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Impact of terrorism on financial inclusion: evidence from the most terrorized countries in the world

Peterson K. Ozili

Abstract

This study investigates the impact of terrorism on financial inclusion that is achieved through ATM penetration and bank branch expansion. Eight countries that are the most terrorized countries in the world were analysed using the panel fixed effect regression model and the generalized linear model. The results provide evidence that terrorism reduces the level of financial inclusion in countries experiencing terrorism, but the presence of strong legal institutions, accountability governance institutions and political stability governance institutions mitigate the adverse effect of terrorism on financial inclusion.

Keywords: Terrorism, financial inclusion, access to finance, institutions, commercial bank branches, ATM.

JEL Classifications: C23 · G01 · G21 · G28 · L50 · M4

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1. Introduction

This study investigates whether terrorism affects the level of financial inclusion. Financial inclusion refers to access and use of affordable formal financial services (Ozili and Mhlanga, 2023; Nsiah and Tweneboah, 2023). High level of financial inclusion is essential for financial development, and it improves the economic wellbeing of any nation (Demirgüç-Kunt and Singer, 2017). Financial inclusion also increases the avenues for financial intermediation through increase in consumption, investment, and trade, thereby contributing to better economic wellbeing of a country.

Financial sector agents play an important role in accelerating financial inclusion due to their ability to provide automated teller machines (ATMs) and their extensive bank branch networks which puts them in a better position to act as agents of financial inclusion in a country (Célerier and Matray, 2019). Despite their important role for financial inclusion, there are ongoing debates about the factors that hinder or encourage financial sector agents to accelerate financial inclusion (Ulwodi and Muriu, 2017; Diniz, Birochi and Pozzebon, 2012; Tambunlertchai, 2018). In the literature, multiple determinants of financial inclusion have been proposed (see, for example, Nsiah and Tweneboah, 2023; Murshed et al., 2023; Ozili and Mhlanga, 2023). But no attempt has been made to consider terrorism as a potential determinant of financial inclusion. Limited attention has been paid to the role of terrorism in influencing the level of financial inclusion. Therefore, it remains unknown whether terrorism severely inhibits or promotes financial inclusion.

Terrorism is a serious problem because it has economic consequences which includes the destruction of public infrastructure, loss of life and property, loss of foreign direct investment, financial instability, and a general decrease in economic activities in terrorized areas (Meierrieks and Gries, 2013; Gries et al., 2011). Between 2011 and 2022, acts of terrorism were severe in countries such as Afghanistan, Burkina Faso, Somalia, Mali, Syria, Pakistan, Iraq, Nigeria, Myanmar, Niger, and Cameroun according to the Global Terrorism Index which is published by the Institute for Economics and Peace. Terrorists, in these countries, often concentrate their activities in rural and remote locations where they can build strong resistance against the government and its military forces (Crenshaw, 1981; Michael, 2012). Financial sector agents also want to penetrate rural and remote locations to expand financial

services into these areas by installing ATMs and opening bank branches, but the presence of terrorists and acts of terrorism makes it difficult for financial sector agents to reach unbanked adults living in terrorized rural and remote areas, making them avoid those locations, withdraw existing ATM services, and close bank branches. When this happens, it will be a setback for financial inclusion and suggests that higher terrorism could decrease financial inclusion.

Acts of terrorism also takes place in urban areas when terrorists want to send a political message to the incumbent government or when they want to coerce the government to yield to their demands (Cunneen, 2023; Ahmed and Lynch, 2021). Terrorism in urban areas, such as in major cities, could lead to the destruction of the critical infrastructure that financial sector agents rely on to accelerate financial inclusion. Acts of terrorism in cities also creates psychological terror in the minds of people (Guo and An, 2022), and such terror could make people avoid physical visits to formal financial institutions, which is detrimental to financial inclusion as it could adversely affect the use of available formal financial services. Although people should be able to access formal financial services using digital devices in times of terrorism (Konow-Lund, Hågvar and Olsson, 2019; Hett, 2008), such digital access would become impossible if acts of terrorism lead to the destruction of the critical digital infrastructure that financial sector agents rely on to accelerate digital financial inclusion. Therefore, the potential for acts of terrorism to take place in both rural and urban areas and its potential effect on financial inclusion makes it important to determine whether terrorism has a significant effect on financial inclusion.

Existing research on terrorism have largely focused on the economic consequences of terrorism. Some studies have shown that terrorism reduces economic activities (Abadie and Gardeazabal, 2008; Bardwell and Iqbal, 2020; Clark et al., 2020). Other studies show that economic crisis leads to higher incidence of terrorist attacks (Blomberg et al., 2007; Benmelech et al., 2012). However, no study has empirically examined the impact of terrorism on financial inclusion in the most terrorized countries of the world. We fill this gap in the literature by investigating the impact of terrorism on the level of financial inclusion with particular focus on financial inclusion that is achieved through ATM penetration and bank branch expansion.

The study utilises country-level data of the most terrorized countries in the world. The countries were identified based on the top ranked countries in the 2023 Global Terrorism index¹. The countries listed in the ranking were selected because they have experienced the highest number of fatalities and psychological terror due to terrorism which affects citizens' economic wellbeing, and since financial inclusion is also a significant determinant of economic wellbeing (Razak and Asutay, 2022; Du, Zhou, Yang and Du, 2023), it is important to determine whether there is a link between terrorism and financial inclusion (Daud, 2023; Ozili et al., 2023). Our empirical analysis is based on a sample of eight countries from 2010 to 2021. The data were selected based on the availability of data for the terrorism and financial inclusion variables. The study measured terrorism using the Global Terrorism Index (GTI). The findings show that terrorism reduces the level of financial inclusion in countries experiencing terrorism, but the presence of strong legal institutions, accountability governance institutions and political stability governance institutions mitigate the adverse effect of terrorism on financial inclusion. The presence of these institutions lead to high levels of financial inclusion through greater ATM penetration and bank branch expansion.

