





Article type:  
Original Research

Article history:  
Received 01 May 2025  
Revised 28 July 2025  
Accepted 05 August 2025  
Published online 08 September 2025

Zinah. Khudhair Mhmood <sup>1</sup>, Sara. Ghobadi <sup>2\*</sup>, Amjed. Subhi Sahib <sup>3</sup>, Hossein. Sharifi Renani <sup>2</sup>

- 1 PhD Student, Department of Economics, Isf.C., Islamic Azad University, Isfahan, Iran.
- 2 Associate Professor, Department of Economics, Isf.C., Islamic Azad University, Isfahan, Iran.
- 3 Assistant Professor Department of Banking and Financial Sciences, Imam Alkadhim University (IKU), Iraq.
- 4 Associate Professor, Department of Economics, Isf.C., Islamic Azad University, Isfahan, Iran.

Corresponding author email address: [sghebadi@iau.ac.ir](mailto:sghebadi@iau.ac.ir)

#### How to cite this article:

Khudhair Mhmood, Z., Ghobadi, S., Subhi Sahib, A., & Sharifi Renani, H. (2025). Analysis of the Effects of Geopolitical Risk and Remittances on Informal Employment in Selected OPEC Countries (Quantile Approach). *Future of Work and Digital Management Journal*, 3(3), 1-11.  
<https://doi.org/10.61838/fwdmj.93>



© 2025 the authors. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

## Analysis of the Effects of Geopolitical Risk and Remittances on Informal Employment in Selected OPEC Countries (Quantile Approach)

### ABSTRACT

The main objective of this article is to analyze the effects of geopolitical risk and remittances on informal employment in selected OPEC countries during the period 2010–2023. For this purpose, the quantile regression method was employed. The results indicate that remittances in the lower, middle, and upper quantiles have led to an increase in informal employment. Geopolitical risk, in the middle and upper quantiles, has resulted in a decrease in informal employment. The interactive effect of geopolitical risk and remittances in the lower, middle, and upper quantiles has had a negative effect on informal employment, suggesting that an increase in geopolitical risk reduces the positive impact of remittances on informal employment. Unemployment rate and population in all three quantiles have contributed to an increase in informal employment. Government legitimacy, in all three quantiles, has led to a reduction in informal employment. Furthermore, the results of the Wald symmetry test indicate that the effects of remittances, geopolitical risk, and their interaction on informal employment are symmetric across different quantiles. In contrast, the effects of unemployment rate, population, and government legitimacy have been asymmetric across different quantiles.

**Keywords:** Informal employment, remittances, geopolitical risk, quantile regression

### Introduction

The phenomenon of informal employment, often referred to as the “shadow economy” or “informality,” remains one of the most pressing socioeconomic challenges in both developed and developing economies. Informal employment encompasses a wide range of economic activities conducted outside of regulatory and legal frameworks, including jobs without formal contracts, social protection, or labor rights. This sector is critical because it not only reflects structural weaknesses in national labor markets but also directly impacts fiscal sustainability, social welfare systems, and political stability [1, 2]. In the context of resource-rich economies, particularly oil-exporting countries, informal employment interacts with external economic and political shocks, such as geopolitical risks and remittance flows, thereby complicating the task of employment management and long-term development planning [3].

Informality is often attributed to the inability of formal institutions to provide sufficient employment opportunities and protections, leading workers to seek survival strategies outside the regulated economy [1]. For example, research in the Western Balkans demonstrates that weak enforcement of institutional frameworks and inadequate social security



mechanisms foster a dependence on informal labor [1]. In Iran and other oil-exporting nations, studies confirm that sanctions, economic mismanagement, and institutional inefficiencies exacerbate informality by limiting formal sector capacity [4-6]. Similarly, quantitative estimates reveal that the shadow economy absorbs a substantial portion of national labor forces, with social security systems losing vast financial resources as a consequence [6].

Informal employment is not uniform across regions; its dynamics are shaped by cultural, institutional, and macroeconomic contexts. For instance, in Russia, socioeconomic conditions, unemployment trends, and demographic pressures have been shown to significantly influence the size of the informal sector [7]. In Uganda, empirical evidence suggests that informality persists even when long-term structural reforms are introduced, underscoring the entrenched nature of the shadow economy in contexts where institutionalized democracy and financial development remain fragile [8-10].

Geopolitical risk (GPR) has emerged as a significant determinant of economic stability, influencing not only capital markets and investment flows but also labor market structures [11, 12]. The geopolitical risk index developed by Caldara and Iacoviello (2022) has been widely adopted to capture the frequency and intensity of adverse geopolitical events and their economic repercussions [11]. Increasingly, research has demonstrated that GPR can destabilize formal labor markets, exacerbate unemployment, and redirect labor into informal channels [3, 13].

