

Following the Money Trail: Unearthing Socio-Economic Drivers of Human Trafficking in South and Central Asia—A GMM-Based Empirical Analysis

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Abstract

Study Objective:

This study examines the dynamic socio-economic factors of human trafficking in 12 South and Central Asian countries between 2015 and 2025, focusing on GDP, refugee population, inflation, literacy, unemployment, and poverty.

Methods

To account for persistence in trafficking and potential endogeneity of the explanatory variables, a dynamic panel framework is estimated using the one-step Generalized Method of Moments (GMM) approach.

Findings:

The findings show that there is long-term persistence of human trafficking. In addition, there exists a positive contemporaneous association between GDP and trafficking, but there is not much effect on trafficking from the lagged GDP. The refugee population and poverty have a strong positive influence at the second lag, which suggests that the vulnerability of being a refugee and poor may be amplified over time. Literacy, on the other hand, has a substantial negative second-lag effect, indicating that there is a lagged protection effect of education. The estimated model does not have statistically significant independent effects of inflation and unemployment.

Conclusion/Implications:

The findings demonstrate the dynamic and cumulative trajectory of the vulnerability to trafficking in South and Central Asia. Such short-term macroeconomic measures must be complemented by other effective anti-trafficking measures: long-term poverty alleviation, refugee protection, education, inclusive economic opportunities, safe migration pathways, and enhanced institutional responses.

1. Introduction

Millions of individuals around the globe are denied their dignity and fundamental human rights due to the extensive criminal human trafficking system. Contemporary slavery is the act of obtaining people using violence, deceit, or force, which in turn leads to their illegal forceful transportation to conditions of forced labor and sexual exploitation (UNODC 2020; Ezeh and Oli 2021). Trafficking criminal acts bring about institutional poverty and produce far-reaching adverse impacts on victims as well as the community, hence continuing to exacerbate socioeconomic disparity. Badejo (2016) refers to the report by the International Labour Organization (2017) that revealed over twenty-five million people are victims of forced labor and sexual exploitation, resulting in illegal earnings. Human trafficking continues to be most susceptible to women and children because the risk factors are associated with both financial hardships and gender inequality (UNICEF 2019). Contrary to what the findings of Europol (2020) and Ebegbulem (2012) indicate, illicit traffickers have deceptive ways of luring victims and take advantage of technological advancements to commit their offences.

Human trafficking is rooted in the economic and political systems of the world that have been changing thanks to financial globalization. Political instability and the lack of proper governance are other factors that lead to the increased incidence of trafficking, especially among refugees and internally displaced people (UNHCR 2018). Regardless of the efforts of international bodies that operate under the Palermo Protocol for prevention, protection, and prosecution (UNODC 2020), these efforts face major challenges that are exacerbated by corruption and a lack of resources to implement them. Survivors face adversity and significant obstacles on the way to receiving justice and readmission into society (Human Rights Watch 2021). To solve the issue of human trafficking, it is important to identify the causes of this problem in socioeconomic disparities, such as poverty and discrimination (Sen and Ghosh, 2022). It needs a holistic solution where economic development, education, enforcement of the law, and social protection are all involved. Figure 1 presents the geographic projection of the number of victims of human trafficking by area, indicating that the Asia Pacific region has the most victims, with approximately fifteen million; Africa has nine million, Europe has four million, and Latin America has three million victims. Other geographical areas, including the North American region and the Middle East, have relatively lower figures ranging between one and two million.

Source: ILO (2017); UNODC (2020)

South and Central Asia are still plagued by the problem of human trafficking. Poor enforcement of anti-trafficking laws, porous borders, socio-economic weaknesses of the region, and political instability have turned the region into a centre of traffickers who target vulnerable populations. Figure 2 shows the prevalence rates of human trafficking in South and Central Asia, with an accentuation of the differences between the countries. The highest rates are presented in Afghanistan (85 victims per 100,000) and Pakistan (70 victims per 100,000). Bhutan (15) and the Maldives (20) have the lowest rates. Such disparity demonstrates how socioeconomic background and geographical instability impact trafficking vulnerability.

The discussion shows the impact of macroeconomic factors, including poverty, unemployment, education, inflation, gross domestic product, and refugee groups, on the prevalence and nature of trafficking in different countries, which are Afghanistan, Bangladesh, Bhutan, India, Kazakhstan, the Kyrgyz Republic, the Maldives, Nepal, Pakistan, Sri Lanka, Tajikistan, and Uzbekistan. Conflict and poverty in Afghanistan have provided a very poor living environment where trafficking is the order of the day, especially among internally displaced persons and refugees (UNODC 2021). As a source country, Bangladesh is experiencing a great challenge, as the problem of domestic trafficking and the lack of effective enforcement of anti-trafficking laws are widespread (United States Department of State 2022). In Bhutan, the rural population is vulnerable to economic migration, and India has a complicated trafficking network with established systemic corruption that prevents enforcement (ILO 2020). Kazakhstan is a transit and destination country, and migrant workers are exploited (United States Department of State 2022 and IOM 2021). The Kyrgyz Republic must struggle with the issues of labor exploitation and cultural customs that

may result in trafficking (Human Rights Watch 2020 and IOM 2021). Migrant workers in the Maldives continue to face exploitation in the tourism and construction industry even though the government is trying to end trafficking (IOM 2021). Nepal is a major contributor of trafficking victims, especially after the two thousand fifteen earthquake (UNHCR 2018). The cultural traditions and the uncertain position of refugees contribute to the complex, multifaceted trafficking issue in Pakistan (Human Rights Watch 2021). In Sri Lanka, women are the most vulnerable to domestic servitude trafficking, and in Tajikistan, there is a severe problem of human trafficking due to the problematic economic situation (UNODC 2020 and United States Department of State 2022). Human Rights Watch (2020) and the ILO (2021) state that Uzbekistan has come a long way in the fight against forced labor, but its application against the trafficking problem remains a thorn in the flesh. Local trends in trafficking in these areas are highly influenced by all the macroeconomic factors such as poverty, unemployment, educational levels, inflation, gross domestic product, as well as the masses of refugees in these regions. It is thus important to identify critical moving factors in devising useful counter trafficking intervention policies and practices.

Figure 3 depicts the six macroeconomic factors that provide the greatest risks for vulnerability to human trafficking¹. The Vulnerability Index illustrates how specific circumstances increase the likelihood of becoming a trafficking victim.

Although the global human trafficking issue has been gaining increased attention over the years, its prevalence in South and Central Asia continues to be alarming (Azam, 2014; Shelley, 2010). The area experiences high levels of human trafficking due to low economic development, political instability, and cultural practices that create high levels of vulnerability and facilitate the crime (Basu and Chowdhury, 2021). Modern studies of human trafficking investigate individual cases and specific characteristics but fail to analyze the underlying economic processes that create complex patterns of exploitation. Research on human trafficking shows that there is inadequate analysis of the impact of macroeconomic factors, such as poverty, unemployment, inflation, and gross domestic product, and the impact of refugee populations on the dynamics of trafficking activity.

