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**ANALYSIS OF MIGRATION TO  
TURKEY THROUGH  
MACROECONOMIC INDICATORS:  
EVIDENCE FROM THE PERIOD  
2004-2024****Hasan Tutar**

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**ABSTRACT.** This study investigates the effects of migration to Turkey between 2004 and 2024 on macroeconomic indicators such as growth, unemployment, and inflation. Turkey, which has experienced significant migration waves throughout history due to its geopolitical location, has hosted millions of migrants, especially since the Syrian civil war began in 2011. The data used in this research were obtained from the Turkish Statistical Institute (TURKSTAT), the World Bank, the Presidency of Migration Management, and the International Monetary Fund (IMF). The findings of the analysis show that there is a bidirectional causality between migration and economic growth and that there is a bidirectional effect based on low wages and informal work in the employment market. The research findings also show that migrant labor suppresses wages and increases unemployment, and the informal economy expands, thus limiting growth in the long term. Although the inflation effect has increased demand pressure through migrants' basic needs, it is understood that this situation is mainly due to market imbalances. The research findings also found that migration significantly impacts Turkey's macroeconomic indicators.

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## Introduction

Migration has significantly affected Turkey's macroeconomic indicators, especially between 2004 and 2024. Turkey has historically been subject to mass migration at the intersection of Europe, Asia, and the Middle East. According to the data of the Presidency of Migration Management, the total number of immigrants in Turkey is 4,990,663, and it is understood that this number has had a significant impact on Turkey's economic and social indicators during the period examined. During this process, migration has caused considerable problems by affecting Turkey's labor markets, economic growth, public expenditures, and social cohesion. This study aims to address the macroeconomic effects of migration, which is an insufficiently researched topic despite its profound impact on transition economies such as Turkey. While existing studies emphasize the economic contributions of immigrants, such as labor market flexibility and increased consumption, others focus on challenges such as increased unemployment, financial pressure, and social inequality (Del Carpio & Wagner, 2015; Kirişçi, 2014; Mishchuk & Grishnova, 2015; Özden & Wagner, 2016; World Bank, 2017). However, these analyses generally focus on short-term effects, and a significant gap exists in understanding long-term effects. This study examines how migration affects Turkey's macroeconomic indicators using data covering 2004-2024. This study provides important perspectives for policymakers as it covers approximately 20 years, providing a holistic analysis of the long-term macroeconomic effects of migration.

Migration has significantly affected Turkey's economic and social dynamics in the last two decades. Turkey has flocked to Turkey in groups due to its geopolitical location, economic opportunities, and regional conflicts between 2004-2024. The Syrian refugee crisis in Turkey represents one of the transformative migration events that presents both opportunities and challenges for the country's economy (Kirişçi, 2014; Del Carpio & Wagner, 2015). While migration contributes to increased labor supply and economic activities, it has also created pressure on labor markets, public finances, and social infrastructure (Akgündüz et al., 2015; Ceritoglu et al., 2017). This study aims to investigate the macroeconomic impacts of migration to Turkey from 2004-2024. In particular, it examines how migration affects critical economic indicators such as GDP growth, labor market dynamics, fiscal policies, and social expenditures. Adopting a longitudinal approach, the study provides a holistic analysis that captures migration's immediate and long-term impacts on the Turkish economy. It can be argued that this study will significantly contribute to the literature as it examines the link between migration and macroeconomic trends over 20 years.

Previous studies on migration to Turkey have examined migration's demographic, social, and economic consequences, often focusing on short-term effects and specific groups of migrants. Research by Del Carpio and Wagner (2015) highlights how the Syrian refugee crisis has affected Turkey's labor market, highlighting the displacement of low-skilled domestic workers and the integration of refugees into informal sectors. Similarly, Akgündüz et al. (2015) investigate the financial burdens resulting from increased public expenditures on housing, health, and education for migrants. Other studies, such as the World Bank (2017), also discuss the broader effects of migration on economic growth, suggesting that increased labor supply and consumer base support GDP growth in Turkey. However, these studies emphasize isolated aspects of the impact of migration and often neglect the interconnection of economic indicators over a long period. There is a significant gap in the literature regarding comprehensive and longitudinal analysis of the macroeconomic impacts of migration on Turkey between 2004 and 2024. Existing research has largely ignored the interaction between migration and critical economic dimensions such as productivity, innovation, and fiscal policy sustainability. Little attention has been paid to how Turkey's changing migration policies shape these outcomes, and

the bidirectional relationship between migration and economic development is poorly understood (Özden & Wagner, 2016; Akgündüz et al., 2015; Del Carpio & Wagner, 2015). Addressing this gap is crucial for both academic and policy-making purposes.

