fiscal, monetary and financial stability, improve public infrastructure, education and digital technology, increase resource use efficiency and create long-term economic growth. All of these are significant goals for developed countries, and they are moving in the right direction. Unfortunately, they are still neglected in developing or less developed countries (O'Sullivan 2000). Social, political and security stability is one of the most important factors in achieving these goals. For example, developed countries in northern Europe have good eco-

nomic growth and significant global influence because of their neutral position in some global conflicts. This region's climate change mitigation program has made other countries aware of adopting renewable energy (Heininen 2018). Social and political stability also has a positive impact on developing countries' economic development. For example, social and political stability in India can drive maximum tourism performance and long-term economic growth (Mishra and Verma 2017).

Failure to manage domestic politics can disrupt a country's long-term economic situation, even in de-

veloped countries. For example, Romanian political instability in the 1990s has kept foreign investors away from the country until this day (Rădulescu and Druica 2014). The same condition exists in developing countries. For example, the military-political crisis has destabilised and weakened Ivory Coast's financial system, as well as reduced the efficiency of household resources and investment (Ouattara 2011). The developing countries will be home to 85% of the global population in 2030 (Goel et al. 2021).

Social and political conditions also have impacts on agricultural performance. Social conflicts disrupt food production and agricultural employment, reduce farmer incomes and endanger national food security (Ameyaw et al. 2021). Meanwhile, political centralisation results in static agricultural performance and land tenure structure, and technological progress has not yet supported agricultural research, public policy, limitation of capital and fluctuation of food prices (Pacheco Troconis 2016).

Negative economic and social conditions will undermine food security, threaten the livelihoods of the most vulnerable groups and hinder the achievement of Sustainable Development Goals (Grófová and Srnec 2012). Food security in developing countries has also been weakened in recent years as a result of the COVID-19 pandemic and war. Developing countries account for 98% of the global malnourished population and have a malnutrition prevalence of 16%. Food supplies are decreasing due to labour shortages or travel restrictions. Consumers are not paid regularly, and many have lost their jobs (Rabbi et al. 2021; Zhu et al. 2022). The global risk external cereal supply index has risen by 65%, putting the Pacific Islands, Latin America and African food security at risk (Zhang et al. 2021).

Based on that, this study examines the impact of political and security stability on food security in developing countries. The novelty of this study is examining the effect of political and security stability on food security in many developing countries, whereas the previous study by Pacheco Troconis (2016) only examined one developing country: Venezuela. The article assesses the Venezuelan government from 1899 to 1908; however, a study with updated data is required to improve theories and take action to increase food security in developing countries.

MATERIAL AND METHODS

Theory and variable selection. Several theories state that food security is related to other factors. Ac-

cording to the Neo-Malthusian theory, ecological factors frequently govern food security. Techno-ecological theorists believe that technology and human ingenuity are valuable resources for food security management. Modernisation theory claims less developed countries (LDCs) must 'modernise' their economies to achieve food security. Dependence and global system theory include international factors that affect food security. According to social stratification theory, stratification and inequality are important sociological factors that influence food security (Scanlan 2003).

Following that, we choose several variables to represent the theory. The Neo-Malthusian theory is represented by cereal production and employment. Land equipped for irrigation and the internet are examples of techno-ecological theory. Modernisation theory is represented by consumer prices, GDP, and government consumption expenditure. Cereal imports and the economic globalisation index represent dependence and global system theory. The theory of social stratification is represented by human capital and political and security stability.

Data source. Annual time series data were used in this study. The secondary data were collected from 83 developing countries from 2002 until 2020. The selection of this data range is based on the data availability, especially the dependent variable, which only exists from 2002–2020. Table S1 in the Electronic Supplementary Material (ESM) shows the countries from three regions: 34 African countries, 27 Asian countries, and the rest are in the Latin America and the Caribbean (LAC).