At the macro-financial level, GPR has been linked to fluctuations in sovereign risk, financial instability, and challenges to sustainable development [14-16]. Specifically, disruptions caused by wars, sanctions, or political unrest often increase vulnerability in labor markets by reducing investment, limiting trade, and weakening social institutions. For example, studies highlight that geopolitical shocks constrain remittance networks in former USSR countries, demonstrating how cross-border instability affects both financial flows and household labor supply [17]. Similarly, evidence from China reveals that geopolitical uncertainty hampers corporate innovation, with downstream effects on labor demand and job creation [18]. In the energy and power industries, GPR has even been shown to influence firm-level decisions regarding mergers and acquisitions, illustrating the broader reallocation of resources under uncertainty [19].

From a labor market perspective, geopolitical shocks have been found to alter employment decisions, particularly in economies with varying levels of employment protection [13]. In Middle Eastern countries, terrorist activities—representing an extreme form of geopolitical risk—have measurable impacts on employment outcomes through spatial spillovers and regional instability [20]. These findings indicate that geopolitical risks are not limited to financial volatility; they have structural implications for employment distribution between formal and informal sectors.

Remittances, defined as cross-border transfers of money by migrant workers, represent a crucial source of external finance for many developing economies. They often serve as countercyclical buffers during periods of crisis, enabling households to smooth consumption and maintain livelihoods [21]. However, their effects on labor markets and informality remain contested. While remittances can enhance household welfare and reduce poverty, they may also increase dependency on informal labor and reduce incentives for formal employment participation [22, 23].

Empirical studies across diverse contexts provide mixed results. In Ghana, remittances demonstrate gender-differentiated impacts on unemployment, suggesting that women and men adjust their labor market behavior differently in response to external transfers [24]. In Tajikistan, remittance inflows have been associated with reductions in formal labor supply, as migrant income substitutes for participation in regulated employment [21]. Conversely, some post-transition economies show that remittances can bolster formal employment opportunities by improving household investment capacity [23]. This

divergence underscores the complexity of the remittance–employment nexus, which appears contingent on institutional quality, governance, and labor market rigidity.

At the political economy level, remittances may contribute to stability by alleviating unemployment pressures, but they can also entrench informality if governance systems fail to channel resources into productive investments [22]. Indeed, the relationship between remittances and informality is mediated by the legitimacy and efficiency of state institutions, which determine whether inflows are absorbed into formal channels or dissipated through informal arrangements [25, 26].

The interaction between geopolitical risk and remittances represents a critical but understudied area of inquiry. While geopolitical instability can disrupt remittance flows, it may also amplify their importance as safety nets for vulnerable households [17]. Yet, the presence of GPR can undermine the developmental potential of remittances by reducing their capacity to generate formal employment. For instance, evidence from BRICS countries shows that geopolitical thresholds significantly influence the balance between natural resources, informality, and economic outcomes [3].

This interaction is particularly relevant in oil-exporting economies, where dependence on volatile external revenues makes labor markets sensitive to external shocks. Studies show that sanctions and geopolitical conflicts push workers into informal employment, as firms and households adapt to reduced opportunities in the formal economy [27, 28]. Additionally, the institutional weakness often accompanying political instability further reduces the absorptive capacity of formal employment channels [8, 29].

Despite substantial advances in understanding the determinants of informal employment, there are still gaps in linking geopolitical risks and remittances as joint explanatory variables. Much of the existing literature addresses these factors separately. Research has established robust determinants of the shadow economy, including taxation, governance, and corruption [30, 31]. However, few studies integrate external shocks, such as GPR and remittances, into a unified framework. The novelty of this approach lies in recognizing that informal employment in resource-rich, geopolitically exposed economies is shaped simultaneously by financial inflows from abroad and by the destabilizing effects of geopolitical uncertainty.

Moreover, asymmetries in how these factors influence different segments of the labor market remain underexplored. Empirical evidence suggests that unemployment, population growth, and state legitimacy have asymmetric impacts on informality across quantiles of income distribution [3, 10]. Such insights highlight the importance of methodological approaches, like quantile regression, that capture heterogeneity in the effects of remittances and GPR across different labor market strata.

Building on this literature, the present study examines the effects of remittances and geopolitical risk on informal employment in selected OPEC member states between 2010 and 2023.

