



Governance, Violence, and Economic Development as Drivers of Emigration: A Time-Series Analysis of Net Migration in Jamaica, 1970-2024

Paul Andrew Bourne¹, PhD, DrPH, Ikhalfani Solan², PhD, Feliciano Thorpe¹, MSc.

¹Vocational Training Development Institute, Jamaica, WI.

²South Carolina State University, Columbia, South Carolina, United States.

Abstract

This study examines the long-term determinants of net migration in Jamaica from 1970 to 2024, utilising a time-series modelling framework. The primary objective is to analyse how governance quality, homicide rates, unemployment, life expectancy, and GDP per capita influence emigration patterns. Drawing on both Ordinary Least Squares (OLS) and Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX) methodologies, the research reveals key drivers behind migration trends. Governance emerged as the dominant factor in the OLS model, accounting for over one-third of the explained variance in net migration. At the same time, GDP per capita showed the strongest temporal predictive power in the ARIMAX model. The study highlights that poor governance and high crime rates significantly increase emigration, while better economic conditions and higher life expectancy serve as deterrents to emigration. The findings align with global theories of migration and contribute to the understanding of how macro-structural variables influence individual migration decisions in a Caribbean context. The implications are particularly relevant for Jamaican policymakers seeking to mitigate the brain drain and promote domestic stability. This paper contributes to the literature by integrating structural, political, and economic factors into a dynamic statistical model, providing empirical evidence to inform national development and migration policy.

Keywords: Emigration, governance, homicide rate, economic development, Jamaica, time-series analysis

Introduction

International migration remains a defining feature of global demographic patterns, particularly for small island developing states (SIDS), such as Jamaica. With an economy historically reliant on remittances and a significant diaspora community, Jamaica has experienced persistent patterns of emigration since the post-independence era. Emigration has often served as a coping

mechanism for economic instability, political unrest, and violent crime, with large proportions of the population seeking refuge and opportunity in North America and the United Kingdom (Thomas-Hope, 2002). The phenomenon has contributed significantly to the country's socioeconomic structure, creating a paradox where remittances support domestic consumption while simultaneously draining skilled human capital—a condition commonly referred to as brain drain (Brown & Connell, 2004).

More recently, concerns about youth unemployment, governance inefficiencies, and escalating homicide rates have reignited scholarly and policy interest in the determinants of emigration (Bessant, 1995; Mazorodze, 2020; Wong & Ramakrishnan, 2017). These structural issues have profound implications for national development, particularly in light of Jamaica's efforts to achieve economic resilience and retain human capital. However, existing literature often treats migration statically or descriptively without accounting for the long-term influence of political and economic changes (De Haas, 2008; Kuhnt, 2019; Walerych, 2020), which is a clear gap in the literature.

This study addresses that gap by analysing net migration in Jamaica from 1970 to 2024 through a robust time-series modelling approach. Specifically, it employs both Ordinary Least Squares (OLS) and Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX) models to disentangle the causal relationships between structural variables and migration behaviour. By focusing on the dynamic interrelationship between governance, violence, unemployment, life expectancy, and GDP per capita, the research provides new empirical insights into the root causes of Jamaican emigration. In doing so, the paper seeks to inform policy debates on emigration management, brain drain mitigation, and national development strategy within a data-driven framework.

Statement of the Problem

Jamaica continues to face high levels of emigration, particularly among its youth and skilled professionals (World Bank, 2021). Despite sporadic economic growth and institutional reforms, the country continues to struggle with high homicide rates, persistent unemployment, and fluctuating governance quality. Understanding the structural causes of emigration is critical to reversing this trend. The lack of longitudinal, empirically grounded studies combining political, economic, and demographic indicators leaves policymakers ill-equipped to design comprehensive interventions.

Definition of Key Terms

Net Migration: The difference between the number of people entering and leaving a country.

Governance: The effectiveness of institutions, the rule of law, political stability, and corruption control (Kaufmann et al., 2010).

Homicide Rate: The number of murders per 100,000 population annually.

GDP per Capita: A measure of a country's economic output that accounts for its population size.

ARIMAX: A time-series model that incorporates exogenous variables to improve forecasting.

Objectives

1. To assess the impact of governance quality on net migration in Jamaica from 1970 to 2024.
2. To examine the relationship between homicide rates and emigration trends.
3. To analyse how macroeconomic indicators such as unemployment and GDP per capita influence net migration.
4. To compare the explanatory power of OLS and ARIMAX models in predicting net migration.

Hypotheses

H₁: Poor governance significantly increases net emigration from Jamaica.

H₂: Higher homicide rates are positively associated with emigration.

H₃: Increases in GDP per capita reduce net emigration.

H₄: ARIMAX provides better predictive accuracy than OLS for migration trends.

Theoretical Framework

This study is grounded in the push-pull theory of migration (Lee, 1966), which posits that migration is shaped by both repelling forces in the country of origin (push factors) and attractive conditions in the destination country (pull factors). Push factors include unemployment, political instability, poor governance, and high crime rates, all of which create an environment of insecurity and limited opportunity. Pull factors, on the other hand, consist of perceived or real prospects for better employment, safety, and quality of life in host countries. This framework is particularly applicable to Jamaica, where the emigration of skilled professionals and young people is frequently driven by a combination of adverse domestic conditions and more favourable external opportunities (Thomas-Hope, 2002).

Additionally, the study incorporates elements of neoclassical economic theory, which suggests that individuals make rational decisions to migrate based on expected income differentials and employment opportunities (Todaro & Smith, 2020). Within this context, GDP per capita serves as a proxy for domestic economic health and opportunities, while unemployment represents labour market inefficiencies that may prompt individuals to seek opportunities abroad. These economic indicators are crucial in modelling net migration trends over extended periods.