This study used eleven explanatory variables: gross cereal production index (cereal production for each year relative to the base period 2004–2006), cereal import dependency ratio (the quantity of the available domestic cereals supply which has been imported and the quantity which comes from the country's own production), consumer price index (the price change between the current and reference periods of the average basket of goods and services purchased by households), GDP growth (the annual average rate of GDP change at market prices based on constant local currency), general government final consumption expenditure [expenditure incurred by the government in its production of non-market goods and services, except Gross Fixed Capital Formation (GFCF) provided as social transfers in kind], % unemployment of total population ratio (the percentage of persons in the labour force who are unemployed), human capital index (index based on the average years of schooling and an assumed rate of return to education), land area equipped for irrigation

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(covers areas equipped for fully controlled irrigation by any of the methods of surface, sprinkler or localised irrigation), individuals using the internet (individuals who have used the internet from any location in the last 3 months), economic globalisation index (a composite index that measures globalisation along the economic dimension for almost every country in the world), and political stability and absence of violence/terrorism (perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism). While the dependent variable in this study is the prevalence of undernourishment (the probability that one person is found to be regularly consuming an amount of food that provides less than his or her dietary energy requirements). Based on Nugroho et al. (2022), the prevalence of undernourishment can represent food security in a country; therefore we use this variable in our study. The sources of the variables are presented in Table 1.

Data analysis. The first step of our study is testing the data's variable stationarity to avoid spurious regressions. We used one type of test to evaluate the stationarity of the variables, the Levin Lin Chu (LLC) (Hill et al. 2011). Following that, we analysed the data using the system GMM (sys-GMM) to overcome serial correlation and heteroscedasticity issues that occur in panel data (Baltagi 2005). Additionally, sys-GMM is ideal for short-term data analyses like the one used in this study, and the process can be dynamic with current realisations of the PUN influenced by past ones [Equation (1)].

$$PUN_{it} = \beta_0 + \beta_1 PUN_{it-1} + \beta_2 CP_{it} + \beta_3 IDR_{it} + \beta_4 CPI_{it} + \beta_5 GDP_{it} + \beta_6 EXP_{it} + \beta_7 EMP_{it} + \beta_8 HCI_{it} + \beta_9 IRRI_{it} + \beta_{10} INT_{it} + \beta_{11} EGI_{it} + \beta_{12} POL_{it} + \alpha_t + \eta_i + v_{it} \quad (1)$$

where: *PUN* – prevalence of undernourishment; *CP* – gross cereal production index; *IDR* – cereal import dependency ratio; *CPI* – consumer price index; *GDP* – GDP growth; *EXP* – general government final consumption expenditure; *EMP* – unemployment to total population ratio; *HCI* – human capital index; *IRRI* – land area equipped for irrigation; *INT* – individuals using the internet; *EGI* – economic globalisation index; *POL* – political stability and absence of violence/terrorism; α_t – *PUN* time specific fixed effect; η_i – country-specific effect; v_{it} – error term.

The coefficient on the lagged dependent variable, β_1 , is likely to be biased upward since it is positively cor-

related with η_i . The sys-GMM can be defined as follows using a system of equations (Arellano and Bover 1995; Blundell and Bond 1998) [Equations (2–3)]:

$$PUN_{it} = \beta_0 + \beta_1 PUN_{it-1} + \beta_2 CP_{it} + \beta_3 IDR_{it} + \beta_4 CPI_{it} + \beta_5 GDP_{it} + \beta_6 EXP_{it} + \beta_7 EMP_{it} + \beta_8 HCI_{it} + \beta_9 IRRI_{it} + \beta_{10} INT_{it} + \beta_{11} EGI_{it} + \beta_{12} POL_{it} + \alpha_t + U_{it} \quad (2)$$

where: – random term ($U_{it} = \eta_i + v_{it}$).