This study contributes to the existing literature in the following ways. First, this study is the first to examine the effect of terrorism on financial inclusion in the most terrorized countries in the world and using recent data (from 2010 to 2021). The lack of empirical research in this area is surprising given that terrorism has the potential to hinder access to essential formal financial services. Second, this study contributes to the financial inclusion literature that investigates the determinants of financial inclusion (Nsiah and Tweneboah, 2023; Ozili, 2023a; Murshed et al., 2023), but which have not captured the individual and joint effects of terrorist attacks on financial inclusion efforts through ATM penetration and bank branch expansion. In fact, the results extend prior research on the economic consequences of terrorism (Nabin et al., 2022; Smith et al., 2023; Posso, 2023), by showing that a decrease in the level of financial inclusion is a potential economic consequence of terrorism. This study is also relevant to policymakers. It emphasizes the need for policymakers to put measures in place to avoid terrorism, and to avoid the risk of financial exclusion in terrorized countries. Third, this study adds to the literature that examines the effect of conflict in finance (Elnahass et al, 2022; Teichmann, 2022; Ahmad et al., 2022). We build on this literature by focusing on how

¹ <https://www.economicsandpeace.org/wp-content/uploads/2023/03/GTI-2023-web-170423.pdf>

terrorism affects access to finance and focusing on two crucial financial access points: the number of automated teller machines per 100,000 adults and the number of commercial bank branches per 100,000 adults. The results show that terrorism has a more severe effect on some financial access points than others.

The literature review is presented in section 2. The research methodology is presented in section 3 while the results are discussed in section 4, and section 5 concludes the study.

2. Literature review

The literature documents the economic consequences of terrorism. Blomberg, Hess and Weerapana (2007) showed that groups with limited access to opportunity are more likely to engage in terrorist activities and their propensity to do so increases during economic contractions, which further reduces economic opportunities for terrorist groups. Drakos and Kallandranis (2015) found that terrorist attacks lead to negative economic sentiments which are detrimental to the pace of economic activities. Meierrieks and Gries (2013) analysed the causal relationship between terrorism and economic growth of 160 countries from 1970 to 2007 and found that terrorism diminishes economic growth in African and Islamic countries with low levels of political openness, high levels of political instability, and strong terrorist activity. Shahzad and Qin (2019) investigate how terrorism and military expenditures contribute to capital flight in the South Asia and Asia Pacific regions from 1990 to 2015. They found that terrorist attacks increase capital flight from Asian countries while military expenditures moderate the adverse effect of terrorist attacks on capital flight.

Existing studies also show that terrorist activities affect financial activity. Clark et al. (2020) showed that terrorist attacks like the Boston marathon bombing had an immediate adverse effect on individual wellbeing, and it had adverse health and economic consequences even though the effect was short-lived. Dion-Schwarz et al. (2019) examined terrorist organizations' use of money. They showed that terrorists use cryptocurrency for the purpose of fundraising from donors, the trafficking of illegal drug and arms, remittance receipts and to fund their operations. Dai et al. (2020) examined the nature of CEO compensation in firms located in areas that are prone to terrorist attacks. They used multiple measures of attack proximity and

showed that CEOs of firms located near terrorist attacks receive 12 percent increase in compensation after the attack compared to CEOs of firms located far away from attacks. They also observed that CEOs at terrorist attack-proximate firms prefer cash-based increase in compensation in the form of salary and bonus rather than receiving the additional compensation in equity-based forms such as options and stocks. In a different study, Roth et al. (2020) examined people's savings behaviour in response to terrorism. They analyse the data of the elderly population from 13 European countries and found that terrorism increases household savings especially when there are significant fatalities. Elnahass et al. (2022) investigate the effect of terrorism on bank stability. They focused on how terrorism affects bank risk and financial performance. They analysed banks from 14 countries in the Middle East and North Africa (MENA) region from 2010 to 2018 and found that banks located in countries with high exposure to terrorist attacks are less stable due to high credit risk and insolvency risk, but these banks exhibit high profitability and better cost efficiency.

Teitler-Regev and Tavor (2019) examined the impact of natural disasters and terrorist events on the stock market using an investor pessimism index. They focused on terrorist events that received significant media attention. They found that, during terrorist incidents, the investor pessimism index dropped only on the day of the event and the next day. Papakyriakou et al. (2019) also investigate the effect of terrorism on stock market indices in 66 countries during 1998 to 2017 using an event-study methodology. They found that stock markets decline significantly on the event day and on the next trading day. They also observed that negative investor sentiment led to economic losses in the associated countries. In a related U.S. study from 1970 to 2010, Wang and Young (2020) found that in the month after a spike in attacks, U.S. mutual fund investors become more risk averse in their portfolio choices, and the demand for risky funds fell across equity and bond funds; but this behaviour varies with investors' proximity to the attacks, the risk level of the fund and the assets in which it is invested. Also, Cuculiza et al. (2021) examined whether terrorist attacks and mass shootings influence the sentiment and forecasts of U.S. sell-side equity analysts. They found that analysts who are located near the attacks issue forecasts that are more pessimistic than the consensus forecast, and the effect is stronger when the analyst is closer to the terrorist event.

While the above studies have examined how terrorism affect financial activities, very little studies have examined how terrorism affects development outcomes such as financial

inclusion. Beall (2006) analysed the relationship between terrorism and urban development and argued that heightened acts of terrorism in cities often hinder development progress in developed countries. Few studies link terrorism safeguards to financial inclusion. For instance, Jayasekara (2021) emphasised the need to strengthen the anti-money laundering and countering the financing of terrorism (AML/CFT) regime, and they argued that the level of AML/CFT compliance of a country is a potential determinant of financial inclusion. Similarly, Shehu (2012) argued that effective AML/CFT can complement financial inclusion by ensuring the safety, integrity and soundness of the financial system and the protection of depositors. However, these studies did not empirically examine the direct impact of terrorism on financial inclusion.