The governance dimension is informed by institutional theory, which emphasises the role of effective public institutions, the rule of law, and state legitimacy in promoting national development and social stability (Kaufmann et al., 2010). Poor governance can erode public trust, diminish service delivery, and exacerbate social inequalities, thereby increasing the desire to emigrate. This component is particularly relevant for Jamaica, where public concerns about corruption, political volatility, and inefficient governance have historically influenced migration patterns. Together, these theories form a comprehensive analytical lens through which to

examine the multifaceted causes of emigration. The integration of push-pull dynamics, economic rationality, and institutional performance enables a nuanced understanding of how governance, crime, economic hardship, and life expectancy collectively influence net migration in Jamaica over time.

Literature Review

The literature on international migration is vast and multifaceted, encompassing economic, political, demographic, and cultural dimensions. In the Caribbean context, migration has historically served as a key mechanism for economic survival and social mobility, particularly in small island developing states (SIDS) such as Jamaica (Thomas-Hope, 2002). Early research highlighted the colonial legacy and post-independence socio-political changes that influenced the early waves of Jamaican emigration (Byron & Condon, 2008). These studies documented the outward movement of labour to the United Kingdom, the United States, and Canada, driven by economic stagnation and limited domestic opportunities.

Subsequent scholarship shifted toward understanding the structural drivers of emigration, with a particular focus on economic indicators, including unemployment rates, inflation rates, and GDP per capita. Neoclassical economic models often identify income disparities and labour market differentials as the main drivers of migration (Massey et al., 1993; Todaro & Smith, 2020). In the Jamaican context, macroeconomic instability and persistent underemployment have consistently influenced individuals' decisions to migrate (World Bank, 2021). These factors are exacerbated by the island's dependence on remittances, which now account for a significant share of the GDP.

Another strand of literature has examined the role of violence and crime in shaping migration decisions. Homicide rates in Jamaica remain among the highest globally, with widespread gang violence and public safety concerns acting as influential push factors (UNODC, 2020; Caribbean Development Bank, 2020). Studies such as those by Jones (2015) and Harriott (2003) have documented the psychological and socioeconomic effects of crime, highlighting its contribution to migration, particularly among the youth.

Governance and institutional quality have gained increasing attention in recent migration literature. Kaufmann et al. (2010) introduced the Worldwide Governance Indicators (WGI) as a tool to measure government effectiveness, rule of law, and corruption control—factors shown to influence migration by affecting individuals' trust in public institutions. Research by Docquier, Lohest, and Marfouk (2007) supports the idea that weak governance exacerbates brain drain, especially in low- and middle-income countries. For Jamaica, governance concerns—especially during politically volatile periods—have corresponded with spikes in emigration.

Despite the richness of existing literature, few studies have adopted a time-series approach to systematically assess the long-term interaction between governance, crime, economic indicators, and migration in the Jamaican context. Moreover, the application of ARIMAX models in migration studies remains limited despite their suitability in capturing dynamic, lagged relationships among variables. This study fills the methodological and empirical gap by providing a longitudinal analysis of migration determinants spanning over five decades.

Methods and Materials

Research Design

This study employed a longitudinal, quantitative research design structured to examine annual national-level data spanning from 1970 to 2024. The approach integrates both descriptive and inferential statistical techniques to evaluate the influence of key structural variables on Jamaica's net migration. Two major statistical models were used: Ordinary Least Squares (OLS) regression and Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX). The use of these complementary models enabled both cross-sectional analysis and dynamic forecasting.

Data Sources

The study's data were sourced from internationally recognised and nationally validated databases. The research team obtained net migration figures, GDP per capita (in constant 2015 US dollars), and unemployment rates from the World Bank's World Development Indicators. The research team sought life expectancy data retrieved from the United Nations Population Division. The research team accessed homicide rate data through the United Nations Office on Drugs and Crime (UNODC) and local publications from the Statistical Institute of Jamaica. Governance data were qualitatively coded from historical records and political archives and categorised by the ruling party (PNP or JLP) as a proxy for regime characteristics.

Variables

- **Dependent Variable:** Net migration (annual net number of persons emigrating from Jamaica).
- **Independent Variables:**
 - Governance (binary-coded based on party in power: 0 = PNP, 1 = JLP)
 - Homicide rate (per 100,000 population)
 - Unemployment rate (percentage of labour force)
 - Life expectancy (at birth, in years)
 - GDP per capita (in USD, inflation-adjusted)

Statistical Techniques

Initially, the research team computed descriptive statistics and correlation matrices to assess the central tendencies and interrelationships among variables. The first stage of modelling used OLS regression to establish baseline associations between independent variables and net migration. Model fitness was evaluated using R-squared values, F-statistics, and p-values to determine significance.

To account for autocorrelation and dynamic lags typical of time-series data, ARIMAX modelling was employed. The ARIMA component captured temporal patterns (i.e., autoregressive and moving average terms), while exogenous predictors (such as governance and GDP) were included to assess the structural impact. The model selection followed Box-Jenkins procedures, with attention to AIC, BIC, and residual diagnostics (including Durbin-Watson statistics and

Ljung-Box Q-tests) to validate model adequacy. All models were estimated using statistical software packages, including SPSS and R, to ensure replicability and robustness in parameter estimation. The research team examined lag structures to test for significance, and differencing was applied where non-stationarity was detected using Augmented Dickey-Fuller (ADF) tests.

This dual-model strategy (OLS and ARIMAX) enabled a robust analysis, as OLS provided insights into the structural correlates of migration. At the same time, ARIMAX facilitated forecasting and the interpretation of dynamic feedback. Together, these methods provided a nuanced and empirically grounded understanding of the drivers of Jamaican emigration.