## Methods and Materials

In the present study, to analyze the effects of remittances and geopolitical risk on informal employment in selected oil-exporting countries, the quantile method is applied. This method, introduced by Koenker and Bassett (1987), can be used in cases where data or error terms do not follow a normal distribution and when the distribution tails are long and asymmetric. Under these conditions, the use of estimators that rely on the mean may lead to biased results. Consequently, estimation will lack the required efficiency. In contrast, since the quantile method bases estimation on the median of the data, it contributes

to preserving the efficiency of estimators. Moreover, unlike the ordinary least squares regression, quantile regression estimates different quantile functions using a conditional distribution.

The analysis of the effects of remittances and geopolitical risk on informal employment in seven selected oil-exporting countries (Iran, Iraq, Angola, Algeria, Congo, Gabon, Nigeria) during the period 2010–2023, and following the studies of Pekovic (2025), Ivalos (2016), and Oud Rajput et al. (2019), is specified by the following model:

$$CFW_{it} = \alpha_0(\sigma) + \sum_{j=0}^{b_1} \lambda_j(\sigma) RPR(t-j) + \sum_{j=0}^{b_2} \alpha_j(\sigma) GR(t-j) + \sum_{j=0}^{b_3} \eta_j(\sigma) (GR \times RPR)(t-j) + \sum_{j=0}^{b_4} \varphi_j(\sigma) UN(t-j) + \sum_{j=0}^{b_4} \varphi_j(\sigma) P(t-j) + \sum_{j=0}^{b_4} \varphi_j(\sigma) SLO(t-j) + \varepsilon_t(\sigma) \quad (1)$$

In equation (1),  $\sigma$  denotes the quantile, which ranges between zero and one.  $\alpha_0$  is the intercept, and  $\varepsilon_t$  is the error term.

- **CFW (Informal Employment):** Informal employment includes all individuals who work without formal and written contracts and without social and legal protections, with wages below the legal minimum, in informal jobs across the formal sector, informal sector, or households. The variable of contributing family workers (as a percentage of total employment), reported annually by the World Bank, is used as the proxy for informal employment. Contributing family workers, as the most vulnerable employment status and individuals lacking formal work arrangements, are classified as informal workers.
- **RPR (Remittances):** Remittances refer to the transfer of cash or goods sent by migrants residing abroad to support their families in the home country. The data on remittances, expressed as a percentage of gross domestic product (GDP), are collected from the World Bank.
- **GR (Geopolitical Risk):** Geopolitical risk, in its broadest sense, encompasses three dimensions: political (wars, social unrest, religious conflicts, etc.), economic (trade frictions, protectionism, anti-globalization, etc.), and natural (earthquakes, tsunamis, droughts, etc.). Caldara and Iacoviello (2022) construct the geopolitical risk index by counting the number of articles related to adverse geopolitical events in ten newspapers—Chicago Tribune, Daily Telegraph, Financial Times, Globe and Mail, Guardian, Los Angeles Times, New York Times, USA Today, Wall Street Journal, and Washington Post—on a monthly basis. This index assesses the probability of occurrence and escalation of adverse events. The data are extracted from the Policy Uncertainty database.
- **GR × RPR (Interactive Effect of Geopolitical Risk and Remittances):** To examine this effect, the product of the geopolitical risk index and remittances is used.
- **UN (Unemployment Rate):** Unemployment refers to the share of the labor force that is without work but available for and seeking employment. This variable, expressed as a percentage of the total labor force, is obtained from the World Bank.
- **P (Population):** The total population of each country, including all residents regardless of legal status or citizenship, expressed as the number of people. The data source is the World Bank.
- **SLO (State Legitimacy):** State legitimacy may arise from a wide range of sources, including the effectiveness of public institutions in fulfilling various functions such as service delivery, taxation, and social protection systems, as well as the degree of representation and accountability. According to Gilley (2006), this indicator is computed based on existing attitudes and practices regarding legitimacy, acceptability of conditions, and satisfaction-based performance on a scale from 0 to 10. Statistical data for this variable are collected from the *Fragile States Index* website.

The model is estimated using EViews 12 software.

**Findings and Results**

The descriptive statistics related to the variables used in the research model are presented in Table (1).

**Table 1. Descriptive Statistics**

Variable Name	Variable Symbol	Mean	Minimum	Maximum	Jarque-Bera Statistic
Informal Employment	CFW	4.90	0.83	16.05	30.08*** (0.000)
Remittances	RPR	0.93	0.0003	0.28	94.30*** (0.000)
Geopolitical Risk	GR	97.76	78.61	155.21	75.02*** (0.000)
Unemployment Rate (%)	UN	13.69	3.07	22.20	5.40* (0.067)
Population (Number of People)	P	56,960,344	1,719,879	2.128 × 10 <sup>8</sup>	40.42*** (0.000)
State Legitimacy	SLO	0.12	0.10	0.14	6.90** (0.032)

The numbers in parentheses are the probability values of the statistics. \*\*\*, \*\*, and \* denote significance levels of 99%, 95%, and 90%, respectively.