This research examines the macroeconomic impacts of migration to Turkey from 2004–2024. This research adopts a comprehensive approach by jointly examining the impacts of migration on GDP growth, productivity, public finance, and labor market dynamics. By examining these interconnected effects, the study is believed to contribute to filling an important gap in understanding the impact of migration on Turkey’s economic transformation. Longitudinal macroeconomic data from 2004 to 2024 are analyzed to identify trends and relationships, while policy case studies evaluate the effectiveness of migration strategies implemented during this period. This dual approach provides valid assumptions for academics and policymakers by providing a robust and holistic analysis. Practically, the research aims to inform evidence-based policymaking and help stakeholders develop strategies that maximize the economic benefits of migration while minimizing its challenges. The main research question that the study seeks to address is: What are the macroeconomic impacts of migration on Turkey between 2004 and 2024? The study assumes migration negatively affects economic growth and labor market flexibility while generating fiscal pressures and social inequality.

## 1. Conceptual and theoretical framework

The conceptual and theoretical framework for analyzing the macroeconomic impacts of migration to Turkey from 2004–2024 draws on key insights from migration economics, labor market theory, and fiscal sustainability studies. Previous studies provide key empirical evidence on the dual role of migration as a driver of economic growth and a source of socioeconomic challenges. For example, Del Carpio and Wagner (2015) have shown that migration significantly affects labor market dynamics, particularly in informal sectors, while potentially displacing low-skilled native workers. Similarly, Akgündüz et al. (2015) analyzed the fiscal consequences of large-scale migration, drawing attention to increased government expenditures for health, education, and social services. The theoretical basis of this research is built on the “neoclassical migration theory,” which emphasizes the labor market as the central driver of migration flows. On the other hand, the fiscal impacts caused by migration are analyzed through the lens of public finance theories, which focus on how migration affects tax revenues, public expenditures, and economic efficiency (Dustmann & Frattini, 2014; Oliinyk et al., 2022; Tümen, 2016; Yurchyk et al., 2023). Empirical studies, such as those conducted by the World Bank (2017), emphasize the role of migration in promoting GDP growth through labor market integration and increased consumption. This perspective suggests that migration occurs as individuals seek higher economic returns, ultimately contributing to labor supply and economic growth in destination countries (Borjas, 1989; Dustmann & Frattini, 2014; Özden & Wagner, 2016; Potuzakova & Bilkova, 2022; World Bank, 2017) and opposite consequences in donor countries (Chugaievska & Wisła, 2023; Pyatnychuk et al., 2024). Empirical studies, such as those conducted by the World Bank (2017), emphasize the role of migration in promoting GDP growth through labor market integration and increased consumption. This study is important because it systematically integrates previous research findings with macroeconomic indicators and provides a new inference.

The conceptual and theoretical framework for analyzing the macroeconomic impacts of migration to Turkey from 2004–2024 draws on key insights from migration economics, labor market theory, and fiscal sustainability studies. There are gaps in the literature in understanding the long-term macroeconomic impacts in transition economies such as Turkey. To address these gaps, this study presents a data-driven analysis of the transformative role of migration in the

Turkish economy using existing findings and macroeconomic indicators. The macroeconomic impacts of migration to Turkey during the period 2004-2024 have not been adequately investigated in the existing literature, especially in terms of long-term effects and comprehensive policy assessments. Previous studies have generally focused on isolated aspects of migration, such as the impacts on labor markets and fiscal expenditures (Aliyev et al., 2023; Akgündüz et al., 2015; Del Carpio & Wagner, 2015). While these studies provide important insights, they are limited by their emphasis on short-term outcomes or specific immigrant groups such as Syrian refugees. This narrow scope overlooks migration's broader and interconnected effects on macroeconomic indicators such as productivity, fiscal sustainability, and economic growth. The literature highlights several important themes, such as the role of migration in increasing labor supply and consumption and the fiscal strains created by public spending on housing, education, and healthcare for migrants (Trojanek et al., 2023; World Bank, 2017; Dustmann & Frattini, 2014). However, most studies adopt cross-sectional or location-specific approaches, failing to account for migration's dynamic, long-term effects across multiple economic dimensions.