The paper is an exploration of how economic and social forces are contributing factors to the pattern of trafficking in South and Central Asia and, therefore, addresses a knowledge gap. The paper will examine the impact of poverty and unemployment in exacerbating risks, the contribution of education level in the case, and the combination of economic inequalities with inflation and the formation of trafficking within the region. The role of the refugee population in escalating the risk of trafficking is also examined in this research, with a specific emphasis on how vulnerable such populations are to the fluctuating economy of South and Central Asia. It will be the aim of the research to identify key systemic issues to create a whole picture of the roots of human trafficking and develop a shift from emergency interventions to long-term solutions to the systemic issues that may lie in the economy.

The study is crucial in the sense that it presents a more in-depth understanding of the phenomenon because it extends previous research, which investigated isolated cases of human trafficking. Trafficking in South and Central Asia is an issue that is frequently used, and the most multifaceted solutions should be worked out by specialists who should focus on the macroeconomic structures and the situation of the victims. To present the policy responses to curbing human trafficking, the researchers relate the macroeconomic issues such as unemployment and poverty with the rate of inflation and refugee mobility. These results indicate that the government should do more than anti trafficking laws and insist on encouraging economic sustainability and favorable conditions for poor populations.

It is research of great importance due to the unique socioeconomic situation in South and Central Asia. The conditions that make this region an ideal target of human trafficking are extreme poverty, political instability, insecure borders, and a huge number of refugees. However, it is not an easy task to consider all these factors in one study by researchers and policymakers. This study includes the observation of regional risk factors to explain how trafficking networks develop from the joint interactions and direct local solutions. It is necessary to promote significant and sustainable transformations in policy and practice since it is a guarantee of security and stability of vulnerable populations in the long term and contributes to breaking the chains of exploitation and human trafficking.

2. Literature Review

Economic and political factors of human trafficking and voluntary migration are connected, and one can notice the similarities between the fundamental motivations of the two types of crimes. According to von Struensee (2000), human trafficking is particularly sensitive to developing countries because of its hazardous situations of abject poverty, inadequate economic prospects, civil conflicts, and political instability. Migration and trafficking are also strongly affected by push factors, which comprise poor living conditions, overpopulation, absence of economic prospects, and tyrannical political administration. All migration trends, both legal and illegal, are driven by economic reasons, as per an analysis of Deutsche Bank (Messina and Lahav, 2006). With low economic performance and unemployment rates, the number of future victims of human trafficking has increased (Huda, 2016).

GDP per capita is also a valuable measure of human trafficking because the countries with the highest rates are those whose GDPs are lower (HSTC, 2005). As the economic deficiency of North Korea promotes the development of this harmful sector, unemployment is a primary factor that contributes to the increase in human trafficking cases (DOS OMCTP 2008). Due to the increase in social wealth disparities, the danger of human trafficking increases (Fein, 2007). Females actively participating in government, education, and the economy are less victimized by human trafficking.

The level of democracy affects the statistics of trafficking directly since democratic regimes lead to decreased cases of trafficking, as demonstrated by Marshall et al. (2009). The pull factors assess the political liberties, economic potential, as well as labor market demands of the destination country. Trying to find favorable destinations where labor is in demand and there are no logistical limitations, traffickers prefer the repeal of immigration regulations (Azam, 2014).

In addition, the geographical distance between countries of origin and destination, migration networks, or corruption also affect the volume of trafficking (Khan, 2019). Traffickers use existing networks of immigrants in the destination countries to facilitate the rate of trafficking since they have an easy time through these networks (Andrees and van der Linden, 2005). The cost of operating trafficking networks decreases when both criminals in the source and

destination countries pay bribes and forge documents that lower their chances of being caught (Wheaton et al., 2010). According to Schulte-Buckholt (2006), traffickers could even be enriching themselves through the liaison of local elites and big politicians through integration into global markets.

Although it is necessary to investigate the issue of trafficking, core economic indicators like GDP and unemployment do not reflect the totality of the phenomenon (Ahmed and Malik, 2021). The extent of government corruption and the facilitation of mobility through visa laws and international positioning significantly influence the pathways utilized in human trafficking (Anti-Slavery International, 2020). The worldwide framework of human trafficking is characterized by an interplay of political and economic elements (Mahmood and Tariq, 2021).

A summary of Past literature on human trafficking is presented in Table 1.

Table 1
Summary of Past Literature

Authors (Years)	Region	Methodology	Conclusion
Achilli (2018)	Jordan-Syria border	Ethnographic field research	Examines the role of human smuggling in the context of Syrian refugees.
Andrijasevic (2010)	Europe	qualitative analysis	Focuses on the agency and citizenship of migrant women in the sex sector.
Zarif (2014)	South Asia	Empirical analysis	Analyzes the socioeconomic factors contributing to human trafficking in South Asia.
Bales (2007)	Global	Qualitative analysis	Discusses strategies and insights to end modern slavery.
Cameron & Newman (2008)	Global	Thematic analysis and case studies	Explores the social, cultural, and political dimensions of human trafficking.
Cho (2015)	Global	empirical analysis	Identifies robust push and pull factors of human trafficking.
Cho et al. (2013)	Global	Empirical analysis	Investigates the relationship between legalized prostitution and human trafficking inflows.
Chuang (2014)	United States	Legal analysis and critique	Examines the expanded legal definition of human trafficking and its implications.
Feingold (2011)	Mekong region	Cultural epidemiological approach	Analyzes how human trafficking data is constructed and its policy implications.
Freedman (2016)	Europe	Qualitative analysis	Highlights the sexual and gender-based violence faced by refugee women.
Gupta & Rajah (2019)	Developing countries	Empirical analysis	Examines the relationship between inflation and human trafficking in developing countries.
Huda (2006)	South Asia	Empirical analysis	Highlights the spread of sex trafficking and its impact on HIV infection in South Asia.
Joiya & Quddus (2022)	Punjab, Pakistan	Logit regression analysis	Examines the role of forced labor in human trafficking in Punjab, Pakistan.
Kara (2010)	Global	Field research, interviews, and economic analysis	Provides a business analysis of the global sex trafficking industry.
McAuliffe & Koser (2017)	Global	Quantitative, qualitative, and mixed methods research	Provides insights into irregular migration patterns and their implications.
Orozco (2018)	Global	Empirical analysis and case studies	Discusses the role of remittances in economic development and their indirect impact on human trafficking.
Salt & Stein (1997)	Europe	Conceptual model and case studies	Analyzes human trafficking as part of the global migration business.
Goudie (2010)	Eastern Europe	Quantitative analysis	Human trafficking risks rise in high-emigration areas due to lower recruitment costs. Awareness campaigns may help reduce crime.
World Bank (2023)	Global	Empirical Analysis	Discusses the impact of migration and remittances on development.
Zhang (2009)	Global	Literature review and critique	Critiques the current research on sex trafficking, emphasizing the need for empirical data.