Table (1) shows that based on the Jarque–Bera statistic, all research variables do not follow a normal distribution. Given the non-normal distribution of the model variables, the use of median-based methods such as the quantile regression method will yield more efficient results.

To estimate the research model, it is first necessary to determine the stationarity degree of the variables. However, given that the data are panel data, it is essential to establish whether there is cross-sectional dependence or independence. If there is dependence between cross-sections, unit root tests that account for cross-sectional dependence should be used. Otherwise, conventional stationarity tests can be applied. Accordingly, the cross-sectional dependence test was conducted using the Pesaran (CD) method, and its results are presented in Table (2).

**Table 2. Pesaran (CD) Cross-Sectional Dependence Test**

Null Hypothesis	CD Statistic	Probability	Test Result
No cross-sectional dependence	-0.178	0.858	Null hypothesis not rejected / Cross-sectional independence

Given the absence of cross-sectional dependence, conventional stationarity tests can be used. In this study, the Levin, Lin, and Chu (LLC) unit root test is applied. The results are presented in Table (3).

**Table 3. LLC Stationarity Test Results**

Variable Name	Variable Symbol	Statistic	Probability	Test Result
Informal Employment	CFW	-3.61	0.000***	Stationary
Remittances	RPR	-2.67	0.004***	Stationary
Geopolitical Risk	GR	-6.33	0.000***	Stationary
Unemployment Rate	UN	-1.94	0.026***	Stationary
Population	P	-8.24	0.000***	Stationary
State Legitimacy	SLO	-5.77	0.000***	Stationary

\*\*\*, \*\*, and \* denote significance levels of 99%, 95%, and 90%, respectively.

According to the results of the stationarity test in Table (3), all variables are stationary. In other words, all variables are integrated of order zero. Thus, the model can be estimated without concerns about spurious results. The results of the research model estimation using the quantile regression method for the lower (0.25), median (0.50), and upper (0.75) quantiles are presented in Table (4).

**Table 4. Quantile Regression Estimation Results**

Variable	Coefficient (Q = 0.25)	Statistic (Q = 0.25)	Coefficient (Q = 0.50)	Statistic (Q = 0.50)	Coefficient (Q = 0.75)	Statistic (Q = 0.75)
RPR (Remittances)	0.43	8.30*** (0.000)	0.54	5.73*** (0.000)	0.71	7.71*** (0.000)
GR (Geopolitical Risk)	0.0003	0.014 (0.928)	-0.06	-1.69* (0.091)	-0.08	-1.75* (0.083)
GR × RPR	-0.26	-1.99** (0.049)	-0.32	-1.82* (0.072)	-0.34	-1.67* (0.098)
UN (Unemployment)	0.14	6.35*** (0.000)	0.13	1.73* (0.088)	0.12	3.34*** (0.001)
P (Population)	0.44	7.22*** (0.000)	0.26	2.99*** (0.003)	0.34	3.81*** (0.000)
SLO (State Legitimacy)	-0.16	-3.15*** (0.002)	-0.48	-7.11*** (0.000)	-0.29	-3.81*** (0.000)
Constant	-0.02	-0.65 (0.515)	0.23	5.66*** (0.000)	0.17	3.56*** (0.000)

The numbers in parentheses are the probability values of the statistics. \*\*\*, \*\*, and \* denote significance levels of 99%, 95%, and 90%, respectively.

Table (4) shows that remittances have had a positive effect on informal employment across all three quantiles (lower, median, and upper). This positive effect increases as the quantile level rises. Geopolitical risk has no significant effect on informal employment in the lower quantile but has a negative effect in the median and upper quantiles, with the negative effect being stronger in the upper quantile than in the median. The interactive effect of geopolitical risk and remittances is negative in all three quantiles, and this negative effect intensifies at higher quantiles. Thus, geopolitical risk reduces the positive impact of remittances on informal employment. Both unemployment rate and population have positive effects on informal employment across all three quantiles. Conversely, state legitimacy has a negative effect on informal employment in all three quantiles.

**Table 5. Diagnostic Test Results**

Test Type	Null Hypothesis	Test Statistic	Probability	Test Result
Parameter Stability (Ramsey)	Parameters are stable	2.26	0.171	Parameters are stable
Normality of Error Distribution (Jarque–Bera)	Errors are normally distributed	0.47	0.791	Error distribution is normal

According to Table (5), the diagnostic tests for error normality and parameter stability fail to reject the null hypothesis. In other words, the error terms are normally distributed and the estimated parameters are stable. Therefore, the estimation results can be trusted, interpreted, and analyzed. Table (6) presents the results of the Wald symmetry test.