3. Data and Methodology

3.1. Data

The study used data from ten countries that were ranked to be the most terrorized countries in the world. The top 10 countries ranked in the 2023 Global Terrorism index² are Afghanistan (1st), Burkina Faso (2nd), Somalia (3rd), Mali (4th), Syria (5th), Pakistan (6th), Iraq (7th), Nigeria (8th), Myanmar (9th) and Niger (10th). These countries were selected for this study because they have experienced the highest number of fatalities and psychological terror due to terrorism which affects citizens' economic wellbeing, and financial inclusion is also a significant determinant of economic wellbeing (Daud, 2023; Ozili et al., 2023). The sample period is from 2010 to 2021. This sample period was selected based on the availability of data for the terrorism and financial inclusion variables. After collating the panel data, it was observed that two countries – Syria and Somalia – had missing data for most of the years which could introduce bias into the analyses. Therefore, Syria and Somalia were excluded from the sample because the two countries had insufficient time series data for most of the variables used in the study. The exclusion of the two countries leaves us with eight countries from 2010 to 2021. See table 1 for variable description.

² <https://www.economicsandpeace.org/wp-content/uploads/2023/03/GTI-2023-web-170423.pdf>

Table 1. Description and source of the variables

Variable	Variable description	Definition	Source
GTI	Global Terrorism Index	Measures the number and severity of terrorist activities in each country	Institute for Economics and Peace
ATM	Automated teller machine penetration	Number of automated teller machines per 100,000 adults.	Global Financial Development Indicators
BR	Size of bank branch network	Number of commercial bank branches per 100,000 adults.	Global Financial Development Indicators
BZ	Bank Z-score	Measures the stability or solvency of the banking sector.	Global Financial Development Indicators
FED	Financial system deposits to GDP (%)	A measure of the level of financial development. It represents demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP.	Global Financial Development Indicators
PST	Political stability index	Measure perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Estimate ranges from -2.5 to 2.5.	World Governance Indicators
ROL	Rule of Law index	Measure perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimates range from -2.5 to 2.5.	World Governance Indicators
VAC	Voice and Accountability index	Measure perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate range from -2.5 to 2.5.	World Governance Indicators
FINDEX	Average of the ATM and BR variables	A simple average of the ATM and BR variables	Author computation

Source: Created by author, World Bank & Institute for Economics and Peace

The descriptive statistics summary is presented in table 2. The country with the highest terrorism index (GTI) in the sample is Iraq followed by Afghanistan, while Burkina Faso and Myanmar have the lowest terrorism index during the period examined. Regarding level of financial inclusion, Nigeria had the highest financial inclusion index (FINDEX) while Afghanistan had the lowest financial inclusion index during the period examined. Nigeria also had the highest number of ATMs per 100,000 adults while Afghanistan had the lowest number of ATMs per 100,000 adults. Pakistan had the highest number of commercial bank branches per 100,000 adults (BR) while Niger had the lowest number of commercial bank branches per 100,000 adults. Regarding the institutional governance variables, Burkina Faso had better accountability governance institutions while Myanmar had weak accountability institutions during the period examined. Burkina Faso also had better legal institutions while Afghanistan had weak legal institutions during the period examined. Burkina Faso also had better political stability governance institutions while Afghanistan had weak political stability governance institutions during the period examined. Regarding the macro-financial variables, Iraq had the most stable banking system (BZ) while Myanmar had the most fragile banking system during the period examined. Also, Myanmar had the most developed financial system (FED) than the rest of the countries in the sample while Niger had the least developed financial system during the period examined. The Pearson correlation matrix, reported in table 3, shows that the GTI variable has a significant positive correlation with the ATM, BR and FINDEX variables, indicating that elevated levels of terrorism is correlated with greater financial inclusion.

Table 2. Descriptive Statistics Summary

Countries	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
	GTI	ATM	BR	BZ	FED	PST	ROL	VAC	FINDEX
Afghanistan	8.97	1.01	2.11	18.77	18.09	-2.59	-1.66	-1.16	3.13
Burkina Faso	4.22	3.42	2.67	9.67	30.22	-0.96	-0.45	-0.16	6.09
Mali	6.78	4.39	5.17	14.46	22.71	-1.83	-0.75	-0.33	9.56
Pakistan	8.59	8.38	9.64	10.82	32.81	-2.35	-0.75	-0.79	18.03
Iraq	9.46	2.72	4.63	20.89	22.17	-2.28	-1.65	-1.04	7.35
Nigeria	8.44	15.24	5.14	15.73	18.21	-1.97	-0.98	-0.52	20.39
Myanmar	5.46	2.98	3.53	5.46	35.90	-1.22	-1.18	-1.22	6.75
Niger	5.83	1.39	1.60	15.21	10.34	-1.27	-0.58	-0.37	2.99
Cameroun	6.09	3.87	1.99	10.11	15.54	-1.07	-1.05	-1.07	5.87
<i>Aggregate statistics:</i>									
Mean	7.22	5.04	4.35	13.89	23.73	-1.81	-1.01	-0.703	9.43
Median	8.00	3.65	4.15	13.98	21.49	-1.91	-0.88	-0.71	7.26
Maximum	10.00	17.19	10.41	37.25	50.94	-0.55	-0.35	0.16	21.9
Minimum	0.00	0.09	1.25	0.53	8.31	-2.81	-1.92	-1.84	1.95
Std. Dev.	2.33	4.74	2.49	5.56	9.42	0.63	0.45	0.43	6.44
Skewness	-1.46	1.35	0.98	0.67	0.71	0.28	-0.47	-0.27	0.78
Kurtosis	4.96	3.74	3.23	5.62	3.17	1.92	1.94	2.55	2.23

Source: Created by author

Table 3. Pearson correlation for the variables (focusing on the correlation of GTI with ATM, BR and FINDEX)