It also considers ΔPUN_{it-1} as instrument for PUN_{it-1} .

$$\Delta PUN_{it} = \beta_0 + \beta_1 \Delta PUN_{it-1} + \beta_2 \Delta CP_{it} + \beta_3 \Delta IDR_{it} + \beta_4 \Delta CPI_{it} + \beta_5 \Delta GDP_{it} + \beta_6 \Delta EXP_{it} + \beta_7 \Delta EMP_{it} + \beta_8 \Delta HCI_{it} + \beta_9 \Delta IRRI_{it} + \beta_{10} \Delta INT_{it} + \beta_{11} \Delta EGI_{it} + \beta_{12} \Delta POL_{it} + \Delta U_{it} \quad (3)$$

Two-step sys-GMM is the main preference in this study because it uses a heteroscedastic weight matrix for estimation; therefore it is more efficient. In addition, the sys-GMM must pass several post-estimation tests to be valid: *i*) the Arellano-Bond test to detect the presence of second-order serial autocorrelation

Table 1. Data variables and sources

Variable	Symbol	Source
Prevalence of undernourishment (%)	<i>PUN</i>	FAO (2023)
Gross cereal production index (2014–2016 = 100)	<i>CP</i>	FAO (2023)
Cereal import dependency ratio (%)	<i>IDR</i>	FAO (2023)
Consumer price index (2010 = 100)	<i>CPI</i>	IMF (2023)
GDP growth (annual %)	<i>GDP</i>	World Bank (2023)
General government final consumption expenditure (% of GDP)	<i>EXP</i>	World Bank (2023)
Unemployment to total population ratio (%)	<i>EMP</i>	ILO (2023)
Human capital index	<i>HCI</i>	Penn World Table (2023)
Land area equipped for irrigation (1 000 ha)	<i>IRRI</i>	FAO (2023)
Individuals using the internet (% of the population)	<i>INT</i>	World Bank (2023)
Economic globalisation index	<i>EGI</i>	KoF (2023)
Political stability and absence of violence/terrorism (index)	<i>POL</i>	FAO (2023)

(Baltagi 2005), and *ii*) the exogeneity (Hansen and Sargan) test checks all instruments are exogenous or valid as a group (Sargan 1958).

RESULTS AND DISCUSSION

According to Table 2, Africa has the greatest *PUN*, which indicates that the food security of the countries in this region is extremely precarious. African countries are likewise heavily reliant on imported food. Comparatively to Africa and LAC, Asian developing countries can achieve greater average levels of food production, GDP and irrigation systems. Unfortunately, countries in Asia experience political and security shocks, although this only happens in a few countries because the standard deviation in this region is very high. Countries in the LAC have the highest human capital index, but they are very vulnerable to product price fluctuations and unemployment.

We have used the LLC unit root test to determine the data's stationarity. Table 3 shows that the null hypothesis is rejected at the 5% significance level or that all variables are stationary. Hence, we can perform the sys-GMM analysis at the next stage.

We must ensure that the estimated parameters are unbiased and consistent after completing the unit root test. The Sargan test of overidentifying restriction revealed

that our model's instruments are both relevant and valid. Simultaneously, the Arellano-Bond test results for AR(2) are accepted. Overall, the specification tests show that sys-GMM estimates are trustworthy (Table 4).

Based on the analysis's findings, *PUN* increased in Africa, as *PUN* in the previous year, general government final consumption expenditure, unemployment, human capital and economic globalisation rose. Meanwhile, a rise in the amount of land that can be irrigated, internet users, political stability and a lack of terrorism/violence helped to lower *PUN*. The increase in *PUN* in the previous year, food import dependence and human capital in Asia have led to an increase in *PUN*. On the other hand, *PUN* in Asia can decrease when there is an increase in cereal production, consumer price index, general government final consumption expenditure, internet users, political stability and a lack of terrorism/violence. *PUN* in LAC experienced a significant increase due to the increase in *PUN* in the previous year, food import dependency, consumer price index and unemployment. Conversely, *PUN* will decrease when GDP, general government final consumption expenditure, human capital, the amount of land that can be irrigated, internet users, economic globalisation, political stability and a lack of terrorism/violence increase.