**Table 6. Wald Symmetry Test Results (Null hypothesis: Symmetry of coefficients across quantiles 0.25 to 0.75)**

Variable	Symbol	Statistic	Probability	Test Result
Remittances	RPR	0.071	0.628	Coefficients are symmetric
Geopolitical Risk	GR	0.032	0.609	Coefficients are symmetric
Interactive Effect	GR × RPR	0.031	0.912	Coefficients are symmetric
Unemployment	UN	0.194	0.000***	Coefficients are asymmetric
Population	P	0.262	0.051**	Coefficients are asymmetric
State Legitimacy	SLO	0.508	0.000***	Coefficients are asymmetric

\*\*\*, \*\*, and \* denote significance levels of 99%, 95%, and 90%, respectively.

The results in Table (6) indicate that the null hypothesis of coefficient symmetry across quantiles is rejected for unemployment, population, and state legitimacy variables. Thus, the estimated coefficients of these variables are asymmetric across different quantiles. However, the null hypothesis of the Wald test cannot be rejected for remittances, geopolitical risk, and their interaction. Therefore, the estimated coefficients of these three variables are symmetric across quantiles.

## Discussion and Conclusion

The primary aim of this study was to analyze the effects of remittances and geopolitical risk on informal employment in selected OPEC countries between 2010 and 2023 using a quantile regression approach. The results demonstrated several key findings: (i) remittances have a positive effect on informal employment across all quantiles, with the effect increasing in higher quantiles; (ii) geopolitical risk has no significant impact in the lower quantile but exerts a negative effect in the middle and upper quantiles, with stronger magnitude at higher levels; (iii) the interaction between remittances and geopolitical risk is negative across all quantiles, indicating that geopolitical instability reduces the positive influence of remittances on informal employment; (iv) unemployment rate and population both positively affect informal employment; and (v) state legitimacy exerts a consistently negative effect on informal employment. These findings provide important contributions to the literature on labor markets, shadow economies, and the influence of external shocks.

The results confirmed that remittances are positively associated with informal employment in selected OPEC countries. Importantly, this positive effect strengthens across higher quantiles, indicating that households in settings with greater reliance on informality tend to convert remittances into informal rather than formal economic opportunities. This finding is consistent with the argument that remittances often act as coping mechanisms for vulnerable households, enabling them to survive in contexts of limited institutional support [2].

Previous literature highlights that remittances provide liquidity that can reduce poverty and vulnerability but also encourage informality when formal labor markets are constrained. For instance, evidence from Tajikistan shows that remittance inflows reduce labor supply in the formal sector, as households rely on external income rather than regulated employment [21]. Similarly, in Ghana, remittances were shown to affect unemployment differently for men and women, highlighting how household-level adjustments can reinforce informality, particularly among marginalized groups [24]. The positive relationship in our results resonates with these findings, suggesting that remittances are absorbed into informal channels when institutions are weak and when opportunities for formal investments are scarce.

At the same time, research in post-transition economies has demonstrated that remittances can promote employment if institutional conditions are favorable [23]. Our findings, however, suggest that in the case of OPEC countries, structural constraints and political fragility reduce the likelihood of remittances being channeled into productive or formal economic activities. In particular, sanctions and governance inefficiencies in economies such as Iran have historically directed household resources toward survivalist strategies, perpetuating informal labor [27, 28]. These results underscore the importance of state institutions in mediating the impact of remittances. Where institutional legitimacy and governance are weak, remittances reinforce rather than reduce informality.

Our findings indicate that geopolitical risk exerts asymmetric effects across quantiles of informal employment. While the effect is insignificant at lower levels, it becomes significantly negative in middle and upper quantiles, indicating that as informal employment intensifies, geopolitical instability further discourages engagement in informal labor markets. This result is consistent with literature that associates geopolitical risk with labor market disruptions. For instance, geopolitical shocks increase unemployment and depress investment, leading to structural distortions [13, 20].

The broader literature supports the adverse role of geopolitical risk in economic and labor market outcomes. Studies demonstrate that geopolitical instability constrains remittance networks, limits trade, and undermines financial stability [15, 17]. In BRICS economies, geopolitical thresholds were found to play a central role in shaping the linkages between natural

resources and informality, reinforcing that instability has both direct and indirect effects [3]. In China, geopolitical risk has been shown to undermine corporate innovation and formal sector dynamism, further curbing employment generation [18].