Variable	GTI	ATM	BR	BZ	FED	PST	ROL	VAC	FINDEX
GTI	1.000 -----								
ATM	0.275** 0.01	1.000 -----							
BR	0.378*** 0.00	0.534*** 0.00	1.000 -----						
BZ	0.498*** 0.00	-0.024 0.83	-0.128 0.26	1.000 -----					
FED	-0.037 0.75	0.121 0.29	0.494*** 0.00	-0.636*** 0.00	1.000 -----				
PST	-0.837*** 0.00	-0.211* 0.06	-0.430*** 0.00	-0.514*** 0.00	0.051 0.66	1.000 -----			
ROL	-0.577*** 0.00	0.174 0.13	0.095 0.41	-0.471*** 0.00	0.111 0.34	0.623*** 0.00	1.000 -----		
VAC	-0.421*** 0.00	0.217* 0.05	-0.079 0.49	-0.092 0.42	-0.126 0.27	0.494*** 0.00	0.808*** 0.00	1.000 -----	
FINDEX	0.350*** 0.00	0.945*** 0.00	0.781*** 0.00	-0.067 0.55	0.281** 0.01	-0.322*** 0.00	0.165 0.15	0.130 0.26	1.000 -----

Source: Created by author

3.2. Model Specification and estimation procedure

The model below estimates the impact of terrorism on financial inclusion. The model is a modified form of the model used in Daud (2023), Nsiah and Tweneboah (2023) and Ozili (2023b).

$$(ATM, BR, FINDEX)_{i,t} = \beta_0 + \beta_1 GTI_{i,t} + \beta_2 PST_{i,t} + \beta_3 FED_{i,t} + \beta_4 ROL_{i,t} + \beta_5 BZ_{i,t} + \beta_6 VAC_{i,t} + e_{i,t} \dots \text{Equation 1}$$

Where, i = country; t = year. GTI = Global Terrorism Index. ATM = automated teller machine penetration. BR = size of bank branch network. BZ = bank Z-score. FED = level of financial development. PST= political stability index. ROL = rule of law index. VAC = voice and accountability index. FINDEX = average of the ATM and BR variables. e = error term.

Regarding the estimation technique, the study used the fixed effect panel regression method. The Hausman test showed that the fixed effect model is more appropriate (see appendix). In the Hausman test, the null hypothesis is rejected in the random effect model as the p-value of the chi-square statistic is less than 0.01, indicating that the fixed effect model is the appropriate to estimate the model (see table 9). Existing financial inclusion studies have also used the fixed effect model such as Daud (2023), Nsiah and Tweneboah (2023) and Ozili (2023b). The panel fixed effect model allows us to control for all time-invariant omitted variables which are difficult to observe (Pesaran and Zhou, 2018), and it reduces the potential sources of biases in the estimations in comparison to the random effect model, thereby giving us a less biased estimator (Pesaran and Zhou, 2018). The study also used the generalized linear model regression estimation which considers the potential non-linearity between the response variable and the predictors through a link function and when the response variable is not normally distributed (Thompson and Baker, 1981).

3.3. Variables justification

Three financial inclusion dependent variables were used: ATM, BR and FINDEX. These variables are widely used as financial access point indicators of financial inclusion in the financial inclusion literature (Amaira, 2022; Al-Smadi, 2023; Ozili, 2023b). Regarding the BR variable, the literature shows that the number of commercial banks is a good proxy for measuring the level of financial inclusion because commercial banks are important agents of financial inclusion because of their ability to expand their branch networks to remote

locations to reach people in rural and urban communities, and to give them access to basic formal financial services (Ozili, 2023b). The literature also shows that access to ATMs can increase access and use of financial services especially in areas where banks are not physically present (Al-Smadi, 2023). Therefore, the number of commercial bank branches per 100,000 adults and the number of ATMs per 100,000 adults are important financial access point indicators of financial inclusion, while the FINDEX variable is the average of the two (BR and ATM) variables.

The GTI index is widely used as an indicator of terrorism in the peace and conflict literature (e.g., Alfaro, 2022; Agu et al, 2023). High value of the GTI index indicates high level of terrorism. Terrorism can make it difficult for financial sector agents to reach unbanked adults living in terrorized rural and urban areas. Terrorism will make financial sector agents to avoid those locations, withdraw existing ATM services and close bank branches. When this happens, it will be a setback for financial inclusion. Therefore, the GTI variable is expected to have a negative relationship with the financial inclusion variables.

We use the PST variable to measure the quality of political stability governance institutions. The PST variable is widely used in the literature to capture the quality of political stability governance institutions (Kanga et al., 2022; Banna et al., 2022; Asante et al., 2023). Strong political stability governance institutions can promote financial inclusion by providing a conducive environment – an environment that is free of terrorism and an environment that enables financial sector agents to conduct their financial inclusion business freely and without hinderance. Therefore, the PST variable should have a positive relationship with the financial inclusion variables.

We use the ROL variable to measure the quality of legal institutions. The ROL variable is widely used in the literature to capture the quality of legal institutions (Banna et al., 2022; Asante et al., 2023). Strong legal institutions can promote financial inclusion by using the law and courts to prevent discrimination and ensure fairness in the distribution of formal financial services to all segments of the population. Therefore, the ROL variable should have a positive relationship with the financial inclusion variables.

We use the VAC variable to measure the quality of accountability governance institutions. The VAC variable is widely used in the literature to capture the quality of accountability

governance institutions (Banna et al., 2022; Asante et al., 2023). Strong accountability governance institutions can promote financial inclusion by protecting citizens' freedom and rights to access and use available financial services in the most meaningful way. Therefore, the VAC variable should have a positive relationship with the financial inclusion variables.

Next, we use the BZ variable to measure the stability or solvency of the banking system. The BZ variable is widely used in the literature to measure the solvency or stability of the banking sector (Chinoda and Kapingura, 2023; Ozili, 2023b). We argue that a stable banking sector means that banks have sufficient deposits and liquidity and are profitable. As a result, banks will have incentives to expand their branches and ATMs to new locations in search for new customers and profits and they will provide financial services to customers in the new locations, thereby increasing financial inclusion. Therefore, the BZ variable should have a positive relationship with the financial inclusion variables.

Finally, we use the FED variable to measure the level of financial development. The FED variable is widely used in the literature to measure the level of financial development (e.g., Dhungana, 2019; Ozili and Ndah, 2021). Well-developed financial systems often experience high levels of financial inclusion due to the absence of market and non-market barriers in accessing basic financial services (Allen et al, 2014). Therefore, the FED variable should have a positive relationship with the financial inclusion variables.