Conclusion

Despite the extensive research, research on human trafficking often takes a disjointed approach, focusing on factors such as the demographics of victims or the trafficking routes, without discussing the systemic factors, which are poverty, unemployment, inflation, economic inequality, and displacement- that create an environment favorable to trafficking, particularly in South and Central Asia. This narrow vision fails to address the fact that these issues are linked and connected to regional and global processes. A complex strategy of using both macroeconomic trends and local realities must be adopted to fight human trafficking. The proposed study will help fill this gap since it will provide a comprehensive analysis that would incorporate both a vast array of socio-economic factors and human-centered perceptions, thus allowing for more efficient and permanent interventions in the target population.

3. Research Methodology

3.1 Conceptual Framework

Various economic conditions expose individuals to a vulnerability to being exploited in human trafficking activities. There are various potential avenues of socioeconomic factors influencing human trafficking, as seen in Fig. 4. Human trafficking is caused by economic and educational institutions, and social determinants are interconnected. Since traffickers exploit individuals in underdeveloped regions who are lacking the necessary resources, poverty is one of the primary factors. When faced with a lack of finance, most individuals engage in hazardous activities that put them and their vulnerable dependents at risk, which in some cases leads to forced labor or economic slavery and, therefore, increases the chances of danger to their well-being.

Unemployment exposes individuals to human trafficking in the sense that it often forces them to work without any supervision, particularly when fraudulent firms defraud innocent individuals by giving them false job opportunities. Foreign laborers are sometimes exploited by economic fraud since the population becomes easy targets due to the rise in employment rates, which creates a conducive environment for such frauds. Due to the decline in income, families must accept unsteady employment due to inflation, and thus they are more vulnerable to human trafficking.

The failure of economic institutions to guard underprivileged people against exploitation may be attributed to the large GDP and inequality in wealth distribution within a country. Weak governmental institutions thrive in countries where most people have weak economies, thus creating a climate that favors human trafficking. Economic growth is a process that brings both protective benefits and a catalyst that brings about vulnerability to risk. The two issues caused by a lack of education opportunities are the lack of awareness of trafficking and the lack of economic opportunities, both of which contribute to more chances of becoming a victim.

Refugees form a particularly vulnerable demographic category since they are denied legal rights, economic security, and social networks due to being displaced. Since refugees are not safe, as they do not know who they are, the chances of trafficking arise. Human trafficking is a systemic problem due to the social and economic forces that interact. The most vulnerable groups, having the highest exposure to trafficking, could mitigate the risk by introducing certain policies that would tackle the problem of society at the structural level.

3.2 Data and Variable Description

The annual identification of victims provides a quantitative measure of the prevalence and severity of human trafficking (HT). Important socioeconomic factors influence the trends of human trafficking. Vulnerability is increased by poverty since it pushes people into exploitative situations (ILO, 2021). People are drawn into uncontrolled labor markets by high unemployment rates, which create opportunities for human traffickers (UNDP, 2022). Education serves as a safeguard, and a lack of access is linked to a higher risk of human trafficking (UNESCO, 2021). When household purchasing power is reduced by inflation, traffickers' promises of financial stability become more alluring. Marginalized populations are vulnerable to human trafficking because of income inequality, regardless of high GDP per capita indicating economic resilience (World Bank, 2023). Refugees are more vulnerable since they do not have access to resources and legal safeguards (UNHCR, 2022). A summary of the variables employed in the research is shown in Table 2, and the flow chart of the analysis will be in Fig. 5:

Table 2
Variable Description

Variable	Code	Unit	Source
Human Trafficking	HT	No. of Victims per Year	US State Department
Poverty	Pov	% of the population below the national poverty line	WDI
Unemployment	Unemp	Percentage	WDI
Education	Lite	Literacy Rate Percentage	WDI
Inflation	CPI	Consumer price index (%age)	WDI
GDP	GDP	USD (constant) 2015	WDI
Refugee Populations	Refug	Number of refugees by country of asylum	WDI

3.3 Econometric Model

The econometric model used in this study quantifies the impact of macroeconomic variables on human trafficking. The relationship is expressed through the following linear regression equation:

$$\ln (HT_{it}) = \beta_0 + \beta_1 \ln (GDP_{it}) + \beta_2 \ln (Refug_{it}) + \beta_3 \ln (CPI_{it}) + \beta_4 \ln (lite_{it}) + \beta_5 \ln (Unemp_{it}) + \beta_6 \ln (Pov_{it})$$

1

whereas (i) represents country and (t) represents year. The human trafficking measure reported in the dependent variable $\ln (HT_{it})$ is also log-transformed to minimize skewness and comparability across countries, and GDP, refugee population, literacy, unemployment, and poverty are also log-transformed. A specific treatment is required for Inflation. The other variables have positive values only, and the conventional logarithmic transformation is suitable. The natural logarithm is undefined for values of zero and negative, so the conventional logarithmic transformation is not suitable when the variable takes such

values. Inflation may take a negative value when there is a period of deflation, so the conventional logarithmic transformation is not appropriate. Hence, the transformed Inflation is given by Inflation. This transformation acts the same as a logarithmic transformation for larger observations, but it is also able to handle negative, zero, and positive observations. It thus leaves the true deflationary fluctuations intact and does not alter their polarity.

The error term (ε) accounts for any other factors that may affect Human Trafficking (HT) that are not observed. The retransformed variables are then introduced into the dynamic Generalized Method of Moments (GMM) model to address the endogeneity of the variables and persistence of the human trafficking phenomenon.

3.4 Econometric Technique

3.4.1 Cross-sectional Dependence Test

We began by studying cross-sectional dependence in the data, which creates discrepancies due to idiosyncratic disturbances, unobserved variables, and regional dependencies (Hoyos and Sarafidis, 2006). The implications of cross-sectional dependency on the outcomes of cointegration analysis and unit root testing are as follows. We used Pesaran's (2004) CD test to test dependency because the dataset comprised large N and small T panels. We used the LM test because the T and N setup was large and small, respectively. Data analysis involving industrialization, the use of renewable energy, and a proactive urbanization framework gave us some figures of less than 0.01, which shows that there is considerable correlation between environmental sustainability and its concomitant aspects of corruption and the shadow economy. Cross-sectional dependence is represented by the equation below:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{I=1}^{N-1} \sum_{J=I+1}^N P_{ij} \right)$$

2

3.4.2 Unit root test CIPS and CADF

This study used Cross-Sectional Im, Pesaran, and Shin (CIPS) as well as Cross-Sectional Augmented Dickey-Fuller (CADF) tests. These are panel unit root tests that were developed by Pesaran (1999). The research that involves this feature necessitates cross-sectional dependency analysis, which renders CIPS and CADF testing procedures important. These are tests that justify the alternative hypothesis since they test the null hypothesis, which is a unit root. A cointegration linkage that persisted over time was proved by the test, which revealed that at the beginning non-stationarity was observed in all the measured variables, but after first differencing the variables attained stationarity. The basis of our proposed analysis developed out of these experimental findings.