Interestingly, the negative association found in the upper quantiles suggests that geopolitical instability may suppress informal employment by constraining household and firm activities altogether. When conflict, sanctions, or political unrest escalate, informal employment becomes unviable due to lack of resources, mobility restrictions, or widespread economic contraction [14, 32]. Thus, while remittances expand informal opportunities, geopolitical shocks curtail them, illustrating a dynamic interplay between financial inflows and political risk.

One of the most novel contributions of this study is the identification of the negative interaction between remittances and geopolitical risk across all quantiles. This finding suggests that while remittances generally encourage informal employment, their positive effect is eroded when geopolitical instability rises. This aligns with the perspective that geopolitical risk undermines the developmental role of remittances by disrupting financial channels, restricting household investments, and increasing transaction costs [3].

Evidence from the former USSR indicates that geopolitical shocks significantly affect the resilience of remittance networks [17]. In politically unstable contexts, remittance inflows may decline, become irregular, or be absorbed by immediate survival needs rather than long-term investments in employment opportunities. Moreover, empirical research shows that economic sanctions and political unrest push households into precarious activities, undermining the transformative potential of external financial transfers [27, 28]. Our findings confirm this pattern, showing that geopolitical risk acts as a dampening mechanism on the otherwise positive link between remittances and informal employment.

This interaction is consistent with the broader literature that stresses the mediating role of state capacity and institutional legitimacy. In contexts where governance is fragile, geopolitical shocks not only destabilize formal markets but also diminish the capacity of remittances to sustain informal employment [10, 22]. This underscores the need to view remittances and geopolitical risk as interconnected factors shaping labor market outcomes, rather than isolated variables.

The results of this study further highlight the importance of structural factors in shaping informal employment. Unemployment and population size both exhibit significant positive effects across all quantiles, confirming that demographic pressures and weak labor market absorptive capacity drive individuals into informal work. This finding is well documented in prior literature, which identifies unemployment and population growth as robust determinants of informality [29, 30].

In Russia, unemployment has been shown to correlate strongly with informal labor, particularly in regions with limited industrial capacity [7]. Similarly, in Uganda, the informal economy continues to absorb labor excluded from formal opportunities, reinforcing its role as a safety valve during times of high unemployment [8]. Our results, therefore, align with global patterns, suggesting that informal labor remains a dominant outlet for excess labor supply in resource-dependent economies.

Conversely, state legitimacy demonstrates a consistently negative effect on informal employment across all quantiles. This underscores the importance of effective governance in reducing reliance on informality. When states provide social protection, enforce labor rights, and offer reliable institutions, informal employment declines [25, 26]. The Iranian case is illustrative, where sanctions and institutional inefficiencies have been shown to expand informality, while governance reforms could mitigate such trends [4, 5]. Similarly, in the Western Balkans, institutional failings have been linked to high

levels of informality [1]. Our findings reinforce this literature, indicating that strengthening state legitimacy is key to addressing the persistence of informal employment.

The results of this study align with and extend previous research in several important ways. First, the positive effect of remittances on informality is consistent with studies that highlight how households use remittances to finance informal labor rather than transition to formal work [21, 24]. Second, the negative impact of geopolitical risk is in line with findings that instability disrupts economic activity, reduces corporate innovation, and constrains both formal and informal markets [18, 32]. Third, the interactive effect of GPR and remittances builds on the literature showing that political instability undermines the developmental potential of remittance inflows [3, 17]. Finally, the role of unemployment, population, and state legitimacy as structural determinants resonates with existing evidence that institutional and demographic contexts shape the prevalence of informal labor [8, 30].

Taken together, the results provide a comprehensive picture of how financial inflows and geopolitical shocks jointly determine informal employment in OPEC countries. They suggest that the persistence of informality cannot be understood without accounting for both external vulnerabilities and domestic institutional frameworks.

This study is not without limitations. First, the analysis is restricted to a selected group of OPEC countries, which may limit the generalizability of the findings to other oil-exporting or developing economies. Second, the use of secondary data, while reliable, may not fully capture the nuances of informal employment, particularly in contexts where statistical systems underreport vulnerable employment. Third, while the quantile regression approach accounts for heterogeneity across different levels of informal employment, it does not explicitly address potential endogeneity between remittances, geopolitical risk, and labor market outcomes. Finally, the geopolitical risk index, although widely used, relies on newspaper-based measures and may not reflect localized risks or informal political dynamics within countries.