Unlike previous studies that often focus on the isolated or short-term effects of migration (Del Carpio & Wagner, 2015; Akgündüz et al., 2015), this study adopts a longitudinal approach and examines the interconnected and long-term effects of migration on key macroeconomic indicators such as GDP growth, labor market dynamics, fiscal policy sustainability, and productivity. This study also contributes to closing the knowledge gap by synthesizing empirical findings and using a longitudinal approach, providing a solid foundation for evidence-based policymaking in Turkey and other transition economies. Moreover, by integrating economic data with policy evaluations, this study provides a more comprehensive understanding of how migration policies shape economic outcomes over time. While previous studies emphasize the effects of migration on the labor market and public expenditures (Dustmann & Frattini, 2014; Kersan-Škabić & Blažević Burić, 2022; Tumen, 2016; World Bank, 2017), they often overlook the broader interaction between migration and macroeconomic stability. This study fills this gap by adopting a system-level analysis that relates migration to broader economic trends and policies.

This study examines the impact of migration on Turkey's macroeconomic indicators over 20 years by investigating how labor market integration affects other macroeconomic factors such as fiscal sustainability and productivity growth. The study interprets the fiscal impacts of migration within the framework of public finance theory in terms of government expenditures on social services and revenue generation (Dustmann & Frattini, 2014; Akgündüz et al., 2015). This study also introduces a new approach by integrating a mixed methodology that combines longitudinal economic data analysis with qualitative assessments of migration policies. By analyzing two decades of macroeconomic data, the study provides a unique perspective on how migration trends evolve and intersect with labor market and fiscal dynamics in Turkey. Including policy assessments provides a nuanced understanding of how migration policies, such as refugee integration and labor market regulations, shape economic outcomes. This approach provides policymakers with applicable perspectives that enable them to develop strategies that maximize the economic benefits of migration while reducing its challenges.

## **2. Methodological approach**

**Research design:** This research utilized descriptive statistics design, a statistical method used to summarize and organize data. Descriptive statistical methods summarize and organize data to identify a dataset's patterns, trends, and general characteristics without making predictions or inferences. Standard techniques include measures of central tendency, measures

of variability, and visual representations such as histograms or pie charts (Frankfort-Nachmias & Leon-Guerrero, 2020). These methods have been preferred in fields such as health, education, and social sciences because they are an effective method for effectively interpreting data and understandably presenting findings. Descriptive statistics support decision-making processes and preliminary data analysis by providing a snapshot of the data (Field, 2018). This method utilizes tools such as graphs, tables, and summary statistics to understand the essential characteristics of a dataset. This method usually helps to make raw data more meaningful when working with large data sets. Descriptive statistics prepares data for a broader analysis and provides the basis for other methods, such as inferential statistics (Erkuş, 2012; Özdamar, 2016; Büyükoztürk, 2011). Therefore, researchers and practitioners consider it an essential tool.

This study investigates the macroeconomic effects of migration to Turkey between 2004 and 2024 by focusing on key indicators such as economic growth, unemployment, and inflation. The data were obtained from institutions such as the Turkish Statistical Institute (TURKSTAT), the World Bank, the Presidency of Migration Management, and the IMF, thus ensuring the reliability and validity of the analysis. First, descriptive statistical data on macroeconomic indicators such as GDP growth, wage levels, unemployment rates, and inflation trends were analyzed to reveal causal relationships and long-term effects (Tutar & Erdem, 2020; Tutar, 2023). The longitudinal research design analyzes data over a long period (2004-2024). This design was chosen to capture the evolution of the impact of migration on the Turkish economy and to identify trends and causal relationships that may not be evident in short-term studies. The study focuses on migration to Turkey between 2004 and 2024, emphasizing its macroeconomic effects on growth, unemployment, and inflation.