3.4.3 Panel Cointegration Test

Our analysis of equilibrium variables relied on the use of panel co-integration methods. The specific method that we have adopted is based on the Durbin-Hausman method and the Pedroni and Kao tests that have effectively shown co-integration exists. This complex interplay gives rise to the possibility of coming up with residuals, which are then modeled in a way as discussed below:

$$Z_{it} = \lambda_i F_t + \epsilon_{it}$$

3

$$F_{jt} = \rho_j + F_j(t-1) + \nu_{jt}$$

4

$$\epsilon_{it} = \varphi + \epsilon_i(t-1) + \eta_{it}$$

5

We define F_t as a k-dimensional vector of common factors, with stationarity ensured by $\rho_j < 1$ for all j. Testing co-integration is equivalent to checking if $\varphi_i = 1$. The panel cointegration test includes two parts: one assuming $\rho_i = \rho$ for all i, and the other relaxing this assumption. Both tests are consistent under the null hypothesis of no co-integration. Durbin-Hausman tests can be computed using IV estimators or OLS. As a result, the statistics for the DH_g and DH_p Tests are as follows:

$$DH_g = \sum_{i=1}^N S_i^{\lambda} (\rho_{1i} - \rho_{2i})^2 \sum_{t=2}^T e_i^{\lambda 2} (t-1)$$

5a

$$DH_p = S_i^{\lambda} (\rho_1 - \rho_2)^2 \sum_{i=1}^N \sum_{t=2}^T e_{i(t-1)}^{\lambda 2}$$

5b

Where ρ_{2i} denotes the OLS estimators for ρ_i in Equations 5a and 5b, and ρ_2 denotes their pooled counterparts. The pooled instrumental variable estimators of ρ_i , designated as ρ_{1i} and ρ_1 , are obtained by simply utilizing ϵ_{it} . It is an instrument-to-instrument $e_i^{\lambda 2} (t-1)$

The null hypothesis and alternative hypothesis for the DHp panel test are as follows:

H0 (null hypothesis): $\rho_i = \rho$ for all $i = 1 \dots N$

H1 (alternative hypothesis): $\rho_i = \rho$ and $\rho < 1$ for at least some

The heterogeneous autoregressive parameter is supposed to be reflective of diverse panel units in this situation. As a result, rejecting the null hypothesis reveals the presence of a long-term link between some panel units.

3.4.4 One-step Generalized Method of Moments

The econometric approach builds upon the foundation of the model in Eq. 1, but adds to it the dynamic panel data approaches in tackling the endogeneity issues. The problem of reverse causality is also a major one, because human trafficking can affect such macroeconomic factors as poverty, unemployment, and GDP, not necessarily being a consequence of them. Further complicating the estimation are omitted variable bias and measurement errors, especially in the case of trafficking statistics, which are underreported, as well as inconsistency in data collection.

To alleviate these issues, the paper uses the one-step Generalized Method of Moments (GMM) estimator that is suitably applicable to datasets with a small-time dimension (2015–2025) and numerous cross-sections (countries). GMM uses internal measures, including lagged independent variables, to address endogeneity and explain the persistence of trafficking over time. It also deals with measurement errors through instrumental variables, and this makes the estimates more reliable. Such methodological decisions guarantee the strength of studying the macroeconomic factors of human trafficking.

The dynamic panel data model can be specified as follows:

$$HT_{it} = \beta_0 + \beta_1 (LHT_{it-1}) + \beta_2 (GDP_{it}) + \beta_3 Lln(GDP_{it}) + \beta_4 L^2ln(GDP_{it}) + \beta_5 (Refug_{it}) + \beta_6 Lln(Refug_{it}) + \beta_7 L^2ln(Refug_{it}) + \varepsilon_{it}$$

This equation includes HT_{it} as the dependent variable representing human trafficking, with LHT_{it-1} indicating its first lag. The explanatory variables are $ln(GDP_{it})$, which is the log of GDP and its lags, $[Lln(GDP_{it}), L^2ln(GDP_{it})]$, followed by $ln(Refug_{it})$, representing the log of the refugee population along with its first lag ($Lln(Refug_{it})$) and second lag ($L^2ln(Refug_{it})$). The $ln(CPI_{it})$ term refers to the log of the Consumer Price Index, with $Lln(CPI_{it})$ as the first lag and $L^2ln(CPI_{it})$ as the second lag. The $ln(Liter_{it})$ variable represents the log of the literacy rate, accompanied by its first lag ($Lln(Lite_{it})$) and second lag ($L^2ln(Lite_{it})$). Additionally, the equation includes $ln(Unemp_{it})$ for the log of the unemployment rate, along with its first lag ($Lln(Unemp_{it})$) and second lag ($L^2ln(Unemp_{it})$). Lastly, $ln(Pov_{it})$ stands for the log of the poverty rate, with its corresponding first lag ($Lln(Pov_{it})$) and second lag ($L^2ln(Pov_{it})$). The error term is denoted by ε_{it} , capturing unobserved factors.

The theoretical frameworks used in this study to support the research include systemic vulnerabilities that lead to human trafficking. Push Factors of Migration underline the contribution of poverty, unemployment, and inflation to the exploitative situations of people. Strain Theory (Merton, 1938) implies that the risk of trafficking is higher when opportunities are blocked, whereas Social Vulnerability Theory addresses the risk women and marginalized groups face due to their refugee status (Basu and Akhtar, 2018; UNHCR, 2018). According to the Human Capital Theory (Schultz, 1961), education makes a person less vulnerable to falling prey to trafficking, and the Economic Theory of Crime (Becker, 1968) is the theory that positions weak law enforcement and an unstable economic environment in the hands of traffickers (UNODC, 2020; Human Rights Watch, 2021).

The GMM is used as the methodology to establish dynamic panel data analysis to grasp the short- and long-term effects of macroeconomic variables on trafficking. Reliability of the model and validity of the instruments are achieved by using diagnostic tests, such as the Arellano-Bond test of autocorrelation and the Sargan test of over-identifying restrictions. This integrated strategy lays a strong basis for the realization of the economic factors behind human trafficking and shapes policy intervention.

4. Results and Discussion

4.1 Preliminary Investigation

Descriptive Statistics

The descriptive statistics in Table 3 reveal substantial variation in human trafficking, GDP, refugee population, inflation, unemployment, and poverty across the sample, while literacy exhibits comparatively low dispersion. Overall, the data reflect marked cross-country and temporal heterogeneity, supporting further panel-based empirical analysis.