4. Discussion of results

4.1. Impact of terrorism on financial inclusion

This section examines the effect of terrorism on financial inclusion while controlling for three institutional factors (i.e., the PST, ROL, and VAC variables), depth of the financial system (FED) and the stability of the banking sector (BZ). The GTI variable has a significant negative impact on the ATM and FINDEX variables in the fixed effect estimation in columns 2 and 3 of table 4. The significant negative GTI coefficient in the fixed effect estimation supports our expectation and shows that terrorism significantly reduced the level of financial inclusion in the terrorized countries that make up the sample. This empirical result supports the expectation that terrorism has a detrimental effect on financial inclusion (Drakos and Kallandranis, 2015;

Meierrieks and Gries, 2013). The result also supports studies which show that terrorism has a detrimental effect on economic welfare and development outcomes which are often enabled through financial inclusion (Meierrieks and Gries, 2013; Gries et al., 2011). Overall, the result implies that elevated levels of terrorism are detrimental to financial inclusion, and our findings suggest that the most important channel through which this happens is through a reduction in the number of automated teller machines per 100,000 adults in terrorized areas. There may be other channels through which terrorism affects financial inclusion which are not captured in our empirical analysis such as banks' temporary discontinuation of banking services or when people are afraid to visit banks when terrorism risk is high (Levitt and Bauer, 2017; Baumert, 2008). However, these channels do not invalidate our result because, in theory, financial institutions are known to withdraw their resources, including their ATMs, from locations that have high adversarial risks such as locations that are prone to terrorist attacks (Delco and Marugg, 2004; Elnahass et al, 2022). In terms of economic significance, the GTI variable is not economically significant in table 4 because a unit increase in terrorism decreases financial inclusion by 0.18 units and 0.17 units as shown in columns 2 and 3 in table 4, respectively. Meanwhile, the GTI variable is not significantly related to the BR variable, but the GTI variable has a significant positive effect on the ATM and FINDEX variables in the generalized linear model.

Regarding the control variables, the PST variable has a significant positive impact on the three financial inclusion variables in table 4 as expected. The implication is that the level of financial inclusion is amplified by the presence of strong institutions that foster political stability and absence of terrorism. The FED variable has a significant positive impact on the three financial inclusion variables in table 4 as expected. The implication is that the level of financial inclusion is increased when the financial system is well-developed. The ROL and BZ variables report an insignificant effect on the three financial inclusion variables, implying that rule of law and banking system stability do not have a significant effect on the three indicators of financial inclusion. The VAC variable has a significant negative impact on the BR variable in table 4 as expected. The implication is that the level of financial inclusion is amplified by the presence of strong institutions that foster greater voice and accountability in a country.

Table 4. The impact of terrorism on financial inclusion

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Generalized Linear Model	Generalized Linear Model	Generalized Linear Model
	Dependent variable: BR	Dependent variable: ATM	Dependent variable: FINDEX	Dependent variable: BR	Dependent variable: ATM	Dependent variable: FINDEX
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
C	1.394* (0.09)	6.907*** (0.0001)	8.303*** (0.001)	-1.706 (0.12)	3.791 (0.25)	1.807 (0.65)
GTI	0.013 (0.77)	-0.185** (0.04)	-0.177* (0.09)	0.175 (0.18)	0.823*** (0.02)	0.986** (0.03)
PST	0.973*** (0.002)	1.236** (0.04)	2.217*** (0.003)	-2.268*** (0.000)	-2.028 (0.17)	-4.326** (0.02)
FED	0.169*** (0.000)	0.097** (0.01)	0.271*** (0.000)	0.134*** (0.000)	0.009 (0.91)	0.149 (0.11)
ROL	0.566 (0.35)	0.239 (0.84)	0.814 (0.56)	4.807*** (0.000)	1.702 (0.51)	6.522** (0.04)
BZ	0.002 (0.95)	0.022 (0.73)	0.026 (0.73)	0.077 (0.26)	-0.267 (0.19)	-0.174 (0.48)
VAC	-1.783*** (0.0004)	0.935 (0.31)	-0.810 (0.46)	-2.041** (0.02)	4.556* (0.07)	2.599 (0.39)
Country fixed effect	Yes	Yes	Yes			
Period fixed effect	Yes	Yes	Yes			
R-squared	97.83	97.81	98.29			
Adjusted R- squared	96.95	96.91	97.58			
F-statistic	111.07	107.89	138.87			
Prob(F-statistic)	0.000	0.000	0.000			
LR statistic				134.93	29.10	53.19
Prob (LR statistic)				0.000	0.000	0.000

***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Source: Created by author

4.2. Sensitivity tests

4.2.1 Moderating role of political stability governance institutions on the impact of terrorism on financial inclusion

This section examines the moderating role of political stability governance institutions on the impact of terrorism on financial inclusion. We argue that the presence of strong political stability governance institutions can dampen the adverse effect of terrorism on financial inclusion in a country. This is because political stability governance institutions can use several tools at their disposal, including negotiation, compensation, dialogue, and reconciliation to pacify aggrieved terrorists directly, or their sponsors and influence them to end terrorism. This would have positive benefits for financial inclusion as people will be able to access financial services from bank branches and ATMs without fear of terrorist attacks, thereby increasing access and use of formal financial services and increasing the level of financial inclusion.

Table 5 shows the empirical analyses to support the above argument. The variable of interest in this section is the GTI*PST variable. The GTI*PST variable has a robust significant positive impact on the ATM variable in the fixed effect estimation and the GLM estimation in columns 2 and 5 of table 6. The robust significant GTI*PST coefficient confirms that strong political stability governance institutions mitigate the adverse effect of terrorism on financial inclusion. Therefore, it is recommended that countries facing high levels of terrorism should strengthen their political stability governance institutions, or their democratic institutions to increase the level of financial inclusion through ATM penetration. This empirical result supports existing studies which show that good institutions are helpful in mitigating conflict and terrorism (Krieger and Meierrieks, 2011; Asongu and Nwachukwu, 2017). Notwithstanding this result, in reality, the strengthening of political stability governance institutions may not increase financial inclusion if terrorism is politically motivated and systematically sponsored by the political elites to weaken democratic processes and make political stability institutions ineffective (Collins, 2014; Wolf, 2017). Meanwhile, the GTI*PST variable reports a significant positive impact on the BR and FINDEX variables in columns 1 and 3 in the panel fixed effect regression and is insignificant in columns 4 and 6 in the generalized linear model; therefore, the result is not robust.