The African continent has the highest *PUN* in the world. The *PUN* in Africa has been increasing over

Table 2. Descriptive statistics of the variable

Variable	Africa		Asia		LAC	
	mean	SD	mean	SD	mean	SD
<i>PUN</i>	18.44	12.82	9.97	7.35	11.52	10.10
<i>CP</i>	93.25	36.35	97.78	48.05	98.06	36.55
<i>IDR</i>	40.36	28.30	28.55	43.24	22.16	88.53
<i>CPI</i>	111.32	48.15	109.52	52.89	138.45	290.62
<i>GDP</i>	4.13	4.43	5.14	4.97	2.62	4.14
<i>EXP</i>	14.74	6.48	13.02	4.72	13.42	2.98
<i>EMP</i>	58.42	14.69	58.31	13.71	59.06	5.25
<i>HCI</i>	1.84	0.44	2.44	0.50	2.53	0.40
<i>IRRI</i>	360.42	724.34	7 770.30	17 454.28	1 072.34	1 807.84
<i>INT</i>	14.63	16.97	28.93	26.69	35.16	23.05
<i>EGI</i>	45.53	10.25	54.29	15.13	52.62	10.33
<i>POL</i>	-0.50	0.82	-0.56	0.90	-0.23	0.68

LAC – Latin America and the Caribbean; *PUN* – prevalence of undernourishment; *CP* – gross cereal production index; *IDR* – cereal import dependency ratio; *CPI* – consumer price index; *GDP* – GDP growth annual; *EXP* – general government final consumption expenditure; *EMP* – unemployment to total population ratio; *HCI* – human capital index; *IRRI* – land area equipped for irrigation; *INT* – individuals using the internet; *EGI* – economic globalisation index; *POL* – political stability and absence of violence/terrorism

Source: Own elaboration

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Table 3. Levin Lin Chu (LLC) unit root test

Variable	Africa		Asia		LAC	
	stage	statistic	stage	statistic	stage	statistic
<i>PUN</i>	at level	–3.926***	at level	–8.207***	at level	–7.922***
<i>CP</i>	1 st difference	–7.200***	at level	–3.387***	1 st difference	–12.163***
<i>IDR</i>	at level	–1.947*	at level	–4.912***	at level	–4.622***
<i>CPI</i>	1 st difference	–3.579***	1 st difference	–3.513***	1 st difference	–6.338***
<i>GDP</i>	1 st difference	–8.209***	1 st difference	–7.486***	1 st difference	–4.891***
<i>EXP</i>	1 st difference	–9.987***	1 st difference	–6.262***	1 st difference	–3.213***
<i>EMP</i>	1 st difference	–2.047*	2 nd difference	–4.150***	1 st difference	–7.553***
<i>HCI</i>	at level	–3.624***	at level	–5.427***	at level	–3.126***
<i>IRRI</i>	at level	–5.704***	at level	–5.714***	at level	–7.233***
<i>INT</i>	2 nd difference	–6.250***	2 nd difference	–7.288***	1 st difference	–3.353***
<i>EGI</i>	at level	–3.283***	at level	–5.686***	at level	–3.494***
<i>POL</i>	at level	–3.312***	at level	–2.017*	at level	–1.879*

*, ***, significant at 0.05 and 0.001 level, respectively; LAC – Latin America and the Caribbean; *PUN* – prevalence of under-nourishment; *CP* – gross cereal production index; *IDR* – cereal import dependency ratio; *CPI* – consumer price index; *GDP* – GDP growth annual; *EXP* – general government final consumption expenditure; *EMP* – unemployment to total population ratio; *HCI* – human capital index; *IRRI* – land area equipped for irrigation; *INT* – individuals using the internet; *EGI* – economic globalisation index; *POL* – political stability and absence of violence/terrorism

Source: Own elaboration

time, so the *PUN* in the previous year has had a positive effect on the *PUN* (22.610%). Cameroon, Uganda, Somalia, Angola, Sudan, Ethiopia, Kenya, Tanzania, Mozambique, and Nigeria were among the African countries that experienced severe hunger in 1993, with a total *PUN* of more than 5 million people. After two decades, famine has spread, and the total *PUN* reached more than 15 million people (Li and Zhang 2017). The previous year's *PUN* had a positive effect on the current *PUN* not only in Africa, but in Asia and LAC as well (14.037% and 46.653%). This influence is driven by long-term policy implementation, which results in mutually influencing outcomes in each period. Asian countries implement policy protocols for obesogenic food environments to decrease *PUN* (Phulkerd et al. 2022), while LAC countries prioritise policies aimed at reducing economic inequality and expanding social programs (Gassmann et al. 2022).

