Unraveling Egypt's Net Migration Patterns: A Time Series Economical and Sociopolitical Analysis

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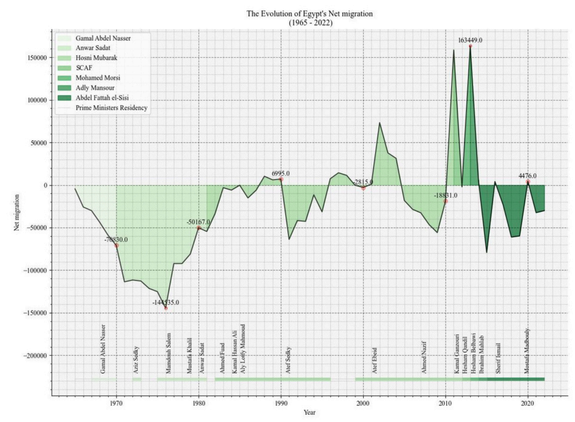
Abstract

Don't forget the names of the research authors and co-authors. Use full names and include any titles or honorifics the authors may have, as well as the university or research institution theyThis study examines Egypt's net migration patterns from 1962 to 2021, exploring the socioeconomic and political factors that influenced these trends. Through a time series analysis, it highlights significant fluctuations in net migration rates during the tenures of various presidents, from Gamal Abdel Nasser to Abdel Fattah el-Sisi. The research identifies negative net migration under Nasser and Sadat, variability under Mubarak, a positive spike during Morsi's presidency, and ongoing instability under el-Sisi. The study also correlates migration patterns with economic indicators such as GDP and population growth, revealing significant relationships. It addresses challenges in identifying specific causes for certain migration trends, emphasizing the complex nature of migration dynamics in Egypt. This analysis provides insights into how historical events and policy decisions have shaped migration in Egypt.

Introduction

Migration is a pivotal force shaping societies globally, with Egypt witnessing substantial movement both inwards and outwards. This study delves into Egypt's net migration patterns from 1965 to 2022, scrutinizing correlations with economic indicators like GDP, inflation, and exchange rates. Findings indicate moderate positive correlation with population and negative correlation with GDP growth. We hypothesize on the influence of regional conflicts and internal instabilities on migration trends. Employing machine learning techniques, we aim to predict net migration based on economic indicators, offering insights into Egypt's socio-economic dynamics.



Methodology

We utilized the World Bank Open Data platform to analyze Egypt's net migration patterns using various economic and demographic variables, ensuring data consistency. After cleaning the data via linear interpolation, we tested several regression models, including Linear Regression, Decision Tree, Random Forest, Gradient Boosting, and XGBoost. Initial R^2 scores indicated Linear Regression performed best. Feature engineering and selection improved model performance, with Gradient Boosting and XGBoost models showing the highest R^2 scores after fine-tuning. Despite improvements, achieving high R^2 scores in economic models remains challenging due to the complexity of human behavior.

Results

This study aimed to predict Egypt's net migration using supervised machine learning with economic indicators. The null hypothesis suggested no predictability ($R^2 = 0$), while the alternative hypothesis posited an $R^2 > 0.35$. Employing Gradient Boosting Regressor and XGBoost algorithms, promising cross-validation R^2 scores of 0.5303 and 0.4944 were achieved, respectively.

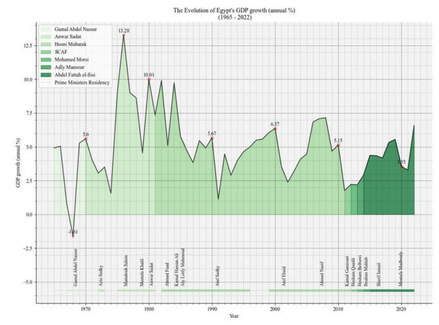
During testing, Gradient Boosting Regressor yielded an R^2 of 0.3919, and XGBoost produced 0.3544. Though lower than cross-validation, both surpassed the threshold, indicating predictability. Model performance graphs showed close alignment between predicted and observed values, affirming model efficacy.

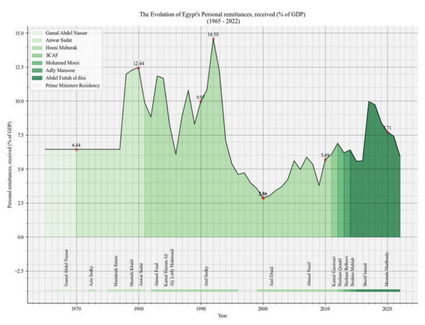
Analysis highlighted two engineered features' high correlation with net migration (FE 1: 0.5861, FE 2: 0.4308), reinforcing model validity. Overall, the results reject the null hypothesis, affirming the predictability of Egypt's net migration using supervised machine learning and economic indicators.