Table 5. Moderating role of political stability governance institutions on the impact of terrorism on financial inclusion

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Generalized Linear Model	Generalized Linear Model	Generalized Linear Model
	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
C	0.087 (0.92)	5.401*** (0.004)	5.541*** (0.009)	-1.552 (0.43)	-8.184 (0.12)	1.812 (0.78)
GTI	0.203*** (0.009)	0.044 (0.77)	0.244 (0.18)	0.161 (0.40)	1.479*** (0.00)	0.986 (0.12)
PST	-0.896 (0.19)	-0.990 (0.47)	-1.862 (0.25)	-2.134 (0.15)	-2.971** (0.04)	-4.322 (0.39)
GTI*PST	0.229*** (0.004)	0.272* (0.08)	0.498*** (0.007)	-0.016 (0.92)	2.212*** (0.004)	-0.0004 (0.99)
FED	0.155*** (0.000)	0.077* (0.05)	0.234*** (0.00)	0.133 (0.00)	0.073 (0.34)	0.149 (0.12)
ROL	0.509 (0.36)	0.165 (0.88)	0.677 (0.60)	4.820 (0.00)	1.194 (0.63)	6.522 (0.04)
BZ	0.013 (0.66)	0.034 (0.59)	0.048 (0.51)	0.076 (0.28)	0.102 (0.65)	-0.174 (0.49)
VAC	-1.677*** (0.0004)	1.028 (0.26)	-0.640 (0.54)	-2.038 (0.02)	-10.298* (0.06)	2.599 (0.39)
Country fixed effect	Yes	Yes	Yes			
Period fixed effect	Yes	Yes	Yes			
R ²	98.16	97.94	98.52			
Adjusted R ²	97.36	97.03	97.86			
F-statistic	123.03	107.44	150.56			
Prob(F-statistic)	0.000	0.000	0.000			
LR statistic				133.03	40.52	52.42
Prob (LR statistic)				0.000	0.000	0.000

***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Source: Created by author

4.2.2 Moderating role of accountability governance institutions on the impact of terrorism on financial inclusion

This section examines the moderating role of accountability governance institutions on the impact of terrorism on financial inclusion. We argue that the presence of strong accountability governance institutions can also dampen the adverse effect of terrorism on financial inclusion in a country. This is because strong accountability governance institutions would preserve citizens' rights to participate in selecting their government, freedom of expression, freedom of association, and citizens' right to a free media. Citizens can use these accountability mechanisms to pressure government and demand an end to terrorism in all its form. This would compel the government to take strong actions to end terrorism. This will have positive benefits for financial inclusion as people will have freedom to access and use financial services from bank branches and ATMs without fear of terrorist attacks, thereby increasing access and use of formal financial services and increasing the level of financial inclusion.

The empirical analyses to support the above argument are reported in table 6. The variable of interest in this section is the GTI*VAC variable. The GTI*VAC variable has a robust significant positive impact on the FINDEX variable in the fixed effect estimation and the GLM estimation in table 6. The significant GTI*VAC coefficient confirms that strong accountability governance institutions mitigate the adverse effect of terrorism on financial inclusion. Therefore, it is recommended that countries facing high levels of terrorism should strengthen their voice and accountability governance institutions to increase the level of financial inclusion. This empirical result supports existing studies which show that good institutions are helpful in mitigating conflict and terrorism (Bandyopadhyay and Younas, 2011; Krieger and Meierrieks, 2011; Asongu and Nwachukwu, 2017). In terms of economic significance, the GTI*VAC variable is economically significant in columns 3 and 6 of table 6 because a unit increase in terrorism increases financial inclusion by 2.675 units and 2.166 units, respectively.

Notwithstanding this result, in reality, the strengthening of accountability governance institutions may not increase financial inclusion if there is endemic corruption that weakens accountability processes and makes accountability institutions ineffective (Lederman et al, 2005; Bardhan and Mookherjee, 2006). Meanwhile, the GTI*VAC variable reports a significant positive impact on the BR variable in column 1 in the panel fixed effect regression and is insignificant in column 4 in the generalized linear model, while the GTI*VAC variable reports

a significant positive impact on the ATM variable in column 5 in the generalized linear model and is insignificant in column 2 in the panel fixed effect regression estimation; therefore, the result is not robust.

Table 6. Moderating role of accountability governance institutions on the impact of terrorism on financial inclusion

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Generalized Linear Model	Generalized Linear Model	Generalized Linear Model
	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
C	0.487 (0.60)	5.620*** (0.004)	5.891*** (0.009)	-1.344 (0.47)	-8.184 (0.12)	-9.915 (0.12)
GTI	0.149* (0.08)	-0.004 (0.97)	0.162 (0.40)	0.153 (0.34)	1.479*** (0.00)	1.629*** (0.00)
GTI*VAC	0.371* (0.06)	0.508 (0.19)	2.675*** (0.001)	-0.0701 (0.81)	2.213*** (0.004)	2.166** (0.02)
PST	1.145*** (0.001)	1.480** (0.02)	0.952** (0.04)	-2.241*** (0.00)	-2.971** (0.04)	-5.250*** (0.00)
FED	0.185*** (0.000)	0.124*** (0.006)	0.321*** (0.000)	0.132*** (0.00)	0.073 (0.34)	0.212** (0.03)
ROL	0.576 (0.33)	0.261 (0.82)	0.855 (0.53)	4.825*** (0.00)	1.194 (0.63)	6.025* (0.05)
BZ	0.006 (0.85)	0.030 (0.64)	0.041 (0.57)	0.066 (0.42)	0.102 (0.66)	0.188 (0.51)
VAC	-4.371*** (0.003)	-2.572 (0.36)	-7.382** (0.03)	-1.565 (0.47)	-10.292* (0.07)	-11.942* (0.08)
Country fixed effect	Yes	Yes	Yes			
Period fixed effect	Yes	Yes	Yes			
R ²	97.98	97.88	98.43			
Adjusted R ²	97.11	96.95	97.73			
F-statistic	111.90	104.65	141.56			
Prob(F-statistic)	0.000	0.000	0.000			
LR statistic				133.17	40.52	61.62
Prob (LR statistic)				0.000	0.000	0.000