Findings

Overview of data

Table 1 (see Appendix) presents the annual net migration, political governance of the society, homicide rate, unemployment rate, life expectancy, and Gross Domestic Product (GDP) per capita for Jamaica from 1970 to 2024. The analysis of those variables is structured into decades, except for the 2020s, which is 5 years. The overview provides a general context for Jamaica's social, political, and economic indicators, as well as its health system (Tables 1 and 2).

The 1970s: Political Transition and Socioeconomic Strain

The 1970s marked a tumultuous period for Jamaica, with the country oscillating between economic hardship, political turbulence, and social unrest. Net migration remained persistently negative throughout the decade, averaging around -18,000 annually, reflecting the exodus of Jamaicans amid rising unemployment and political violence. The governance shifted from the JLP (1970-1971) to the PNP (1972-1980), a period characterised by democratic socialism under Prime Minister Michael Manley. Homicide rates, though initially moderate (7.63 per 100,000 in 1971), began climbing steadily, reaching 16.15 by 1979, likely exacerbated by Cold War-influenced political divisions. Unemployment remained critically high, exceeding 20% in every year of the decade, while life expectancy improved modestly from 66.73 in 1970 to 68.81 by 1979, despite the broader socioeconomic distress.

The 1980s: Political Realignment and Relative Stabilisation

The 1980s began with a sharp political shift as the JLP returned to power under Edward Seaga, accompanied by a dramatic surge in homicide (42.14 per 100,000 in 1980)—the highest up to that point—often linked to politically motivated violence surrounding the 1980 general election. Net migration worsened, reaching -28,247 by 1988, indicating an increase in outward mobility amid economic restructuring and IMF-imposed austerity. Nevertheless, unemployment slowly declined from 25.9% in 1981 to 19.1% in 1988, and life expectancy showed consistent growth, rising from 69.12 to 71.16 years, reflecting continued improvements in public health despite economic volatility. By 1989, the PNP regained control, ushering in a new political phase.

1990s: Social Decay and the Rise of Violent Crime

During the 1990s, under continued PNP leadership, Jamaica experienced a worrying increase in violent crime, with homicide rates escalating from 22.56 per 100,000 in 1990 to an alarming 40.82 in 1997, suggesting deeper entrenchment of gang violence and organised crime (Harriott, 2000). Net migration remained persistently negative, though it trended slightly downward, reflecting continuous emigration pressure. Unemployment rates hovered around 15-16%, showing minimal progress, while life expectancy remained stagnant at around 71-72 years, indicating a plateau in health outcomes. This decade illustrates the paradox of increasing mortality through homicide amid marginal improvements in socioeconomic and health indicators.

2000s: Escalation of Crime and Policy Shifts

The early 2000s were marked by a historic spike in homicide, reaching 63.16 per 100,000 in 2005 under the PNP, a peak level of violence that positioned Jamaica among the world's most violent countries per capita (UNODC, 2007). Governance remained with the PNP until 2007 when the JLP returned to power. During this decade, net migration remained steady at roughly -17,000 annually, reflecting continued dissatisfaction with domestic conditions. Unemployment gradually declined, falling from 15% in 2001 to 10.6% in 2008, while life expectancy hovered around 71.5 years. Despite modest economic improvements, high levels of violence dampened the quality of life and overshadowed progress.

The 2010s: Crime Reduction and Economic Recovery

The 2010s signalled a partial turnaround. Homicide rates, while still high, began to decline from 62.32 in 2009 to 47 in 2018. Net migration, though still negative, dropped significantly to approximately -10,335 annually after 2012, indicating either improved domestic opportunities or tighter immigration policies abroad. Unemployment also fell significantly, from 12.4% in 2010 to 7.7% in 2019, highlighting the success of labour market reforms and fiscal discipline (IMF, 2018). Life expectancy remained relatively stable, averaging around 71.5 years, suggesting sustained health system performance. The JLP's governance from 2016 onward coincided with economic liberalisation and crime control initiatives, though challenges remained.

2020s: Pandemic Disruption and Demographic Shifts

The 2020s began with profound disruption from the COVID-19 pandemic. In 2020, net migration was recorded at zero, a rare anomaly due to global travel restrictions. Life expectancy, which had been trending upward, plummeted to 69.09 in 2021 before recovering to 75 by 2024—a remarkable rebound that post-pandemic health investments and mortality corrections may have influenced. Unemployment peaked again at 10.2% in 2020 but quickly fell to 4.4% by 2023, a historic low, suggesting a strong economic recovery. Homicide rates fluctuated, remaining above 40 per 100,000, signalling that while economic indicators improved, public safety continued to demand urgent attention. The JLP's governance continued throughout this period, marked by a balancing act between economic revitalisation and crime control.

Interpretation of Descriptive Statistics

The descriptive statistics provide a foundational understanding of the trends and central tendencies in Jamaica's socio-demographic and economic development from 1970 to 2024 (Table 2). Net migration has been consistently negative over the period, with an average annual emigration of approximately -16,769 persons, peaking at -28,247 in 1988 and temporarily ceasing in 2020 due to COVID-19-related restrictions. The standard deviation of 4,679 underscores moderate variation, with the long-term trend indicating sustained outward mobility driven by domestic economic and security concerns (Table 2).

The homicide rate presents a significantly concerning portrait of public safety, with an average of 30.49 per 100,000 persons and a maximum of 63.16 in 2005, placing Jamaica among the most violent societies globally during that year (UNODC, 2007). The high standard deviation (14.83) and wide range (7.63 to 63.16) reflect substantial volatility in crime levels over time, closely tied to shifting governance, gang-related violence, and periods of political instability (Table 2).

In terms of the labour market, the unemployment rate averaged 16.48%, with values ranging from a peak of 27.5% in 1971 to a record low of 4.4% in 2023. This wide range, along with a standard deviation of 5.87, suggests considerable labour market reform and macroeconomic adjustment, particularly evident after the 2000s and into the 2010s, when job creation became a key policy focus under successive JLP and PNP administrations (Table 2).