CP (gross cereal production index) in Asia has been shown to reduce *PUN* (–0.009%). Increased agricultural production has been shown to increase food availability and income, thereby increasing food security and decreasing *PUN* (Abdallah et al. 2021). Furthermore, *CP* does not affect *PUN* in Africa and LAC because it is influenced not only by food availability but also by the ease of food access (Nugroho et al. 2022).

Developing countries have become more reliant on staple food imports. *IDR* (import dependency ratio) has a positive effect on *PUN* in Asia (0.030%) and LAC (0.017%). The high *IDR* indicates that a country has not been able to ensure food availability and easy access to food for its population. This is certainly dangerous, as trade terms deteriorate and global food prices fluctuate. Rising food prices will reduce demand for food among poor consumers, threaten food security and human well-being (Rosegrant et al. 2013). Therefore, countries in Asia and the LAC must implement agricultural modernisation and food diversification policies to reduce *IDR*.

Several economic indicators also have an impact on *PUN* in Africa, Asia, and LAC. *CPI* (consumer price index) has a negative impact in Asia (–0.025%) but a positive impact in LAC (0.003). Higher *CPI* in Asia is associated with increased economic growth, which drives down *PUN* (Arndt et al. 2016). Meanwhile, a *CPI* increase in the LAC raises food prices, making it difficult for people to obtain food (Köse and Ünal 2022). *GDP* has a negative effect on *PUN* in LAC (–0.229%). *GDP* growth is a macroeconomic indicator that determines people's standard of living, and countries use their income to buy food. Inadequate income can set off a vicious cycle that traps people in a state of food insecurity. Even when food is available, poverty hinders

Table 4. Determinant factors of the *PUN* in developing countries in Africa, Asia and LAC

Variable	Africa		Asia		LAC	
	coefficient	SE	coefficient	SE	coefficient	SE
PUN_{it-1}	22.610*** (4.858)	4.654	14.037*** (4.089)	3.433	46.653*** (10.069)	4.633
<i>CP</i>	0.006 (0.435)	0.013	−0.009. (−1.772)	0.005	−0.005 (−0.496)	0.010
<i>IDR</i>	0.009 (0.444)	0.021	0.030*** (3.589)	0.008	0.017*** (4.260)	0.004
<i>CPI</i>	0.009 (0.886)	0.011	−0.025*** (−4.001)	0.006	0.003** (2.730)	0.001
<i>GDP</i>	−0.072 (−0.744)	0.097	0.054 (0.997)	0.054	−0.229** (−2.590)	0.089
<i>EXP</i>	0.216** (2.841)	0.076	−0.364*** (−5.829)	0.062	−0.607*** (−4.892)	0.124
<i>EMP</i>	0.418*** (10.234)	0.041	0.022 (0.779)	0.028	0.154** (2.300)	0.067
<i>HCI</i>	3.020* (2.278)	1.327	2.004** (2.722)	0.736	−8.513*** (−7.735)	1.101
<i>IRRI</i>	−0.003*** (−3.942)	0.001	0.00002 (1.468)	0.00001	−0.001*** (−5.447)	0.001
<i>INT</i>	−0.237*** (−6.627)	0.036	−0.103*** (−6.780)	0.015	−0.069*** (−3.500)	0.020
<i>EGI</i>	0.207*** (3.900)	0.053	−0.030 (−1.050)	0.028	−0.210*** (−5.214)	0.040
<i>POL</i>	−2.516*** (−4.176)	0.602	−2.499*** (−5.934)	0.421	−1.419 ⁰ (−1.965)	0.722
Arellano–Bond test for AR (1)		0.349	–	0.548	–	0.845
Arellano–Bond test for AR (2)		0.764	–	1.102	–	1.769
Sargan test		9.191***	–	7.460***	–	3.973***