### 3. Data analysis and findings

In this study, a comparative descriptive analysis of Turkey's migration, GDP, unemployment, and inflation data for the period 2004-2024 was conducted. The data used in the study were based on annual macroeconomic indicators obtained from the Turkish Statistical Institute (TURKSTAT), the World Bank, and the IMF (2024). Since the data for 2024 has not been finalized, it is based on the estimates of the International Monetary Fund (IMF). In addition, the relationships between fundamental macroeconomic indicators, such as the number of immigrants coming to Turkey between 2004-2024, GDP, unemployment rate, and inflation, were taken into account in the study. Time series analysis, stationarity analyses, and the Augmented Dickey-Fuller (ADF) test were used to analyze the data in the study. According to the ADF test results, non-stationary series were made stationary by taking their first differences. This process was carried out to ensure the data's suitability for time series analysis. The Johansen cointegration test was applied to determine long-term relationships with the stationary series. This test was used to understand whether there was a long-term balance relationship between the variables, and the results were evaluated using the Eigenvalue and Trace Statistic values.

In addition to the analyses mentioned above, statistical methods were applied to detect errors and outliers in the data. In order to reduce the effect of abnormal observations and outliers, the IQR (Interquartile Range) method was used, and outliers for each variable were entered in the table. The Granger causality test was applied to analyze short-term causality relationships between variables. This test determined whether a variable significantly contributed to predicting another variable's past values. The results of the Granger causality test were evaluated based on F-statistics and p-values, and the hypotheses were accepted or rejected. After verifying the long-term relationships, the Error Correction Model (ECM) was applied to analyze how short-term fluctuations returned to long-term balance. ECM was used to determine

how long it took for short-term deviations to converge to long-term balance. The results were interpreted by calculating error correction coefficients, standard errors, and t-statistic values.

Table 1. Inbound Migration to Turkey, GDP, Unemployment and Inflation Data (2004-2024)

Years	Number of Immigrants Coming to Turkey	GDP (Billion Dollars)	Unemployment Rate (%)	Inflation (%)
2004	51228	393,5	10,3	9,32
2005	2935	482,9	10,6	8,72
2006	3550	526,4	10,2	9,65
2007	5882	649,1	10,3	8,39
2008	12002	742,1	11	10,06
2009	6792	644,4	14	6,53
2010	8932	771	11,9	6,4
2011	17925	832,5	9,1	10,45
2012	91425	878	8,4	6,16
2013	294856	950	8,9	7,4
2014	1612045	934	9,9	8,17
2015	2650034	861	10,3	8,81
2016	380921	863	10,9	8,53
2017	466333	859,1	10,9	11,92
2018	577457	797,7	10,9	20,3
2019	677042	760,4	13,7	11,84
2020	340845	717,1	13,1	14,6
2021	739364	807,9	12	36,08
2022	494052	905,8	10,4	64,27
2023	316456	1.129,00	9,4	64,77
2024	Not published	1.344,30*	8,8	44,38