Future research should expand the scope of analysis to include non-OPEC developing economies to assess whether the relationships observed here hold in other contexts. Additionally, incorporating micro-level household or firm data could provide more granular insights into how remittances and geopolitical risk shape employment choices. Employing alternative measures of geopolitical instability—such as regional conflict indicators or social unrest datasets—could also enhance the robustness of findings. Finally, future studies could adopt causal inference approaches, such as instrumental variable methods or structural models, to address potential endogeneity and strengthen the validity of results.

For policymakers, the findings emphasize the need to strengthen institutional legitimacy to reduce reliance on informal labor. Governments should design mechanisms to channel remittances into productive and formal economic activities, such as small and medium enterprise financing or community infrastructure programs. Additionally, diversifying economies away from resource dependence can mitigate the destabilizing effects of geopolitical shocks on labor markets. Building resilient social protection systems and enhancing employment policies tailored to vulnerable groups will further help in reducing informality and promoting inclusive growth.

### Acknowledgments

We would like to express our appreciation and gratitude to all those who cooperated in carrying out this study.

### Authors' Contributions

All authors equally contributed to this study.

### Declaration of Interest

The authors of this article declared no conflict of interest.

### Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

### Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

### Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

### References

- [1] C. C. Williams and A. Gashi, "Formal institutional failings and informal employment: evidence from the Western Balkans," *The South East European Journal of Economics and Business*, vol. 17, no. 2, pp. 83-95, 2022, doi: 10.2478/jeb-2022-0016.
- [2] M. C. L. Bue, T. T. N. Le, M. S. Silva, and K. Sen, "Gender and vulnerable employment in the developing world: Evidence from global microdata," *World Development*, vol. 159, p. 106010, 2022, doi: 10.1016/j.worlddev.2022.106010.
- [3] M. Sebri, F. M. Ajide, and H. Dachraoui, "Geopolitical risk threshold in the informal economy-natural resources nexus: evidence from BRICS economies," *Mineral Economics*, pp. 1-18, 2025, doi: 10.1007/s13563-025-00514-w.
- [4] F. Havasbeigi, H. Asgari, and M. Ooshni, "The effect of economic sanctions on the size of the informal economy in Iran," *Development and Capital*, vol. 6, no. 2, pp. 1-18, 2021.
- [5] M. Mohammad Shafiei and M. Zamani Samani, "Examining the effects and consequences of informal employment in Iran: An integrated thematic analysis and Delphi approach," *Quarterly Journal of Program and Development Research*, vol. 2, no. 8, pp. 127-150, 2021.
- [6] S. Zarouki, M. Yadollahi Otaghsara, and A. Yousefi Barforoushi, "Calculation and analysis of informal employment in economic sectors and estimation of lost resources of social security," *Social Security Quarterly*, vol. 16, no. 2, pp. 13-46, 2021.
- [7] S. V. Kiselev, S. K. Seitov, V. A. Samsonov, and I. V. Filimonov, "Employment in Informal Sector of Russia: Unemployment and Other Socio-Economic Factors," *Population and Economics*, vol. 8, no. 3, pp. 197-219, 2024, doi: 10.3897/popecon.8.e114046.
- [8] S. Esaku, "Institutionalized democracy and the shadow economy in the short-and long-run: empirical analysis from Uganda," *Humanities and Social Sciences Communications*, vol. 9, no. 1, pp. 1-12, 2022, doi: 10.1057/s41599-022-01128-1.
- [9] S. Esaku and S. Mugoda, "The nexus between the shadow economy and financial development in Uganda," *Financial Statistical Journal*, vol. 7, no. 1, pp. 1-17, 2024, doi: 10.24294/fsj.v7i1.6408.
- [10] S. Esaku and S. Mugoda, "Unemployment and the informal economy in Uganda: An empirical investigation," *Forum for Economic and Financial Studies*, vol. 3, no. 1, pp. 2218-2218, 2025, doi: 10.59400/feFs2218.
- [11] D. Caldara and M. Iacoviello, "Measuring geopolitical risk," *American Economic Review*, vol. 112, no. 4, pp. 1194-1225, 2022, doi: 10.1257/aer.20191823.