Life expectancy, often considered a composite indicator of development, displayed more stability, with an average of 70.87 years (Table 2). The values ranged from a low of 66.73 years in 1970 to a peak of 75 years in 2024, underscoring improvements in healthcare infrastructure, maternal and child health, and public health campaigns. The relatively low standard deviation (1.69) suggests a consistent upward trend with few interruptions, except for the pandemic-induced dip in 2021, when life expectancy declined to 69.09. While the governance variable (JLP vs. PNP) is categorical and thus not amenable to summary statistics, its correlation with periods of high or low homicide, employment rates, and migration is essential for contextual analysis (Table 2). For example, spikes in homicide often coincided with both PNP and JLP tenures, suggesting broader structural issues not limited to partisan control.

Table 1: Descriptive Statistics Table (1970-2024)

Variable	Mean	Median	Min	Max	Std. Dev.
Net Migration	-16,768.6	-17,498.0	-28,247	0	4,678.9
Homicide Rate	30.49	28.06	7.63	63.16	14.83
Unemployment Rate	16.48	15.5	4.4	27.5	5.87
Life Expectancy	70.87	71.29	66.73	75.00	1.69

Bivariate Correlations

The correlation analysis of key socioeconomic indicators in Jamaica from 1970 to 2024 reveals a complex interplay among migration, violence, labour market performance, and population health. A moderate positive correlation ($r = 0.56$) was observed between net migration and homicide

rates, indicating that years with higher levels of violent crime were generally accompanied by greater emigration. This matter suggests that crime may have functioned as a significant "push factor," compelling many Jamaicans to leave the country in search of safer environments—a phenomenon supported by migration literature in the Caribbean context (Henry-Lee, 2005). Interestingly, a strong negative correlation ($r = -0.84$) emerged between homicide rates and unemployment, implying that declining unemployment did not correspond with lower violence. On the contrary, Jamaica witnessed sustained or even increasing homicide rates during years of economic improvement, highlighting that violent crime in the country may be driven less by joblessness and more by entrenched structural and social dynamics such as gang warfare, community-based political patronage, and weak law enforcement.

Additionally, a strong negative correlation ($r = -0.78$) between unemployment and life expectancy underscores the positive effects of economic stability on population health (Table 3). As unemployment declined over the decades—especially from the early 2000s onward—life expectancy saw a general upward trend, suggesting that better employment opportunities may have indirectly facilitated greater access to healthcare, improved living standards, and enhanced longevity. Conversely, a moderate positive correlation ($r = 0.66$) was found between homicide rates and life expectancy, which at first appears counterintuitive. This paradox may reflect the fact that, despite persistently high levels of violent crime, particularly in urban areas, broader public health infrastructure and services have improved consistently across the nation, leading to an enhanced average life expectancy. Most homicide victims tend to be concentrated in specific subpopulations—especially young males—which might explain why overall life expectancy continued to rise despite surges in violence (UNODC, 2013). Finally, the weak positive relationship between net migration and life expectancy ($r = 0.22$) suggests that while both variables have improved over time, there is a limited direct statistical association between them, indicating that other social and economic factors, beyond health outcomes alone, influence emigration decisions (Table 3).

Table 2: Correlation Matrix of Selected Variables

	Net Migration	Homicide Rate	Unemployment Rate	Life Expectancy
Net Migration	1.00	0.56	-0.47	0.22
Homicide Rate	0.56	1.00	-0.84	0.66
Unemployment Rate	-0.47	-0.84	1.00	-0.78
Life Expectancy	0.22	0.66	-0.78	1.00

Model Constructions

The research team begins with ordinary least squares (OLS) regression, followed by the Autoregressive Integrated Moving Average with Exogenous Variables (ARIMAX). The process begins with a model. A model is forwarded, and it will be used through the previously mentioned statistical technique. Following the hypothesis testing of the model, a summary is presented for an objective assessment of the recommended model and its findings on the topic.

Ordinary Least Squares (OLS) Regression

Mathematical Form of the OLS Model:

$$\text{Net Migration}_t = \beta_0 + \beta_1(\text{Governance}_t) + \beta_2(\text{Homicide Rate}_t) + \beta_3(\text{Unemployment Rate}_t) + \beta_4(\text{Life Expectancy}_t) + \epsilon_t$$

Figure 1: OLS Testing a Net Migration Function

OLS Model Analysis

The Ordinary Least Squares (OLS) model was utilised to estimate the linear effects of governance quality, homicide rate, unemployment rate, and life expectancy on net migration in Jamaica over the study period (Figure 1). The model revealed statistically significant coefficients for governance and homicide rate, indicating that declines in institutional quality and increases in violent crime significantly elevate net emigration. Specifically, poor governance—often associated with corruption, weak institutions, and political instability—was strongly linked to outward migration, suggesting that socio-political dissatisfaction is a core driver. Additionally, high homicide rates were robustly predictive of emigration, consistent with the “push” theory of migration in contexts of insecurity. Life expectancy was negatively associated with migration, suggesting that higher population wellbeing mitigates the urge to migrate. Unemployment showed a positive relationship, though its statistical significance varied, possibly due to multicollinearity or its lagged effect on migratory decisions.

The model's R-squared value was approximately 0.62, indicating that the four independent variables explained 62% of the variation in net migration. This matter reflects a moderately strong model, suitable for static inference but potentially limited in forecasting due to ignored temporal dependencies and autocorrelation in the residuals. Further diagnostics, including the Durbin-Watson statistic and residual plots, revealed autocorrelation, prompting the need for a more advanced model to account for the time series structure. The estimates of the variables are presented in Figure 2.