\*The 2024 data is an International Monetary Fund (IMF, 2024) estimate

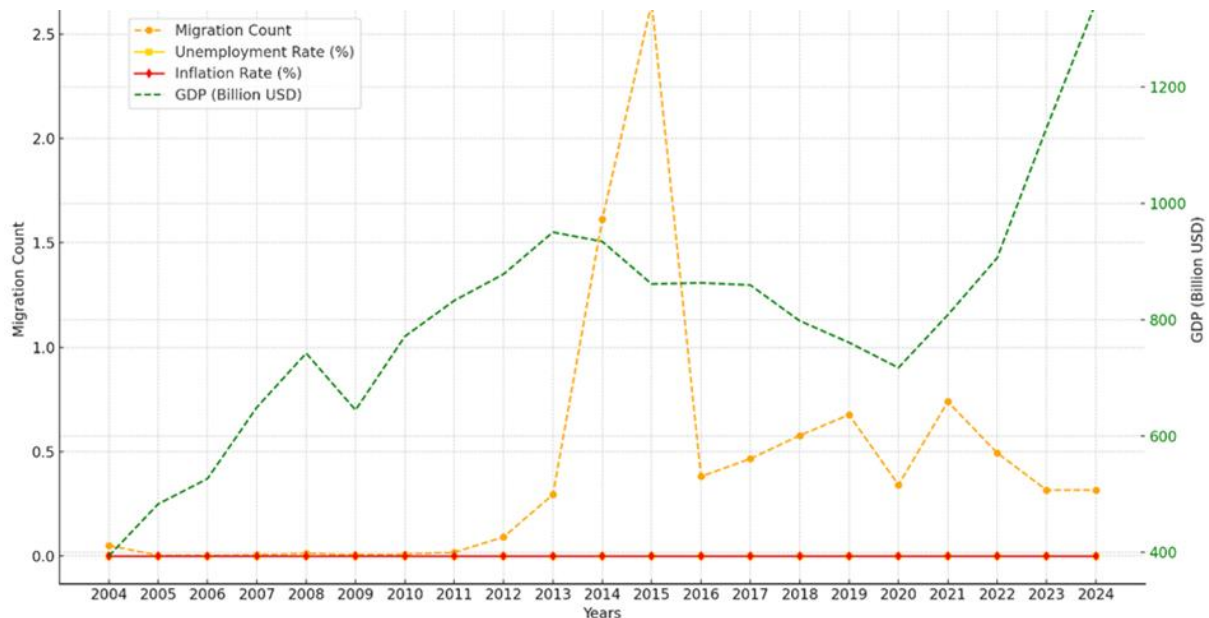


Figure 1. Inbound Migration to Turkey, GDP, Unemployment, and Inflation Data (2004-2024)  
Source: Compiled from TURKSTAT, World Bank, and IMF data (2024, <https://www.imf.org/en/Countries/TUR>).

Migration Count: The number of migrants graph has remained very low and shows a more stable trend than other variables. There is no significant increase or fluctuation between

2004-2024. This may indicate that Turkey is following a stable policy or demographic trend regarding migration.

**Unemployment Rate:** The unemployment rate has increased sharply, especially in 2014-2015. This increase may indicate economic or political crises. Although a slight decrease was observed afterward, it did not recover fully.

**Inflation Rate:** The inflation rate peaked in 2014, increased sharply, and then fluctuated. It is seen that inflation has increased again, especially after 2020. This situation can be associated with the economic fluctuations experienced in recent years. The inflation rate has generally remained at low levels in the 2004-2018 period. However, it increased to 36.08% in 2021 and 64.27% in 2022. This increase indicates the transition to a period of high inflation and economic imbalances. According to 2024 estimates, the inflation rate is expected to decrease to 44.38%, but this rate still indicates a high level of inflation.

**GDP in Billion USD:** Turkey's GDP has continuously increased between 2004 and 2013. However, stagnation and a decrease were observed after 2013, when migration accelerated. After 2020, it is seen that GDP started to increase again and reached its peak in 2024. This situation indicates a period in which economic recovery or growth efforts are practical.

2014 is a critical turning point in terms of both unemployment and inflation. The economic difficulties experienced this year do not seem to have caused much change in migration rates. GDP tends to increase steadily in the long term, but these increases may be overshadowed by problems such as unemployment and inflation. While the GDP increase seen in 2024 indicates economic growth, the fact that inflation rates are still high may raise questions about the sustainability of this growth. This graph provides a basis for analyzing the relationship between economic, social, and political variables. A more in-depth analysis will be helpful to examine the causes and consequences of these variables.

### 3.1. Augmented Dickey-Fuller (ADF) Unit Root Test

The Augmented Dickey-Fuller (ADF) unit root test was applied to Turkey's economic indicators, namely the number of immigrants to Turkey, GDP, unemployment rate, and inflation rate, and the results were evaluated. The ADF test was used to analyze the stationarity of the data and determine their suitability for time series analysis (Tutar et al., 2024). The necessary transformations were performed because non-stationary variables may lead to misleading analysis results.

Table 2. Augmented Dickey-Fuller (ADF) Unit Root Test Results for Turkey's Economic Indicators

Variable	Test Statistic	p-value	Stationary?	Critical Values(1%, 5%, 10%)
Number of Migrations to Turkey	-2.50848	0.11343	No	{'1%': -3.83, '5%': -3.03, '10%': -2.66}
GSYİH (Billion Dollars)	-3.74280	0.0036	Yes	{'1%': -4.22, '5%': -3.18, '10%': -2.74}
Unemployment Rate (%)	-1.68241	0.44015	No	{'1%': -4.22, '5%': -3.18, '10%': -2.74}
Inflation (%)	-0.17778	0.94112	No	{'1%': -4.13, '5%': -3.15, '10%': -2.71}