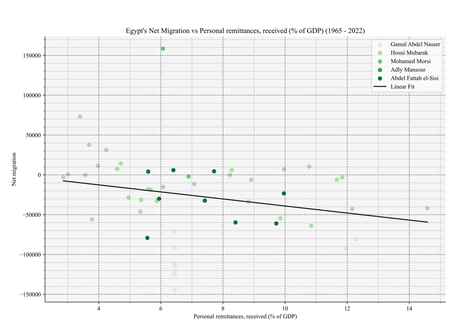
Discussion

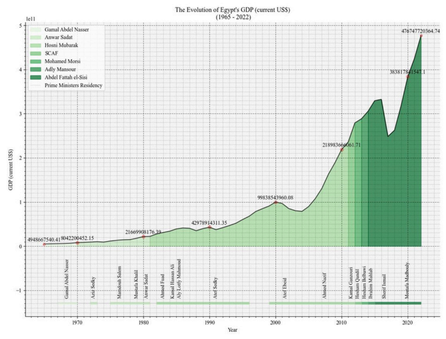
This study analyzed the correlation between Egypt's net migration and economic factors like population, GDP, and GDP growth from 1965 to 2022, finding weak to moderate statistically significant correlations. The analysis considered different presidential eras, noting how economic policies and sociopolitical events influenced migration patterns. For instance, under Gamal Abdel Nasser, economic struggles and the 1967 Six-Day War led to increased emigration. Anwar Sadat's Open-Door Economic Policy initially reduced emigration but later led to a skilled labor shortage. Hosni Mubarak's era saw fluctuating GDP per capita and rising corruption, culminating in the 2011 revolution, which spiked emigration. Mohamed Morsi's period experienced significant Coptic Christian emigration and an influx of Syrian and Sudanese refugees. Under Abdel Fattah El-Sisi, economic challenges and the COVID-19 pandemic affected migration trends. Limitations included difficulties in finding consistent data and identifying reasons behind some migration patterns.

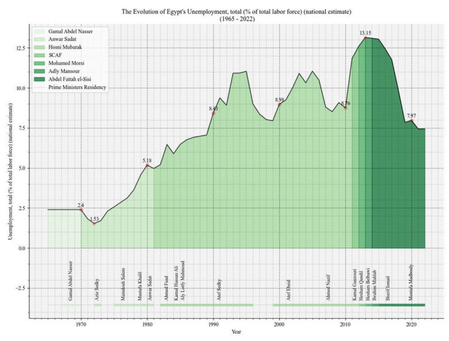
Visualizations

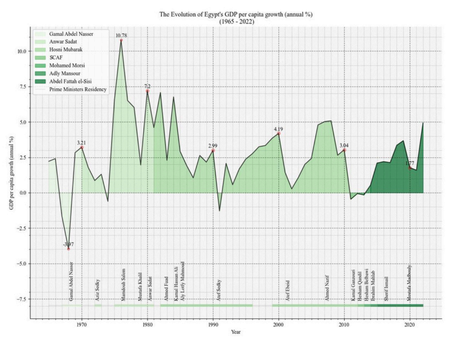


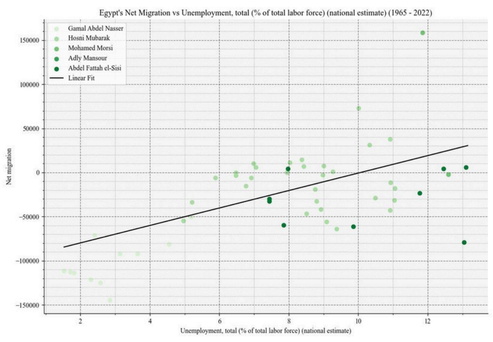












Conclusion

In conclusion, our analysis of Egypt's net migration patterns reveals nuanced correlations with economic and sociopolitical factors spanning six decades. From Nasser's era to the present, economic fluctuations, political unrest, and policy shifts have shaped migration trends. Each presidency brought distinct challenges and opportunities, influencing migration dynamics. Despite limitations in data and complexities in correlations, our study underscores the multifaceted nature of migration and the need for comprehensive analysis to inform policymaking and address socio-economic concerns.