Table 3
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
lnHT	5.104	2.740	0.000	10.472
lnGDP	24.668	1.989	21.491	28.926
lnRefug	9.638	2.985	2.639	14.723
lnCPI	2.397	0.901	-1.120	4.655
lnLite	4.351	0.277	3.548	4.615
lnUnemp	1.729	0.687	0.000	3.735
lnPov	2.888	0.638	1.668	4.194

Table 4 shows that human trafficking is **positively correlated with lnGDP (0.751), lnRefug (0.473), inflation (0.315), lnUnemp (0.179), and lnPov (0.388)**, while it is **negatively correlated with lnLite (-0.314)**. Overall, the correlations indicate meaningful associations among the variables without evidence of perfect multicollinearity.

Table 4
Correlation Matrix

Variables	1	2	3	4	5	6	7
(1) lnHT	1						
(2) lnGDP	0.751***	1					
(3) lnRefug	0.473***	0.336***	1				
(4) lnCPI	0.315***	0.346***	0.046	1			
(5) lnLite	-0.314***	0.028	-0.474***	-0.018	1		
(6) lnUnemp	0.179**	0.150*	0.094	-0.011	-0.097	1	
(7) lnPov	0.388***	-0.043	0.125	0.154*	-0.606***	0.108	1
Note: *** p < 0.01, ** p < 0.05, * p < 0.10.							

The panel unit root results in Table 5 demonstrate instances of both level $I(0)$ stationarity and first difference $I(1)$ stationarity. CADF indicates level stationarity for lnRefug and lnCPI, but CIPS reveals level stationarity for lnHT, lnUnemp, and lnPov. GDP, Refug, Lite, and CPI necessitate first differencing to achieve stationarity under CIPS, whereas HT, GDP, Lite, and Pov require first differencing under CADF. The long-run co-integration analysis is corroborated by the test results at significant levels (*, **, ***), indicating dual integration ordering among the variables.

Table 5
Panel Unit Root Test Results

Variables	CIPS $I(0)$	CIPS $I(1)$	CADF $I(0)$	CADF $I(1)$
lnHT	-3.273**	--	--	-3.392***
lnGDP	--	-3.467***	--	-4.504*
lnRefug	--	-3.699*	-2.656*	--
lnLite	--	-3.313*	--	-4.806***
lnUnemp	-3.888***	--	-4.254*	--
lnPov	-3.387*	--	--	-8.229**
lnCPI	--	-4.010*	-2.641*	--
*p < 0.01; **p < 0.01; ***p < 0.01				

Table 6 also indicates that all the values have significant variable dependence, as indicated by the cross-sectional dependency analysis, except lnRefug, which shows negative interdependence. The results indicate that there is a necessity to have models that appropriately explain cross-sectional dependency to derive credible estimates.

Table 6
Cross-sectional Dependency Test

Variables	lnHtr	lnGDP	lnRefug	lnCPI	lnLite	lnUnemp	lnPov
Breusch-Pagan LM	244.8***	92.3***	260***	92.3***	643.5***	170.7***	53.2***
Pesaran Scaled LM	34.5***	11.0***	369***	11.0***	96.6***	23.1***	78.6***
Bias-Corrected Scaled LM	34.42	10.9***	36.8***	10.9***	95.9***	23.0***	78.5***
Pesaran CD	9.2***	4.1***	-3.1***	4.1***	25.4***	4.3***	22.9***

The dynamics of co-integration between the variables are then conducted through a thorough analysis of the variables that includes the Johansen co-integration test, Pedroni method, Kao test, and Westerlund co-integration test, as carried out in Table 7. Notably, every panel in the study agrees to reject the null hypothesis, indicating that the variables are at the 1 percent level of significance. This meaningful finding is a strong piece of evidence in favor of the works by Mensah et al. (2021), Khurshid et al. (2024), and Safi et al. (2023). The paper then uses the GMM regression estimator to look at the long-run implications of the sample variables.

Table 7
Results of Panel cointegration tests

Test Statistics	Statistics	Probability
Pedroni Test		
Modified Phillips–Perron t	5.2518	0.000a
Phillips–Perron t	-11.4832	0.000a
Augmented Dickey-Fuller t	-0.5171	0.303
Kao Test		
Modified Dickey-Fuller t	-0.0507	0.480
Dickey-Fuller t	-4.2745	0.000
Unadjusted modified Dickey-Fuller t	-7.7431	0.000
Unadjusted Dickey-Fuller t	-9.1119	0.000
Westerlund Test		
Variance ratio	9.2586	0.000

The findings of the one-step Generalized Method of Moments (GMM) estimation of the dynamic macro-economic determinants of human trafficking in South and Central Asia are presented in Table 8. The presence of contemporized and lagged explanatory variables enables them to separate immediate and delayed effects. This is especially important since vulnerability associated with trafficking could develop over time because of shifts in economic conditions, displacement, education, and household deprivation as opposed to an immediate reaction to a macroeconomic shock.

The coefficient of the lagged dependent variable is positive and significant (L). This shows time continuity in trafficking (lnHT = 0.251, $p = 0.049$). It implies that countries with relatively high prevalence of trafficking at one time are likely to have some of this vulnerability at the next time. There are theoretical grounds to believe this persistence may be possible, as trafficking takes place through known recruitment networks, migration routes, exploitative labour practices, and regularized areas of vulnerability in the socio-economic context. Wheaton et al. (2010) define trafficking as an economic sector that is driven by the relationship between vulnerable groups, middlemen, and demand for exploited labour. The finding implies, therefore, that trafficking cannot be considered only as a reaction to temporary shocks but also a phenomenon that has an important degree of structural persistence.

Results also show a significant and positive contemporaneous relationship between GDP and human trafficking (lnGDP = 1.259, $p = 0.044$), but the lagged GDP coefficients are not statistically significant. Importantly, this shouldn't be taken to mean that economic growth is a direct cause of trafficking. Instead, growth in aggregate can coexist with inequality, informal work, labour mobility, migration and unequal access to economic opportunities. The micro-level evidence also indicates that the concept of trafficking vulnerability does not necessarily equate with poverty; migration patterns and socioeconomic environment can significantly affect trafficking vulnerability. For example, Mahmoud and Trebesch (2010) show that the risk of trafficking is related to migration flows and opportunities for trafficking by traffickers; van der Vink et al. (2024) warn against assuming poverty and unemployment are the only factors that make someone vulnerable to trafficking. The present study also does not find evidence for any significant lagged GDP effects, which further indicates that the GDP association is more contemporaneous than persistent.

One important finding is especially relevant to the issue of refugees. Coefficient L1 is statistically insignificant, coefficient L2 is positive and highly significant, but the coefficient L0 is statistically insignificant. lnRefug = 0.219, $p < 0.001$). This discovery implies that there may be a lag time between the vulnerability to displacement and its effect on trafficking. Household coping mechanisms are depleted over time, and over time refugees can become vulnerable to insecure work, irregular migration, and exploitation for recruitment in the household. UNODC also highlights how displacement can enhance trafficking vulnerability due to weakened services and rule of law, disrupted livelihoods, and limited income generation opportunities; more importantly, the vulnerability of long-term refugees is heavily dependent on their legal and economic status in the country of destination. UNODC's previous evidence in the region also highlights

vulnerabilities of Afghan refugee populations and migrants to trafficking and forced labour. The strong second-lag effect thus highlights the necessity for continued livelihood and labour-market protection measures for internally displaced populations, and not just for the immediate humanitarian response.