- [12] Q. Wang, F. Ren, and R. Li, "Does geopolitical risk impact sustainable development? A perspective on linkage between geopolitical risk and sustainable development research," *Journal of Cleaner Production*, vol. 451, p. 141980, 2024, doi: 10.1016/j.jclepro.2024.141980.
- [13] J. Ji, Z. Cao, C. Y. Zhang, and X. Zheng, "Dissecting the influence of geopolitical risks on employment decisions: The role of employment protection across countries," 2025, doi: 10.2139/ssrn.4995635.
- [14] A. Afonso, J. Alves, and S. Monteiro, "Beyond borders: Assessing the influence of Geopolitical tensions on sovereign risk dynamics," *European Journal of Political Economy*, vol. 83, p. 102550, 2024, doi: 10.1016/j.ejpoleco.2024.102550.
- [15] M. Hodula, J. Janků, S. Malovaná, and N. A. Ngo, "Geopolitical risks and their impact on global macro-financial stability: Literature and measurements," in "BOFIT Discussion Papers," 2024.
- [16] X. Wang, Y. Wu, and W. Xu, "Geopolitical risk and investment," *Journal of Money, Credit and Banking*, vol. 56, no. 8, pp. 2023-2059, 2024, doi: 10.1111/jmcb.13110.
- [17] E. A. Mack, G. M. Henebry, and E. Mongeon, "Assessing the vulnerability of remittance networks to geopolitical shocks in countries of the former USSR: an econometric analysis," *Applied Geography*, vol. 136, p. 102567, 2021, doi: 10.1016/j.apgeog.2021.102567.
- [18] S. Jia, L. Yang, and F. Zhou, "Geopolitical risk and corporate innovation: Evidence from China," *Journal of Multinational Financial Management*, vol. 66, p. 100772, 2022, doi: 10.1016/j.mulfin.2022.100772.
- [19] H. Shen, Y. Liang, H. Li, J. Liu, and G. Lu, "Does geopolitical risk promote mergers and acquisitions of listed companies in energy and electric power industries," *Energy Economics*, vol. 95, p. 105115, 2021, doi: 10.1016/j.eneco.2021.105115.
- [20] M. Kefayat, M. Ebrahimi, and H. Zare, "The impact of shocks caused by terrorist activities on employment using a spatial econometrics approach: Evidence from selected Middle Eastern countries," *Economic Policy*, vol. 17, no. 33, pp. 359-397, 2025.
- [21] E. Murakami, E. Yamada, and E. P. Sioson, "The impact of migration and remittances on labor supply in Tajikistan," *Journal of Asian Economics*, vol. 73, p. 101268, 2021, doi: 10.1016/j.asieco.2020.101268.
- [22] M. Lah and H. Salameh, "Informal sector, remittances, and political stability: A study of Granger-causality in four large geopolitical sets," in "PSE Working Papers halshs-04721826," HAL, 2024.
- [23] D. Peković, "Impact of remittances on employment: Evidence from post-transition countries," *Journal of International Studies*, vol. 18, no. 1, 2025, doi: 10.14254/2071-8330.2025/18-1/9.
- [24] M. R. Saani, A. M. Abdulai, and M. Salifu, "Unemployment and remittances nexus in Ghana: The gender perspective," *Cogent Economics & Finance*, vol. 11, no. 2, p. 2243068, 2023, doi: 10.1080/23322039.2023.2243068.
- [25] S. Esaku and S. Mugoda, "The shadow economy and education in Uganda: Is there a long-run relationship?," *International Social Science Journal*, vol. 73, no. 248, pp. 393-414, 2023, doi: 10.1111/issj.12405.
- [26] A. T. Le and T. P. Tran, "Corporate governance and labor investment efficiency: International evidence from board reforms," *Corporate Governance: An International Review*, vol. 30, no. 5, pp. 555-583, 2022, doi: 10.1111/corg.12422.
- [27] A. M. Kelishomi and R. Nisticò, "Economic sanctions and informal employment," *Labour Economics*, vol. 89, p. 102581, 2024, doi: 10.1016/j.labeco.2024.102581.
- [28] F. Mirali, S. Eissazadeh, and S. E. Hosseini Doost, "Investigating the impact of economic sanctions on employment in Iran using the synthetic control method," *Economic Policy*, vol. 14, no. 28, pp. 101-138, 2022.
- [29] K. K. Gokmenoglu and A. Amir, "Investigating the determinants of the shadow economy: The Baltic region," *Eastern European Economics*, vol. 61, no. 2, pp. 181-198, 2023, doi: 10.1080/00128775.2022.2163905.
- [30] S. Zhanabekov, "Robust determinants of the shadow economy," *Bulletin of Economic Research*, vol. 74, no. 4, pp. 1017-1052, 2022, doi: 10.1111/boer.12330.
- [31] M. Frosch and J. Gardner, "Defining informality for contributing family workers," ILO, Geneva, 2022.
- [32] T. Haque, T. P. Pham, and J. Yang, "Geopolitical risk, financial constraints, and tax avoidance," *Journal of International Financial Markets, Institutions and Money*, vol. 88, p. 101858, 2023, doi: 10.1016/j.intfin.2023.101858.