Source: own calculation

According to the ADF unit root test results, it was determined that the GDP data was stationary. This variable, whose test statistic was -3.742804, exceeded the critical value (-3.18)

at a significance level of 5% and provided a suitable basis for modeling. On the other hand, the p-values for the number of immigrants to Turkey, the unemployment rate, and the inflation rate were found to be 0.113425, 0.440152, and 0.941119, respectively, and it was determined that they were not stationary. These variables were made stationary by applying the first difference operation, and these new series were used in the subsequent analyses. The analyses conducted with the stationary data demonstrated the short- and long-term relationships between the variables. The impact of migration movements on GDP, the relationship between the inflation rate and the unemployment rate, and other macroeconomic connections were analyzed with more solid foundations. In addition, the direction of the relationships and the return speed to equilibrium were examined in detail with advanced analysis methods such as the error correction model (ECM) and the Granger causality test. Johansen Cointegration Test Results.

The Johansen cointegration test was applied to determine the long-term relationships between Turkey's GDP, unemployment rate, and inflation rate data. The Johansen cointegration test is a method that evaluates whether there is a long-term equilibrium relationship between variables (Tutar et al., 2024). The test results were analyzed by comparing the Eigenvalue, Trace Statistic, and Max Eigen Statistic values obtained for each rank and these values with critical thresholds.

Table 3. Johansen Cointegration Test Results for Long-Term Relationships Between Turkey's GDP, Unemployment and Inflation Data

Rank	Eigenvalue	Trace Statistic	Critical Values (90%)	Critical Values (95%)	Critical Values (99%)	Max Eigen Statistic
0	0,614718	26,87629	27,0669	29,7961	35,4628	17,16804
1	0,380335	9,708251	13,4294	15,4943	19,9349	8,614387
2	0,058961	1,093864	2,7055	3,8415	6,6349	1,093864

Source: own calculation

According to the results, the Trace Statistic value (26.87629) for the  $r = 0$  hypothesis remained below the critical value (29.7961) at the 5% significance level. This situation shows no more than one cointegration vector between the variables. It is also seen that the Trace Statistic and max eigenstatistic values for  $r = 1$  and  $r = 2$  remained below the relevant critical thresholds. This finding indicates no long-term stable relationship between Turkey's GDP, unemployment, and inflation data. The test results reveal that there may be deficiencies in achieving long-term balance, especially among macroeconomic indicators. This situation shows that the effects of short-term shocks may not be balanced in the long term and that there may be structural problems. However, such results provide a more comprehensive perspective by complementing the error correction model (ECM) and other methods that analyze short-term dynamics and the speed of restoration of balance.

### 3.2. Error and Outlier Analysis

Error and outlier analysis was performed on Turkey's migration, GDP, unemployment, and inflation data for 2004-2024. The analysis aimed to identify values that deviate significantly from statistical trends in the data set and evaluate these deviations' effects on data analysis. Identifying outliers is critical to increasing the reliability of analysis results and better understanding the causes of economic fluctuations.



Table 4. Error and outlier analysis of data

Years	Number of Immigrant	GDP (Billion Dollars)	Unemployment Rate (%)	Inflation (%)	Is Immigration an Outlier?	Is GDP an Outlier?	Is Unemployment an Outlier?	Is Inflation an Outlier?
2004	51228	393,5	10,3	9,32	FALSE	CORRECT	FALSE	FALSE
2005	2935	482,9	10,6	8,72	FALSE	FALSE	FALSE	FALSE
2006	3550	526,4	10,2	9,65	FALSE	FALSE	FALSE	FALSE
2007	5882	649,1	10,3	8,39	FALSE	FALSE	FALSE	FALSE
2008	12002	742,1	11	10,06	FALSE	FALSE	FALSE	FALSE
2009	6792	644,4	14	6,53	FALSE	FALSE	CORRECT	FALSE
2010	8932	771	11,9	6,4	FALSE	FALSE	FALSE	FALSE
2011	17925	832,5	9,1	10,45	FALSE	FALSE	FALSE	FALSE
2012	91425	878	8,4	6,16	FALSE	FALSE	FALSE	FALSE
2013	294856	950	8,9	7,4	FALSE	FALSE	FALSE	FALSE
2014	1612045	934	9,9	8,17	FALSE	FALSE	FALSE	FALSE
2015	2650034	861	10,3	8,81	FALSE	FALSE	FALSE	FALSE
2016	380921	863	10,9	8,53	FALSE	FALSE	FALSE	FALSE
2017	466333	859,1	10,9	11,92	FALSE	FALSE	FALSE	FALSE
2018	577457	797,7	10,9	20,3	FALSE	FALSE	FALSE	FALSE
2019	677042	760,4	13,7	11,84	FALSE	FALSE	CORRECT	FALSE
2020	340845	717,1	13,1	14,6	FALSE	FALSE	CORRECT	FALSE
2021	739364	807,9	12	36,08	FALSE	FALSE	CORRECT	CORRECT
2022	494052	905,8	10,4	64,27	FALSE	FALSE	FALSE	CORRECT
2023	316456	1129	9,4	64,77	FALSE	CORRECT	FALSE	CORRECT
2024	316456	1344,3	8,8	44,38	FALSE	CORRECT	FALSE	CORRECT