In contrast, the coefficients on inflation are not statistically significant under the two different specifications (contemporaneous and lagged). The revised estimates, therefore, offer little reliable evidence that inflation is a direct cause of human trafficking, in the absence of other macroeconomic vulnerabilities and dynamic effects. However, inflation could have indirect impacts on trafficking through its impact on real income, purchasing power, financial strains in households, and employment conditions. Evidently, the correct reading is not that inflation is unimportant, but that the current model fails to provide a statistically meaningful direct effect.

An important delayed protective effect is found for literacy. Lag1 and Lag2 are not significant, but Lag2 is negative and significant. $\text{InLite} = -6.869$, $p = 0.026$. This indicates that while enhancing literacy is a positive step toward mitigating vulnerability to trafficking, this process can be somewhat time-consuming. Educational training can help to build people's ability to assess employment and migration prospects, identify misleading recruitment strategies, secure formal employment, and access institutional assistance. Existing evidence supports this protective channel. Uwaechiaf et al. (2019) conclude that increased access to education is typically correlated with reduced child trafficking and recommend that education be accompanied by other socioeconomic inclusion indicators. Furthermore, Spire (2021) identifies education as a key prevention tool and argues that a lack of access to quality education can increase vulnerability to forced labour, debt bondage, and other forms of trafficking-related exploitation. Moreover, in Pakistan, there is strong evidence of the significant link between education and awareness of human trafficking, underlining the capacity of human capital to contribute to human trafficking prevention. The findings of the present study demonstrate that literacy is not necessarily a short-term protective factor but rather a medium-to-term protector.

The coefficients of unemployment are not statistically significant in either specification (contemporaneous/lagged). The study therefore does not detect a significant relationship between the unemployment rate and trafficking independent of the effects of GDP, poverty, displacement, literacy, inflation, and dynamic effects. The finding is significant as unemployment is a common vulnerability described in descriptive and micro studies of trafficking. Studies conducted in Pakistan found that financial difficulties and lack of economic options are associated with trafficking vulnerability. Recent evidence, however, also warns that the risk of trafficking must not be assumed to be the result of a single factor but can be the result of a complex interplay of socio-economic, demographic, migration, and institutional factors. The insignificance here might thus suggest that the effect of unemployment is not independent of these interwoven channels but a macro-level effect.

Finally, poverty shows a delayed positive relationship with human trafficking. The contemporaneous and first-lag coefficients are not significant, while the second-lag coefficient is significant and positive (L2). $\text{InPov} = 1.847$, $p = 0.029$. The pattern over time indicates that long-term poverty, rather than short-term changes in poverty, could increase the vulnerability to trafficking. The cumulative effects of living in poverty can include depletion of household savings or coping mechanisms, a rise in liabilities, limited access to economic opportunities or acceptable livelihoods, and an indifference to risky migration or employment. Empirical studies conducted in Pakistan have linked poverty to vulnerability to trafficking, while a literature review also points to the fact that poverty is linked to other structural factors, education, and migration. Most recent studies on Bangladesh also show that poverty, lack of education and employment opportunity, false promises of jobs, and organized trafficking networks are interrelated risk factors and are not mutually independent.

Table 8
One-step GMM Regression Results

Variable	Coef.	Std. Err.	z-value	p-value	95% CI
L.InHT	0.251	0.128	1.965	0.049	[0.0007, 0.5005]
lnGDP	1.259	0.624	2.018	0.044	[0.0361, 2.4819]
L.lnGDP	-1.131	0.595	-1.902	0.057	[-2.2960, 0.0342]
L2.lnGDP	-0.682	0.869	-0.785	0.432	[-2.3857, 1.0207]
lnRefug	0.005	0.049	0.109	0.913	[-0.0911, 0.1018]
L.lnRefug	-0.064	0.036	-1.774	0.076	[-0.1348, 0.0067]
L2.lnRefug	0.219	0.054	4.023	0.000	[0.1121, 0.3250]
Inflation (asinh)	-0.123	0.088	-1.403	0.161	[-0.2957, 0.0490]
L.Inflation (asinh)	0.068	0.051	1.343	0.179	[-0.0313, 0.1674]
L2.Inflation (asinh)	-0.059	0.121	-0.488	0.626	[-0.2973, 0.1788]
lnLite	8.527	7.093	1.202	0.229	[-5.3747, 22.4291]
L.lnLite	3.739	4.485	0.834	0.405	[-5.0517, 12.5286]
L2.lnLite	-6.869	3.095	-2.220	0.026	[-12.9344, -0.8039]
lnUnemp	-0.275	0.384	-0.715	0.475	[-1.0276, 0.4783]
L.lnUnemp	0.361	0.376	0.962	0.336	[-0.3753, 1.0984]
L2.lnUnemp	-0.042	0.206	-0.202	0.840	[-0.4461, 0.3625]
lnPov	1.363	1.163	1.172	0.241	[-0.9166, 3.6434]
L.lnPov	-2.892	1.879	-1.539	0.124	[-6.5741, 0.7908]
L2.lnPov	1.847	0.847	2.181	0.029	[0.1868, 3.5075]

Diagnostic tests for GMM validate the model's reliability and robustness. Key tests include the Arellano-Bond test for autocorrelation and the Sargan test for over-identifying restrictions. Table 9 displays the outcomes of the diagnostic tests. The Arellano-Bond test indicates the absence of substantial second-order autocorrelation (AR(2), $p = 0.989$), hence validating the instrument selection. The Sargan test rejects the null hypothesis in the non-robust version ($p = 0.004$), suggesting possible overidentification problems. Nevertheless, the robust version ($p = 1.000$) indicates that the test's efficacy is diminished by the abundance of instruments.

Table 9
Diagnostic Tests

Diagnostic Tests		
1. Arellano-Bond test		
Arellano-Bond test for AR (1) in first differences:	z = -1.85	Pr > z = 0.064
Arellano-Bond test for AR (2) in first differences:	z = 0.01	Pr > z = 0.989
2. Sargan test of overid		
1. Null Hypothesis: Not robust, but not weakened by many instruments		
restrictions: chi2(51) = 82.05	Prob > chi2 = 0.004	
2. Null Hypothesis: Robust but weakened by many instruments.		
restrictions: chi2(51) = 0.00	Prob > chi2 = 1.000	

5.1 Conclusion

This study investigates the dynamic macroeconomic determinants of human trafficking in South and Central Asia applying a one-step GMM framework. The findings reveal that human trafficking exhibits significant persistence, indicating that trafficking vulnerabilities and networks tend to carry forward over time. GDP has a positive contemporaneous association with trafficking, while its lagged effects are insignificant, suggesting that economic growth alone may not be sufficient to reduce trafficking vulnerability.