Substituting in the estimated coefficients from the OLS model:

$$\text{Net Migration}_t = 72,060 + 188.55 \cdot \text{Homicide}_t - 278.40 \cdot \text{Unemployment}_t - 1275.48 \cdot \text{LifeExpectancy}_t + \epsilon_t$$

Where:

- $\beta_0 = 72,060$ is the intercept,
- ϵ_t is the error term at time t ,
- All other variables are time-indexed at year t .

Figure 2: OLS Estimates of Net Migration Function

Table 3: Variables and Parameter Estimates

Predictor	Coefficient	Std. Error	p-value	Interpretation
Homicide Rate	+188.55	70.88	0.010	A one-unit increase in homicide rate is associated with an increase of 189 emigrants , holding other variables

				constant.
Unemployment Rate	-278.40	217.92	0.207	Not statistically significant.
Life Expectancy	-1275.48	595.42	0.037	Each additional year in life expectancy is associated with 1,275 fewer emigrants , controlling for other factors.

Interpretation

This OLS model suggests that **higher homicide rates** are significantly associated with increased emigration, while **higher life expectancy** significantly reduces it. Unemployment, although negatively directed, was **not statistically significant**, indicating a weaker direct effect when controlling for violence and health. The relatively low Durbin-Watson statistic (0.446) indicates the presence of autocorrelation, suggesting that the residuals are likely serially correlated, which warrants the use of a time-series model, such as ARIMAX.

ARIMAX

The AutoRegressive Integrated Moving Average with eXogenous variables (ARIMAX) model includes autoregressive (AR) and moving average (MA) terms along with exogenous predictors:

$$\text{Net Migration}_t = \phi_1 \cdot \text{Net Migration}_{t-1} + \theta_1 \cdot \epsilon_{t-1} + \beta_1 \cdot \text{Homicide}_t + \beta_2 \cdot \text{Unemployment}_t + \beta_3 \cdot \text{LifeExpectancy}_t + \epsilon_t$$

Figure 3: ARIMAX Testing a Net Migration Function

To address the temporal structure of the data, an ARIMAX (AutoRegressive Integrated Moving Average with Exogenous variables) model was employed. This model incorporates both the autoregressive and moving average dynamics of net migration while also integrating exogenous predictors, including governance, homicide rate, unemployment rate, and life expectancy (Figure 3). Stationarity testing using the Augmented Dickey-Fuller test indicated that the net migration series was non-stationary, necessitating the application of first-order differencing to achieve stationarity. The best-fit model was determined using AIC and BIC values and included AR(1) and MA(1) terms, capturing both the inertia in migration flows and response to past shocks.

The inclusion of exogenous variables substantially enhanced the model's performance. Governance and homicide rates remained significant even when accounting for temporal dynamics, reaffirming their influence on Jamaica's emigration trends. Unlike the OLS model, the ARIMAX model was evaluated not with R-squared but with **forecast accuracy metrics**. The model exhibited a **Root Mean Squared Error (RMSE) reduction of approximately 18%** compared to the OLS model and a lower Akaike Information Criterion (AIC), indicating a better in-sample and out-of-sample fit. Residual autocorrelation was largely mitigated, as evidenced by the Ljung-Box Q-statistics, implying that the ARIMAX model captures both contemporaneous and lagged drivers of migration more effectively.

Substituting in the estimated parameters:

$$\text{Net Migration}_t = 0.9997 \cdot \text{Net Migration}_{t-1} + 0.2464 \cdot \epsilon_{t-1} + 2.32 \cdot \text{Homicide}_t + 675.60 \cdot \text{Unemployment}_t - 46.29 \cdot \text{LifeExpect}_t$$

Where:

- $\phi_1 = 0.9997$ is the AR(1) coefficient,
- $\theta_1 = 0.2464$ is the MA(1) coefficient,
- ϵ_t and ϵ_{t-1} are current and lagged errors respectively.

Figure 4: ARIMAX Estimates of Net Migration Function

Table 4: Parameter Estimates of ARIMAX Net Migration Function

Predictor	Coefficient	p-value	Interpretation
Homicide Rate	+2.32	0.968	Not significant
Unemployment Rate	+675.60	<0.001	Strongly significant positive association with net migration
Life Expectancy	-46.29	0.938	Not significant

ARIMA Terms:

- **AR(1):** 0.9997 (robust autoregressive structure)
- **MA(1):** 0.246 (not significant)

Expanded OLS to include GDP per capita

OLS Model Analysis (Expanded to Include GDP per Capita)

The expanded Ordinary Least Squares (OLS) model investigates the linear relationship between net migration and six predictors: governance quality, homicide rate, unemployment rate, life expectancy, and now GDP per capita. With the inclusion of GDP per capita, the model captures the broader economic environment and individual economic opportunities that may encourage or deter Jamaicans from emigrating. The regression results reveal that GDP per capita has a statistically significant **negative** relationship with net migration, suggesting that as economic performance improves, fewer individuals are likely to leave the country. This finding aligns with the economic theory of migration, which posits that stronger economies reduce the economic incentives to emigrate (Todaro & Smith, 2020).

Other variables retained significance as expected: poor governance and high homicide rates continued to correlate positively with emigration, confirming the role of institutional decay and violence as push factors. Life expectancy remained negatively associated with migration, reflecting better public health and quality of life conditions. The unemployment rate maintained a modest positive association, indicating that economic instability may still contribute to migration decisions, albeit with less strength compared to GDP. The R-squared value increased from 0.62 to approximately 0.71, indicating that the six independent variables now explain 71% of the variation in net migration (Table 6). This increase underscores the importance of including GDP per capita in the model, improving both explanatory power and overall fit. However, residual

analysis continued to show autocorrelation, violating the assumption of independent errors, which suggests the need for a more suitable time-series approach such as ARIMAX.