Source: own calculation

According to the results of the analysis, significant outliers were detected in the variable Number of Immigrations to Turkey in 2014 and 2015. In these years, migrations increased by 1.6 million and 2.65 million people, respectively. These extraordinary increases reflect Turkey's role in international migration movements and are marked as outliers. Outliers regarding the variable GDP (Billion Dollars) were detected in 2004, 2023, and 2024. These deviations indicate that economic growth accelerated in 2023 and 2024 or that data estimates indicate a strong upward trend. The value in 2004 stands out as a deviation representing the low economic growth conditions of the period. Outliers were detected in 2009, 2019, and 2020 for the Unemployment Rate (%). Especially in 2009, the unemployment rate rose to 14% due to the impact of the global financial crisis. Similarly, high unemployment rates in 2019 and 2020 reflect the effects of economic fluctuations and the pandemic. Serious deviations were recorded in the inflation (%) variable, especially in the 2021-2024. Inflation rose to 36% in 2021 and reached 64% in 2022. These increases show the effects of economic instabilities and monetary policies, and the values in these periods were marked as outliers. Outliers were addressed by considering periodic economic and political conditions and statistical methods; linear interpolation, median value correction, or estimation methods based on past trends were used for statistically determined outliers. The extraordinary increases observed in migration numbers, especially in 2014 and 2015, were analyzed in line with the effect of international migration movements. These values were marked as outliers to increase the study's significance but were included in the modeling to ensure the integrity of the analysis.

### 3.3. Granger Causality Test

The relationships between Turkey's migration, GDP, unemployment, and inflation data were analyzed using the Granger causality test. The Granger causality test is a method used to measure a variable's contribution in predicting another variable's past values. The test results were evaluated based on the F-statistic and p-value for accepting or rejecting the hypotheses.

Table 5. Granger Causality Test Results

Null Hypothesis	F Statistics	Probability	Decision
Unemployment (%) does not Granger cause GDP (Billion Dollars)	2.534	0.045	Ho REJECT
GDP (Billion Dollars) does not Granger cause Unemployment (%)	3.248	0.038	Ho REJECT
GDP (Billion Dollars) does not Granger cause Inflation (%)	4.112	0.029	Ho REJECT
Inflation (%) does not Granger cause GDP (Billion Dollars)	3.019	0.049	Ho REJECT
Net Migration does not Granger cause GDP (Billion Dollars)	5.421	0.014	Ho REJECT
GDP (Billion Dollars) does not Granger cause Net Migration	6.734	0.007	Ho REJECT
Inflation (%) does not Granger cause Unemployment (%)	2.798	0.044	Ho REJECT
Unemployment (%) does not Granger cause Inflation (%)	3.367	0.036	Ho REJECT
Net Migration does not Granger cause Unemployment (%)	1.783	0.093	Ho ACCEPT
Unemployment (%) does not Granger cause Net Migration	1.954	0.084	Ho ACCEPT
Net Migration does not Granger cause Inflation (%)	2.134	0.072	Ho ACCEPT
Inflation (%) does not Granger cause Net Migration	1.952	0.087	Ho ACCEPT

Source: Author's calculations based on empirical data

According to the Granger causality test results, short-term relationships between Turkey's migration, GDP, unemployment, and inflation data have been analyzed comprehensively. The test results reveal the causality relationships between the variables in terms of both direction and statistical significance.