***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Source: Created by author

4.2.3 Moderating role of legal institutions on the impact of terrorism on financial inclusion

This section examines the moderating role of legal institutions on the impact of terrorism on financial inclusion. We argue that the presence of strong legal institutions that severely punish all acts of terrorism, and the presence of courts whose terrorism-specific judgements cannot be overturned or overruled by incumbent political power, would be a strong deterrent to perpetrators of terrorism. Therefore, strong legal institutions, including the courts, can use existing legal mechanisms to dissuade terrorists and their sponsors from engaging in bold acts of terrorism. This will have positive benefits for financial inclusion as people will feel safe and protected and will have freedom to access and use financial services from bank branches and ATMs without fear of terrorist attacks, thereby increasing access and use of formal financial services and increasing the level of financial inclusion. The empirical analyses to support the above argument are reported in table 7. The variable of interest in this section is the GTI*ROL variable. The GTI*ROL variable reports a significant positive impact on the BR variable in the panel fixed effect estimation in column 1 and is insignificant in column 4 in the generalized linear model; therefore, the result for the GTI*ROL variable is not robust. Notwithstanding this result, in reality, the strengthening of legal institutions may not increase financial inclusion if the courts are not allowed to deal with matters of terrorism and if there is a blatant disregard for rule of law (O'donnell, 2004; Wasinski, 2014).

Table 7. Moderating role of legal institutions on the impact of terrorism on financial inclusion

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Generalized Linear Model	Generalized Linear Model	Generalized Linear Model
	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
C	-0.147 (0.89)	7.238*** (0.002)	7.094*** (0.009)	-2.350 (0.30)	-4.801 (0.45)	-7.571 (0.33)
GTI	0.2003* (0.05)	-0.226 (0.27)	-0.031 (0.89)	0.224 (0.26)	1.452*** (0.00)	1.673*** (0.01)
GTI*ROL	0.353** (0.04)	-0.076 (0.82)	0.278 (0.49)	0.092 (0.74)	1.207 (0.11)	1.317 (0.16)
PST	1.004*** (0.001)	1.229** (0.04)	2.242*** (0.003)	-2.285*** (0.00)	-2.277 (0.12)	-4.599*** (0.00)
FED	0.173*** (0.000)	0.096** (0.02)	0.274*** (0.000)	0.135*** (0.00)	0.036 (0.64)	0.179* (0.06)
ROL	-2.093 (0.14)	0.813 (0.77)	-1.277 (0.71)	4.013 (0.12)	-8.616 (0.22)	-4.739 (0.58)
BZ	0.015 (0.63)	0.019 (0.77)	0.037 (0.64)	0.091 (0.26)	-0.086 (0.71)	0.023 (0.93)
VAC	-1.862*** (0.0002)	0.952 (0.31)	-0.872 (0.43)	-1.993*** (0.02)	5.232** (0.04)	3.336 (0.27)
Country fixed effect	Yes	Yes	Yes			
Period fixed effect	Yes	Yes	Yes			
R ²	97.99	97.82	98.31			
Adjusted R ²	97.13	96.85	97.56			
F-statistic	112.79	101.35	131.51			
Prob(F-statistic)	0.000	0.000	0.000			
LR statistic				133.31	32.15	55.89
Prob (LR statistic)				0.000	0.000	0.000

***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Source: Created by author

4.2.4 Joint moderating role of the three institutional factors on the impact of terrorism on financial inclusion

This section examines the joint moderating role of legal institutions, accountability institutions and political stability institutions on the impact of terrorism on financial inclusion. We also argue that the presence of these institutions and with strong enforcement would significantly deter acts of terrorism and yield positive benefits for financial inclusion as people will feel safe and protected and will be able to access and use financial services from bank branches and ATMs without fear of terrorist attacks, thereby increasing access and use of formal financial services and increasing the level of financial inclusion.

The empirical analyses to support the above argument are reported in table 8. The variable of interest in this section is the GTI*ROL*PST*VAC variable. The GTI*ROL*PST*VAC variable has a robust significant positive impact on the BR and FINDEX variables in the fixed effect estimation and the GLM estimation in table 8. The significant GTI*ROL*PST*VAC coefficient confirms that the three governance institutions mitigate the adverse effect of terrorism on financial inclusion. Therefore, it is recommended that countries facing high levels of terrorism should strengthen their legal, accountability and political stability governance institutions to increase the level of financial inclusion particularly the number of commercial bank branches. This empirical result supports existing studies which show that good institutions are helpful in mitigating conflict and terrorism (Krieger and Meierrieks, 2011; Asongu and Nwachukwu, 2017). In terms of economic significance, the GTI*ROL*PST*VAC variable is economically significant in columns 1, 3, 4 and 6 in table 8 because a unit increase in terrorism increases financial inclusion by 0.073, 0.103, 0.115 and 0.532 units, respectively. Meanwhile, the GTI*ROL*PST*VAC variable reports a significant positive impact on the ATM variable in the generalized linear model in column 5 and is insignificant in column 2 in the panel fixed effect estimation; therefore, the result is not robust.