Importantly, the effects of several structural factors become apparent with a time lag. The second-lag effects of refugee population and poverty are significant and positive, meaning that economic deprivation and long-term displacement can lead to greater susceptibility to trafficking over time. There is a strong negative second-lag effect of literacy, however, indicating that education is an important medium/long-term protective factor. The role of inflation and unemployment is not well shown and is statistically non-significant across the estimated periods.

The results overall highlight trafficking as a multi-dimensional and dynamic phenomenon which is driven by longstanding and accumulated socioeconomic vulnerabilities. The findings highlight the need to tackle the issue of chronic poverty, educational deprivation, trafficking networks, and prolonged displacement. Overall, anti-trafficking measures need to go beyond temporary economic measures to also include long-term social protection, refugee protection, inclusive economic opportunities, safe migration routes, and robust institutional responses.

5.2 Policy Recommendations

The data collected suggests that there is a need for a policy response to human trafficking in South and Central Asia that is long-term and multidimensional. The scale of trafficking, its persistence, and the need for more sustained institutional responses, including improved identification and monitoring mechanisms, more effective trafficking prosecutions, victim protection and rehabilitation, and improved national and cross-border coordination.

Second, the strong impact of refugees on the long-term suggests that protection needs are not limited to humanitarian assistance. Governments and development partners should provide improved legal documentation, access to formal employment, social protection, livelihoods, and safe migration routes to refugees and displaced populations, especially in the context of extended displacement.

Third, the fact that literacy has a strong protective impact over time is an important reminder of the critical need for continued investment in education and human-capital development. Education policies should be accompanied by trafficking awareness, information on safe migration, vocational skills, and enhanced linkages between the education and decent employment sectors. Likewise, the delayed positive impact of poverty underscores the urgency of poverty alleviation and social protection policies to improve the resilience of households and decrease reliance on precarious labour market options and migration.

Lastly, the positive contemporaneous correlation between GDP and trafficking underscores the need not to take economic growth as a given protection from trafficking. Growth strategies must be inclusive, and must be supported by equal opportunities to work, social protection, good governance, and protection for vulnerable groups. The statistical significance of inflation and unemployment is not found in the revised model; thus, any claims of anti-trafficking policy based on the two variables must be made with caution.

5.3 Study Limitations

There are some limitations of this study. First, the statistics for human trafficking are not easily obtained, as accurate counts of the number of trafficking cases reported may also be influenced by differences in detection, reporting, institutional capacity, and law-enforcement effectiveness in countries. Second, when observations were missing, interpolation and/or extrapolation/imputation were employed to enable a complete panel of observations. This may help with the dynamic estimation, but the estimated observations could have reduced the natural variation and could have affected the magnitude and significance of the results.

Third, the rather small number of countries and the specified time horizon limit the validity of the results. Some factors that may be important but not explicitly included in the model are institutional quality, income inequality, conflict, gender vulnerability, migration governance, capacity of the law enforcement system, and corruption. Finally, the results should be considered as conditional empirical associations, and not as causal effects, as dynamic GMM was used to address the endogeneity problem, and endogeneity is not ruled out in this context. These relationships might be further examined in future research by using alternative indicators of trafficking, regional samples larger in size, field-administered data sets, and additional institutional and socioeconomic factors.

Declarations

Ethical Approval

This article does not contain any studies with human participants performed by any of the authors.

Informed Consent

Informed consent was not applicable because the study was based exclusively on publicly available secondary country-level data and involved no direct participation, recruitment, or interaction with human subjects.

Author Contribution

ARK conceived the study, collected and curated the data, and prepared the original manuscript draft. NK designed the methodology, conducted the econometric estimation and formal analysis, contributed to data curation, and prepared the original draft. MR supervised the research, critically reviewed and edited the manuscript, validated the findings, and provided overall guidance throughout the study. All authors read and approved the final manuscript.

Acknowledgement

Not Applicable.

Data Availability

Data Availability Statement The data used in this study were obtained from publicly available secondary sources. Human trafficking data were sourced from the U.S. Department of State, while data on poverty, unemployment, literacy, inflation, GDP, and refugee populations were obtained from the World Development Indicators (WDI). The processed dataset used for the empirical analysis, including the treatment of missing observations, is available from the corresponding author upon reasonable request.

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Footnotes

1. Sources: Poverty: ILO 2021; Unemployment: IOM 2021; Education: UNESCO 2019. UNICEF 2019; Inflation: World Bank 2020. ILO 2021; GDP: UNODC 2020. ILO 2017; Refugee Populations: UNHCR 2020. Human Rights Watch 2021.

Figures

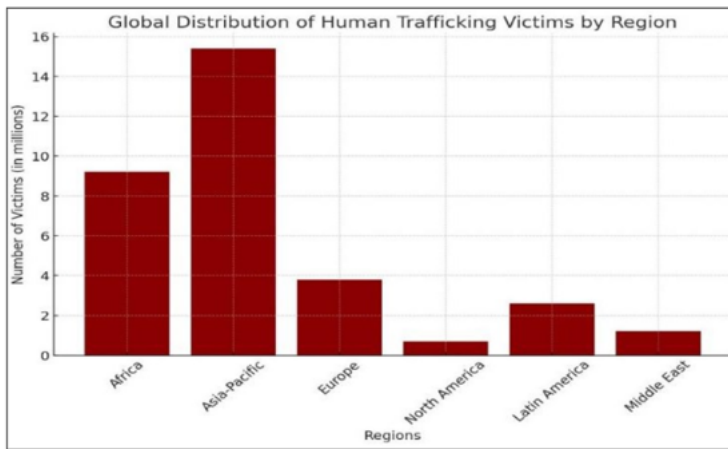


Figure 1

Global Distribution of Human Trafficking Victims by Region.