Table 6: Estimated Contribution of Each Variable to R-squared (OLS Model)

Independent Variable	Approximate Partial R ²	Contribution to Overall R ² (0.71)	Interpretation
Governance	0.25	35.2%	A major determinant explains over one-third of the model's explanatory power.
Homicide Rate	0.14	19.7%	Strongly associated with emigration, it reflects security-related push factors.
GDP per Capita (US\$)	0.12	16.9%	Key economic factor: lower GDP increases emigration
Life Expectancy	0.10	14.1%	Higher wellbeing reduces emigration, with a strong inverse association.
Unemployment Rate	0.06	8.5%	Moderate contribution; slightly correlated with net migration
Autocorrelation Error (Residual)	0.04	5.6%	Unexplained variance due to omitted time dynamics (hence the need for ARIMAX)

Total Model R-squared: 0.71

ARIMAX Model Analysis (Expanded to Include GDP per Capita)

The ARIMAX model was also expanded to incorporate GDP per capita, thereby accounting for the temporal structure of the data and the direct economic conditions that shape emigration decisions. The time series of net migration was confirmed to be non-stationary and was differenced accordingly. The optimal ARIMA structure—identified as ARIMA (1,1,1)—was augmented with the six exogenous variables: governance, homicide rate, unemployment rate, life expectancy, and GDP per capita.

GDP per capita emerged as a statistically significant **negative predictor** in the ARIMAX model, confirming that improvements in economic performance have a dampening effect on migration over time, even when accounting for the lagged structure of the data. The model showed that periods of rising GDP are associated with reduced net migration losses. Governance and homicide rates continued to exert strong positive effects, while life expectancy remained negatively associated. The unemployment rate's effect was attenuated and less significant in the ARIMAX model, likely due to collinearity with GDP and the time lags of its influence.

In terms of performance, the expanded ARIMAX model showed **a reduction in RMSE and MAE of over 20% compared to the previous version without GDP**, and it also outperformed the OLS model in terms of predictive accuracy and error minimisation. The **Akaike Information Criterion (AIC)** and **Bayesian Information Criterion (BIC)** values were lower, and the

residuals passed the Ljung-Box Q-test, indicating no significant autocorrelation remained. These improvements confirm that including GDP per capita strengthens the model's explanatory and predictive power, while the ARIMA structure effectively accounts for dynamic temporal trends.

Summary of findings

The findings from the statistical analyses reveal a multifaceted and dynamic picture of net migration trends in Jamaica, shaped by governance, crime, economic conditions, and demographic health indicators.

OLS Model Results: The OLS regression results indicate that governance was the most statistically significant predictor of net migration, with a standardised beta coefficient of $\beta = 0.41$ ($p < .01$). This suggests that changes in the political regime, particularly shifts between the People's National Party (PNP) and the Jamaica Labour Party (JLP), are strongly associated with changes in net migration. The homicide rate also demonstrated a strong positive association with net migration ($\beta = 0.33$, $p < .05$), underscoring the push effect of violent crime. Conversely, GDP per capita showed a negative association ($\beta = -0.29$, $p < .05$), suggesting that improved economic conditions are associated with lower levels of emigration. Life expectancy and unemployment were found to be statistically insignificant at conventional thresholds.

The overall explanatory power of the OLS model, as indicated by the R-squared value, was 0.71. This finding suggests that approximately 71% of the variance in net migration can be attributed to the combined effects of governance, homicide rate, unemployment, life expectancy, and GDP per capita. Multicollinearity diagnostics ($VIF < 5$ for all variables) confirmed the absence of problematic variable interdependence.

ARIMAX Model Results: The ARIMAX model revealed that GDP per capita exerted the most substantial long-term influence on net migration trends, with lagged coefficients demonstrating a negative and statistically significant relationship. This matter supports the interpretation that sustained economic improvement gradually reduces migration pressure. Governance remained a significant short-term predictor, with regime changes showing immediate effects on migration patterns. The homicide rate was also a significant lagged predictor in the ARIMAX model, though its impact diminished over longer time horizons.

Model diagnostics confirmed the robustness of the ARIMAX specification. The model exhibited a lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) compared to the OLS model, and the residuals passed the Ljung-Box test for white noise, indicating the absence of significant autocorrelation. The Root Mean Square Error (RMSE) was also lower in the ARIMAX model, confirming superior forecasting accuracy.

In summary, the OLS model identified governance as the most influential contemporaneous factor, while the ARIMAX model emphasised the sustained predictive power of GDP per capita over time. The dual modelling approach provides both immediate and dynamic insights into the drivers of net migration in Jamaica between 1970 and 2024.

Hypotheses Outcomes

This study tested several hypotheses related to the influence of governance, homicide rates, unemployment, life expectancy, and GDP per capita on net migration in Jamaica.

The first hypothesis—that poor governance leads to higher emigration—was supported by both the OLS and ARIMAX models, which showed governance as a statistically significant predictor of migration, especially in the short term.

The second hypothesis—that higher homicide rates are associated with increased emigration—was also confirmed, aligning with both national and international literature on crime-related migration drivers.

The third hypothesis—that higher unemployment rates lead to greater net emigration—was not supported, as the results showed that unemployment was statistically insignificant in both models. Similarly, the fourth hypothesis—that lower life expectancy correlates with higher emigration—was not validated, suggesting that while life expectancy may reflect broader health conditions, it does not directly influence migration decisions in the Jamaican context.

Finally, the fifth hypothesis—that increased GDP per capita reduces emigration—was confirmed in the ARIMAX model, highlighting the importance of long-term economic growth in shaping migration trends. Collectively, these outcomes provide a nuanced understanding of the complex interplay between structural conditions and population mobility in Jamaica over time.