⁰, *, **, ***significant at 0.1, 0.05, 0.01, and 0.001 level, respectively; LAC – Latin America and the Caribbean; *PUN* – prevalence of undernourishment; *CP* – gross cereal production index; *IDR* – cereal import dependency ratio; *CPI* – consumer price index; *GDP* – GDP growth annual; *EXP* – general government final consumption expenditure; *EMP* – unemployment to total population ratio; *HCI* – human capital index; *IRRI* – land area equipped for irrigation; *INT* – individuals using the internet; *EGI* – economic globalisation index; *POL* – political stability and absence of violence/terrorism

Source: Own elaboration

food acquisition (Adeyeye et al. 2017). Furthermore, high-income countries implement a variety of social protection programs to help the poor, vulnerable, and disadvantaged people. Food insecurity should be eliminated permanently through social protection policies (Krawinkel 2012).

EXP (general government final consumption expenditure) had a different impact on each of our study areas, increasing the *PUN* in Africa by 0.216% while decreasing the *PUN* in Asia and LAC by −0.364% and −0.607%, respectively. This is because government

spending in Africa is focused on activities that increase economic performance efficiently (Adegboye and Akinyele 2022), whereas government spending in Asia and LAC is focused on activities that improve people's quality of life (Shaddady 2022).

Our studies show that a 1% increase in *EMP* (unemployment) raises the *PUN* by 0.418% in Africa and 0.154% in LAC but has no effect in Asia. Job loss and *EMP* are linked to lower food sufficiency for families and children, as well as lower confidence in achieving food security (Milovanska-Farrington 2022). People

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will not have enough money if they do not have a job. As a result, they have limited access to food sizes and nutrients and must rely heavily on disliked foods. Haini et al. (2023) also support the idea that a high EMP rate exacerbates the negative impact of income inequality on food security in developing countries. However, this is insignificant in advanced economies.

HCI (human capital index) had a significant impact on decreasing the *PUN* in LAC (−8.513%) while increasing the *PUN* in Africa (3.020%) and Asia (2.004%). Education in the LAC region facilitates access to opportunities, infrastructure, assets and socioeconomic status (Sinclair et al. 2022). The rise in *HCI* has given residents more opportunities to innovate and find better jobs and powerful skills to face many challenges (Iazzolino and Laise 2018). Both are capable of encouraging residents to earn a higher income and returns on assets, and thus escape the cycle of food insecurity (Pietrantonio and Iazzolino 2014; Arndt et al. 2020). A good education can also enhance agricultural research and development, optimise agricultural and human resources, and generate income, all of which contribute to food security and reduce *PUN* (Bishwajit 2014). Meanwhile, educated women have better nutritional knowledge and are aided in the selection of nutritious food, which is essential for a successful pregnancy and for households (Bain et al. 2013). Education growth in Africa and Asia has not been evenly distributed, making it impossible to reduce the *PUN* in both continents.

IRRI (irrigated land) reduced the *PUN* by −0.003% and −0.001% in Africa and LAC, respectively, but had no significant impact in Asia. Meanwhile, increased *INT* (individuals using the internet) helped to reduce the *PUN* in Africa (−0.237%), Asia (−0.103%) and LAC (−0.069%). As expected, infrastructure and technology development is critical for increasing agricultural production and ensuring food security (Bishwajit 2014). *IRRI* will increase land productivity, agricultural production quantity and efficiency, and farmer profits, creating a stimulus to reduce the *PUN* in developing countries. *IRRI* is also critical for bridging the supply-demand gap for fresh water caused by population growth, economic growth, and climate change (Nie et al. 2021). The use of *INT* has been shown to increase food production and people's income, and improve food supply chain performance, food price transparency and mitigation of climate change (Nugroho 2021). *INT* in developing countries also facilitates the flow of agricultural information from upstream to downstream, helps producers meet consumer demand and links domestic business actors and international in-

vestors. *INT* has also succeeded in accelerating rural transformation and increasing people's income (Goel et al. 2021). All of these factors are ultimately able to increase food security or reduce the *PUN* in developing countries.