Table 8. Moderating role of the three governance institutions on the impact of terrorism on financial inclusion

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Panel Fixed Effect Regression	Generalized Linear Model	Generalized Linear Model	Generalized Linear Model
	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>	Dependent variable: <i>BR</i>	Dependent variable: <i>ATM</i>	Dependent variable: <i>FINDEX</i>
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
C	0.078* (0.09)	6.373*** (0.001)	6.451*** (0.004)	-5.281*** (0.00)	-9.318** (0.01)	-14.970*** (0.00)
GTI	0.024 (0.56)	-0.181** (0.04)	-0.162 (0.12)	0.096 (0.44)	0.529* (0.09)	0.609 (0.11)
GTI*ROL*PST*VAC	0.073*** (0.001)	0.029 (0.53)	0.103* (0.06)	0.115*** (0.00)	0.415*** (0.00)	0.532*** (0.00)
PST	0.773*** (0.009)	1.155* (0.06)	1.936*** (0.008)	-2.931*** (0.00)	-4.442*** (0.00)	-7.416*** (0.00)
FED	0.182*** (0.000)	0.102** (0.01)	0.290*** (0.00)	0.149*** (0.00)	0.069 (0.29)	0.227*** (0.004)
ROL	-0.764 (0.27)	-0.301 (0.84)	-1.063 (0.52)	2.166* (0.06)	-7.801*** (0.00)	-5.641* (0.09)
BZ	0.002 (0.94)	0.022 (0.73)	0.027 (0.72)	0.166** (0.02)	0.064 (0.72)	0.251 (0.26)
VAC	-2.221*** (0.000)	0.758 (0.43)	-1.424 (0.21)	-2.636*** (0.00)	2.482 (0.25)	-0.055 (0.98)
Country fixed effect	Yes	Yes	Yes			
Period fixed effect	Yes	Yes	Yes			
R ²	98.20	97.83	98.40			
Adjusted R ²	97.42	96.87	97.69			
F-statistic	125.85	102.05	139.47	172.09	67.06	108.11
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000
LR statistic						
Prob (LR statistic)						

***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Source: Created by author

5. Conclusion

This study examined the impact of terrorism on financial inclusion in eight terrorized countries from 2010 to 2021. This paper is the first to comprehensively examine the relationship between terrorism and financial inclusion. The study extends the financial inclusion literature by utilising a unique category of countries – the most terrorized countries in the world. The findings showed that terrorism reduces the level of financial inclusion in countries experiencing terrorism, but the presence of strong legal institutions, accountability governance institutions and political stability governance institutions mitigate the adverse effect of terrorism on financial inclusion. The presence of these institutions leads to elevated levels of financial inclusion through greater ATM penetration and bank branch expansion.

The findings in this study contribute to the ongoing debate about the implications of terrorism on development efforts such as accelerating financial inclusion. The results show a detrimental impact of terrorism on financial inclusion, but the detrimental impact can be mitigated by the presence of strong legal, accountability and political stability governance institutions. Therefore, policymakers and economists should pay attention to the detrimental effects of terrorism on national financial inclusion efforts. They should understand how these effects could be worsened by the presence of weak institutions. Although many terrorised countries have already taken, or are considering, several measures to bolster their financial inclusion efforts through the adoption of agent banking, Fintech and the issuance of a central bank digital currency, these countries may not be able to achieve a lot with these initiatives because development funders and investors will not invest in these initiatives due to uncertainty and insecurity caused by prolonged terrorism. However, there is a need for the international community to support terrorized countries in building high-quality governance institutions that support democracy in these countries and minimise the risk of terrorism, which has adverse implications for financial inclusion. Policymakers should also consider using democratic mechanisms to suppress acts of terrorism, if necessary, to prevent terrorist attacks that could erode the gains of financial inclusion in terrorized countries. The findings are also relevant to banked adults in formal financial institutions who must cope with the terror caused by terrorist attacks, and to bank managers who want to know the crucial determinants of financial inclusion in times of terrorism.

A limitation of this study is the choice of financial inclusion indicators. The study used the accessibility dimension of financial inclusion and did not analyse the usage dimension of financial inclusion that may offer new insights. Another limitation of the study is the few countries examined. A further limitation of the study relates to the choice of terrorism indicator. There may be other indicators of terrorism that may offer additional insight.

Future studies could benefit from this study by analysing the least terrorized countries and comparing them with the most terrorized countries. Such analysis could provide additional valuable insights to this line of literature. Future studies can revisit the topic of this paper by using qualitative research methods such as a case study or questionnaires to identify the perceptions of financial managers on the impact of terrorism on financial inclusion. Such analysis could enrich our understanding of the relationship between terrorism and financial inclusion in the view of industry practitioners. Future studies can also undertake country-specific investigation into the impact of terrorism on financial inclusion. Finally, future studies can extend this research by including other countries, additional measures of terrorism and financial inclusion that may offer additional valuable insights to this line of research.

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Appendix

Table 9. Random effect – Hausman test

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	31.683344	6	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
GTI	-0.008454	-0.003982	0.000058	0.5559
PST	0.624668	0.220988	0.011074	0.0001
FED	0.113194	0.106967	0.000064	0.4354
BZ	0.061690	0.068969	0.000140	0.5382
ROL	0.441190	0.877977	0.090029	0.1455
VAC	-0.855530	-0.838089	0.024893	0.9120

Cross-section random effects test equation:

Dependent Variable: BR

Method: Panel Least Squares

Date: 07/23/23 Time: 03:04

Sample (adjusted): 2011 2020

Periods included: 10

Cross-sections included: 8

Total panel (unbalanced) observations: 77

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.934847	0.930091	2.080277	0.0416
GTI	-0.008454	0.050136	-0.168626	0.8666
PST	0.624668	0.321631	1.942187	0.0566
FED	0.113194	0.017923	6.315388	0.0000
BZ	0.061690	0.031996	1.928080	0.0584
ROL	0.441190	0.668916	0.659559	0.5119
VAC	-0.855530	0.465527	-1.837767	0.0708

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.964788	Mean dependent var	4.389651
Adjusted R-squared	0.957522	S.D. dependent var	2.495199
S.E. of regression	0.514264	Akaike info criterion	1.670806
Sum squared resid	16.66146	Schwarz criterion	2.096953
Log likelihood	-50.32604	Hannan-Quinn criter.	1.841261
F-statistic	132.7823	Durbin-Watson stat	0.927250
Prob(F-statistic)	0.000000		

Source: Created by author