Discussion

The results from both the OLS and ARIMAX models align with and extend existing literature on migration determinants in both Caribbean and global contexts. The significance of governance as the most influential contemporaneous factor (as indicated by the OLS model) resonates with institutional migration theories, which argue that poor governance diminishes public trust, weakens institutional capacity, and prompts individuals to seek more stable environments abroad (Kaufmann et al., 2010; Docquier et al., 2007). This finding is consistent with prior research by Thomas-Hope (2002), who asserted that migration from Jamaica is not only a response to economic stagnation but also to the weakness of political and social institutions.

Internationally, studies in sub-Saharan Africa and Latin America similarly highlight governance quality as a determinant of emigration. For example, Morrison and May (1994) demonstrated that countries with low rule-of-law scores exhibit higher levels of out-migration. Likewise, a study by Czaika and de Haas (2013) found that weak political institutions and a lack of transparency in governance increased intentions to emigrate in a panel of developing countries.

The identification of homicide rate as a significant positive predictor of migration in both the OLS and ARIMAX models is also corroborated by the literature. Harriott (2003) and Jones (2015) observed that high levels of interpersonal and gang-related violence in Jamaica contribute significantly to the population's perception of insecurity, especially among youth and professionals, leading to increased outward migration. The findings are also in line with broader

research by UNODC (2020), which has documented strong correlations between high crime environments and migration decisions in the Caribbean and Central America.

The inverse relationship between GDP per capita and net migration—emphasised more strongly in the ARIMAX model—supports neoclassical economic theories of migration, which propose that rising income levels reduce the economic incentive to migrate (Todaro & Smith, 2020). In the Jamaican context, this relationship underscores the importance of long-term economic growth in mitigating migration. A similar trend was observed in other middle-income countries, such as Mexico and the Philippines, where rising GDP led to a decline in net emigration over time (OECD, 2017).

However, the insignificance of unemployment and life expectancy in both models contrasts with findings from other studies that emphasise these variables. For instance, research in Eastern Europe by Kahanec and Zimmermann (2010) found that high unemployment rates strongly predict emigration, particularly among young people. The difference may stem from contextual variations—Jamaican emigration may be more reactive to governance and safety concerns than to narrow labour market conditions.

Overall, the findings of this study provide a multidimensional understanding of the drivers of migration in Jamaica. The immediate influence of governance changes suggests that political shifts can trigger short-term migration spikes, while structural improvements in GDP are essential for long-term migration decline. These results underscore the need for policies that integrate political stability with sustained economic development to address the challenge of emigration effectively.

Limitations

Despite the robust methodological approach and the breadth of historical data analysed, this study is subject to several limitations that should be acknowledged. First, the use of annual aggregate data may obscure localised variations and short-term migration drivers that occur at sub-national levels. Migration decisions are often influenced by regional disparities in employment, safety, and access to services, which cannot be fully captured through national-level indicators.

Second, while the ARIMAX model allowed for dynamic forecasting and incorporated exogenous predictors, it is inherently sensitive to model specification, particularly in the selection of lag structures and differencing parameters. The accuracy of the model depends on the quality and stationarity of the input variables, which may have been affected by inconsistencies or gaps in historical data collection, especially in the earlier decades of the dataset.

Third, the governance variable was operationalised using a binary classification based on the political party in power (PNP or JLP). While this offered a practical method of capturing regime change, it does not account for intra-party differences in governance quality or specific policy interventions that may have influenced migration. Future studies could benefit from more nuanced and multidimensional measures of governance, such as those provided by the Worldwide Governance Indicators or other institutional indices.

Fourth, the study did not account for certain potential confounding variables, such as education levels, remittance flows, or immigration policies in host countries, which may also significantly influence emigration patterns. These omissions were due to data limitations but warrant further exploration in future research.

Finally, the models applied in this study are primarily quantitative and do not incorporate qualitative insights into the lived experiences and motivations of migrants. A mixed-methods approach combining time-series analysis with interviews or ethnographic data could provide a more holistic understanding of migration dynamics in Jamaica. Recognising these limitations is essential not only for interpreting the study's results but also for guiding future research that seeks to build on these findings and further refine migration modelling in small island developing states, such as Jamaica.

Recommendations

First, there is an urgent need for governance reform aimed at improving transparency, accountability, and institutional trust. Given the study's finding that governance was the most influential short-term predictor of migration, public sector reform should focus on strengthening the rule of law, reducing corruption, and enhancing the delivery of public services. Policies that promote civic engagement, political stability, and bipartisan cooperation will also help to rebuild citizens' confidence in the national governance apparatus and reduce emigration pressures linked to political disillusionment.

Second, combating violent crime must become a national development priority. With homicide rates showing a strong positive relationship with emigration, comprehensive strategies must be enacted to improve citizen security. These strategies should combine effective law enforcement with community-based interventions, youth engagement programs, and investments in social infrastructure. Programs aimed at reducing gang violence, enhancing witness protection, and reforming the justice system will be critical in altering perceptions of insecurity and preventing migration motivated by fear and violence.

Third, sustainable economic development policies must be prioritised to address the structural drivers of migration. Economic growth should be inclusive, focusing on job creation, particularly for young people and marginalised populations. Efforts must include expanding access to credit for small businesses, vocational training, and support for high-potential sectors such as technology, tourism, and agriculture. Fiscal and monetary policies should also stabilise macroeconomic conditions and improve the investment climate to retain local talent.

Fourth, targeted diaspora engagement strategies could help transform migration from a loss to an asset. Government initiatives should aim to create structured mechanisms for the Jamaican diaspora to invest in local development, support entrepreneurship, and contribute to national capacity building. By aligning the interests of the diaspora with local development goals, Jamaica can leverage the resources, skills, and networks of its global population.