EGI (economic globalisation) increased the *PUN* in Africa by 0.207% while decreasing the *PUN* in LAC by −0.210% and having no effect in Asia. Most African countries are still food insecure and rely heavily on imports from global markets. Globalisation facilitates this process while increasing these countries' reliance on imports. This is not an ideal situation because the crisis and fluctuations in the global food market jeopardise the food security of importing countries (Abdullah et al. 2021). This situation also causes them to spend more money to buy imported products and limits certain people's economic access. In addition, ineffective trade facilitation in Africa has led to increased food deficits and a decrease in the adequacy of food energy supplies (Bonuedi et al. 2020). The opposite situation exists in LAC, which exports food and other agricultural products. Globalisation has encouraged countries in this region to increase food production, which is used to meet domestic consumption and external demand (Mihalache-O'Keef and Li 2011). They also receive more money from food exports, which they can use to meet the needs of their citizens. All of these conditions will be able to increase food security or reduce the *PUN* in the LAC.

The most important finding of our study is that *POL* (political stability and absence of violence/terrorism) can reduce the *PUN* in Africa (−2.516%), Asia (−2.499%), and LAC (−1.419%). Abdullah et al. (2021) revealed that increased *POL* harms the country's food security. *POL* has also disrupted agricultural input distribution, reduced food consumption scores and caused income shocks. This reduces not only food production but also the population's access to nutritious food (George et al. 2020). For example, Colombia's *POL* has resulted in a civil war and economic instability. A peace agreement between the government and the rebels in 2016 brought the 50-year conflict to an end. The agreement's real impact is the reduction of the *PUN* (Sinclair et al. 2022). The same thing happened in Burundi, Eritrea, Somalia, and Sudan, where the *PUN* increased as a result of long-term *POL*. The *PUN* remains a problem in these countries, even though their natural environments are conducive to crop production. Many agricultural labourers disappeared, and the use of fertiliser was reduced, causing agricultural land to be abandoned, and agricultural yield declined (Li and Zhang

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2017). Hence, political and security stability is the best way to increase food security or reduce the *PUN*.

CONCLUSION

Political instability and violence are becoming more common nowadays, especially in developing countries. The interesting thing is how these incidents affects food security. According to our findings, political and security stability in developing countries can increase food security or reduce the *PUN* in Africa, Asia and LAC. Food production and distribution activities, as well as the economy, will run well when there is political and security stability. Food will be available in large quantities, and people can access it easily.

We also investigate several other factors that influence food security in developing countries. The rise of the land area equipped for irrigation and the number of individuals using the internet are significant factors in increasing food security or lowering the *PUN* in developing countries. Food security in developing countries will be threatened (the *PUN* will increase) due to the increase in the previous year's *PUN*, the cereal import dependency ratio and unemployment. Other factors have varying effects on the *PUN* in developing countries across the globe. Increased cereal production could help to reduce *PUN* in Asia. The increase in the consumer price index caused the *PUN* to rise in the LAC but had the opposite effect in Asia. The increase in *GDP* could only help to lower the *PUN* in the LAC. Meanwhile, the *PUN* will rise in Africa and fall in Asia and the LAC as the general government's final consumption expenditure (% of *GDP*) increases. Increases in human capital were able to reduce *PUN* in the LAC, but increased *PUN* in Africa and Asia.

This study contributes to the development of social stratification theory. The study results add to this theory that political and security instability has an impact on food security. Practically, this study contributes to the importance of each country being able to protect itself from political and security conflicts to guarantee food security.

Based on this study, we recommend several things: maintaining political stability and the absence of violence, creating jobs and improving production infrastructure and ICTs (information and communication technologies). The activities will enable residents to increase food production and quality, income access, food distribution, and food source access. The biggest limitations of our study are using 19 years of data and the food security indicator represented by the preva-

lence of undernourishment. We encourage future studies to use other food security indicators so that the data span can be longer and, hopefully, better represent the situation.

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