Source: ILO (2017); UNODC (2020)

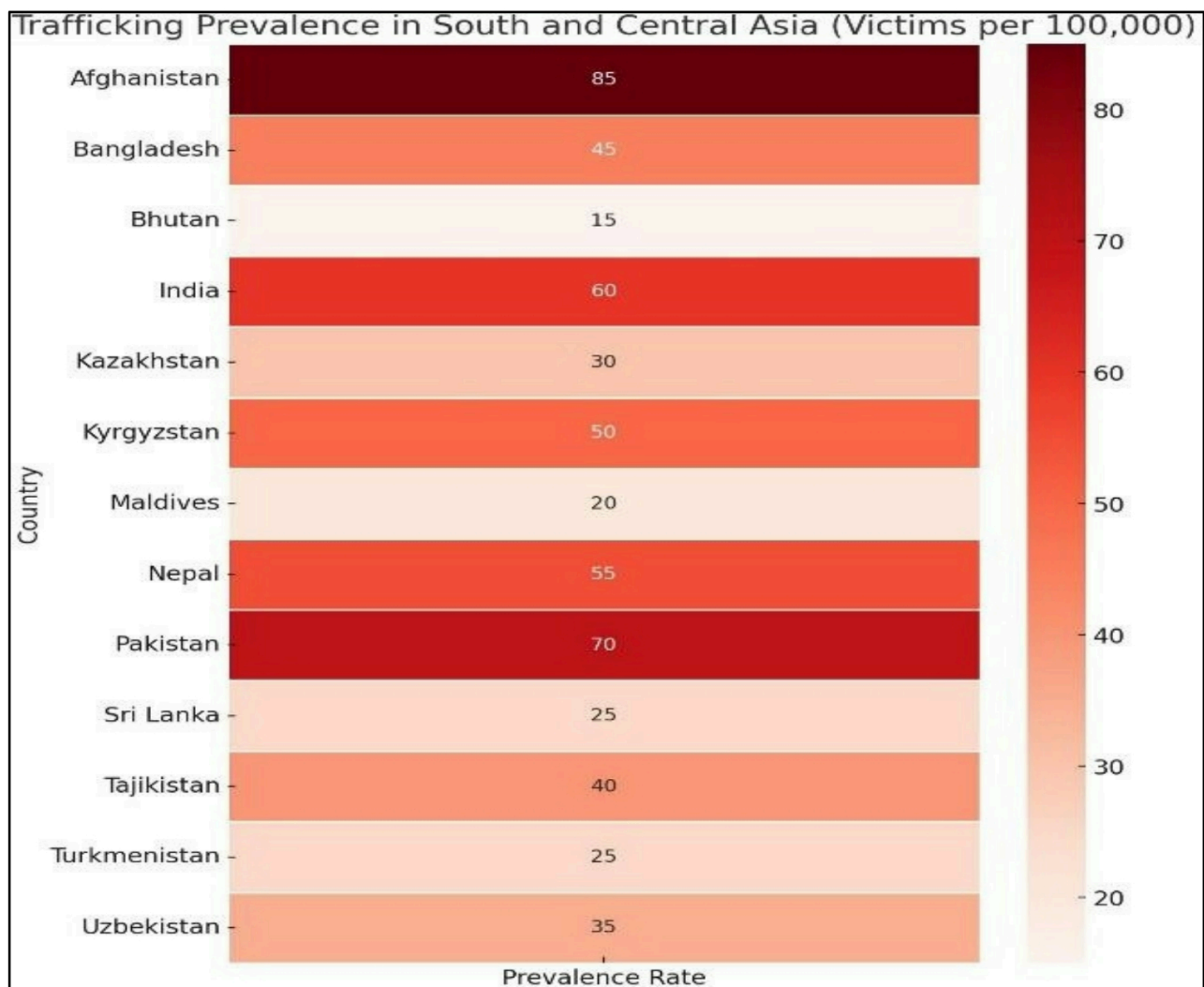


Figure 2

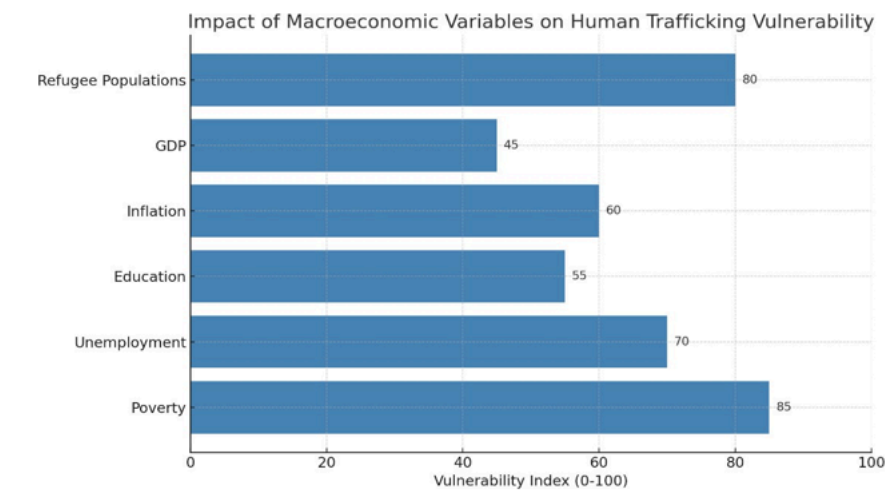


Figure 3

Six macroeconomic factors that provide the greatest risks for vulnerability to human trafficking

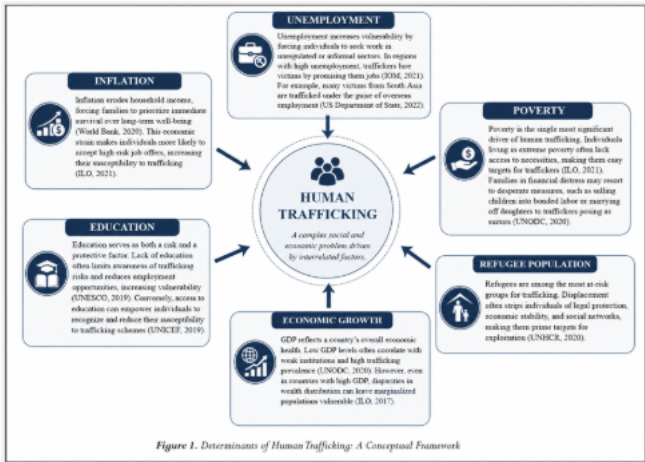


Figure 4

Conceptual Framework

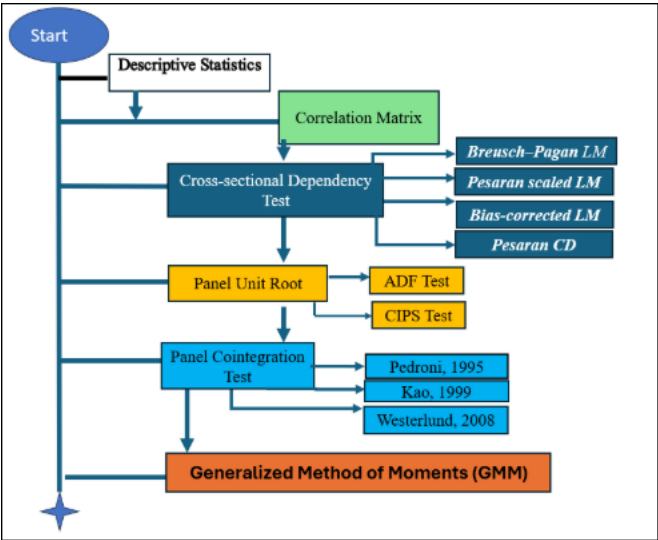


Figure 5

Supplementary Files

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