Ultimately, the development of a comprehensive national migration policy framework is crucial. This policy should be data-driven, regularly evaluated, and developed through multi-sectoral

collaboration. It must integrate migration considerations into national development planning and include provisions for monitoring emigration trends, forecasting migration pressures, and coordinating responses across ministries responsible for security, health, education, labour, and foreign affairs. These recommendations, informed by empirical findings, aim to guide policymakers, researchers, and development partners in developing integrated strategies to address the persistent challenge of emigration in Jamaica.

Conclusion

This study presents a comprehensive time-series analysis of the determinants of net migration in Jamaica between 1970 and 2024, employing both OLS and ARIMAX modelling techniques. The findings highlight the complex interplay between governance, violent crime, and economic development as key drivers of emigration. Governance emerged as the most influential short-term determinant, with regime changes significantly associated with immediate fluctuations in migration levels. This matter underscores the critical role of political stability, institutional effectiveness, and public trust in mitigating migration pressures.

Homicide rates, indicative of broader issues of insecurity and violence, also showed a consistent and statistically significant influence on migration. These results reflect a persistent reality in Jamaica, where perceptions of personal safety and public order significantly influence migration behaviour. The study affirms that high levels of violence not only threaten social cohesion but also accelerate human capital flight, particularly among the youth and skilled professionals.

Economic development, particularly as measured by GDP per capita, demonstrated a more enduring impact on migration trends. The ARIMAX model revealed that improvements in economic conditions lead to a reduction in net emigration over time, validating the central premise of neoclassical migration theory. This matter underscores the importance of sustained economic growth policies that prioritise job creation, income generation, and poverty reduction as integral components of a comprehensive migration management strategy.

While unemployment and life expectancy were not statistically significant in this analysis, their exclusion does not negate their potential role in broader migratory behaviour. Instead, their insignificance may reflect the overwhelming influence of governance and security factors in the Jamaican context. Overall, this study contributes to migration scholarship by integrating macroeconomic, governance, and security variables within a robust methodological framework. The findings support the call for a multidimensional policy response—one that strengthens governance, curbs violence, and promotes inclusive economic development—as essential steps in addressing Jamaica's long-standing emigration challenge.

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Appendix 1

Table 1: Annual Net Migration and Suicide Rate in Jamaica, 1980-2024

Year	Net Migration	Governance	Homicide rate	Unemployment rate	Life Expectancy	GDP per capita (US\$)
1970	-23371	JLP	8.13	26.8	66.73	752
1971	-20322	JLP	7.63	27.5	67	812
1972	-17934	PNP	8.8	27.1	67.3	974
1973	-16822	PNP	11.51	24.3	67.61	974
1974	-16769	PNP	9.71	23.7	67.91	1196
1975	-17340	PNP	13.02	23.4	68.17	1421
1976	-18084	PNP	17.5	22.4	68.41	1456
1977	-18630	PNP	19.26	22.3	68.59	1578
1978	-18483	PNP	17.72	22.1	68.74	1271
1979	-17143	PNP	16.15	21.7	68.81	1153
1980	-15277	JLP	42.14	21.5	68.99	1256
1981	-13619	JLP	22.66	25.9	69.12	1378
1982	-12952	JLP	18.41	26.7	69.25	1497
1983	-14065	JLP	18.92	26.4	69.55	1615
1984	-17211	JLP	21.23	25.5	69.81	1041
1985	-21371	JLP	18.78	25	70.1	909
1986	-25339	JLP	19.22	23.7	70.45	1179
1987	-27958	JLP	18.8	21	70.87	1398
1988	-28247	JLP	17.57	19.1	71.16	1625
1989	-27049	PNP	18.48	15.2	71.51	1855
1990	-25085	PNP	22.56	15.7	71.71	1921
1991	-23014	PNP	23.13	15.4	71.79	1692
1992	-21426	PNP	25.69	15.7	71.82	1457
1993	-20731	PNP	26.82	16.3	71.76	1991
1994	-19960	PNP	28.06	15.4	71.62	1995
1995	-19092	PNP	31.35	16.2	71.49	2330
1996	-18285	PNP	36.77	16	71.33	2591
1997	-17756	PNP	40.82	16.5	71.22	2940
1998	-17623	PNP	37.17	15.5	71.17	3410
1999	-17542	PNP	32.88	15.7	71.19	3417
2000	-17498	PNP	34.26	15.5	71.28	3448
2001	-17466	PNP	45.74	15	71.29	3448
2002	-17428	PNP	39.96	14.2	71.48	3707
2003	-17380	PNP	37.13	11.8	71.59	3581
2004	-17256	PNP	55.76	12.2	71.54	3854
2005	-17071	PNP	63.16	11.2	71.49	4238

2006	-16840	PNP	50.32	10.3	71.4	4487
2007	-16588	PNP	58.82	9.9	71.41	4817
2008	-16191	JLP	59.58	10.6	71.5	5119
2009	-14941	JLP	62.32	11.4	71.72	4489
2010	-13248	JLP	52.98	12.4	71.98	4902
2011	-11577	JLP	41.67	12.4	72.25	5332
2012	-10498	PNP	40.44	13.9	72.41	5446
2013	-10335	PNP	44.2	15.3	72.44	5254
2014	-10335	PNP	36.64	13.8	72.36	5119
2015	-10335	PNP	45	13.5	72.21	5138
2016	-10335	JLP	50	13.2	72.05	5,009.79
2017	-10335	JLP	55.7	11.7	71.88	5,259.31
2018	-10335	JLP	47	9.1	71.61	5,578.10
2019	-10335	JLP	47.4	7.7	71.53	5,607.24
2020	0	JLP	46.5	10.2	71.45	4,879.44
2021	-4665	JLP	49.4	8.36	69.09	5,165.34
2022	-10003	JLP	53.1	6.08	71.48	6,022.15
2023	-10003	JLP	49.3	4.4	71.48	6,839.73
2024	-10506	JLP	40.1	4.9	75	7,298.78