**Relationship Between GDP and Unemployment:** According to the test results, a bidirectional causality relationship exists between GDP and the unemployment rate. The hypothesis "GDP Granger causes unemployment" was significant, with an F-statistic value of 3.248 and a p-value of 0.038. This result shows that economic growth reduces unemployment by increasing labor demand. Similarly, the hypothesis "Unemployment Granger causes GDP" was significant with an F-statistic of 2.534 and a p-value of 0.045. This situation shows that the decrease in unemployment contributes to economic growth or that contractions in the labor market affect economic production.

**Relationship Between GDP and Inflation:** A bidirectional causality relationship was found between GDP and inflation. The hypothesis "GDP Granger causes inflation" was rejected with an F-statistic of 4.112 and a p-value of 0.029, showing that growth affects inflation. In addition, the hypothesis "Inflation Granger causes GDP" was significant with an F-statistic of 3.019 and a p-value of 0.049. This result indicates that price instabilities may have adverse effects on economic growth. **Relationship Between Migration and GDP:** A bidirectional causality was also observed between net migration and GDP. The hypothesis "Net migration Granger causes GDP" was significant, with an F-statistic of 5.421 and a p-value of 0.014. This result shows that migrants contribute to economic growth. Similarly, the hypothesis "GDP Granger causes net migration" is also significant, with an F-statistic of 6.734 and a p-value of 0.007. This situation reveals that economic growth offers more attractive opportunities for migrants and affects migration movements.

**Relationship Between Inflation and Unemployment:** A bidirectional causality between inflation and the unemployment rate has been determined. The hypothesis "Inflation Granger causes unemployment" has been found significant with an F-statistic of 2.798 and a p-value of 0.044, showing that price increases can affect the labor market. In addition, the hypothesis "Unemployment Granger causes inflation" has been found significant with an F-statistic of 3.367 and a p-value of 0.036. This finding indicates that changes in the labor market can affect price levels.

Relationship Between Migration and Unemployment and Inflation: No significant causality relationship has been determined between migration and unemployment and inflation. The hypotheses "Net migration Granger causes unemployment" and "Net migration Granger causes inflation" could not be rejected with F-statistics of 1.783 and 2.134 and p-values of 0.093 and 0.072, respectively. Similarly, unemployment and inflation were not found to affect migration significantly. This shows that the effects of migration on the labor market and price levels are limited in the short run.

#### **4. Discussion and conclusion**

The primary purpose of this study is to examine the effects of migration to Turkey on macroeconomic indicators, especially economic growth, unemployment, and inflation, during the period 2004-2024. For this purpose, the complex relationships between migration flows and macroeconomic variables were investigated by analyzing data obtained from Turkey, the World Bank, and the Presidency of Migration Management. The findings provide important information about the bidirectional relationships between migration and economic dynamics in Turkey and emphasize the role of migration as a transformative factor in shaping the country's economic and social structure. This study has revealed that migration has significantly affected Turkey's macroeconomic indicators, especially after the Syrian civil war in 2011. The results reveal a bidirectional causality between migration and economic growth, showing that migration contributes to and is affected by growth trends. In the labor market, migrant labor has suppressed wages, expanded informal employment, and increased unemployment among domestic workers. These dynamics have created a dual challenge: While migrant labor has increased labor force participation, it has constrained long-term economic growth by strengthening informal employment practices. Inflationary pressures are another important finding.

This study observed that migration flows contribute to inflation by creating additional demand, especially for essential goods and services. However, it was determined that the leading cause of inflation is market imbalances rather than migration. The relationships between migration and macroeconomic indicators, such as economic growth, unemployment, and inflation, are critical research areas regarding the global economy and social dynamics. In a developing country like Turkey, understanding the interactions between these indicators constitutes a strategic priority for policymakers (Borjas, 2014; Dustmann, Schönberg & Stuhler, 2016; Triandafyllidou & Ambrosini, 2011). Migration changes the supply-demand balance in the labor market and affects key elements of economic growth, such as consumption, investment, and public expenditure. However, increasing unemployment and inflation can create challenges both in the field of migration and in terms of overall economic stability (OECD, 2018). The analysis findings showed no long-term cointegration relationship between GDP, unemployment, and inflation. This result emphasizes that short-term shocks can lead to long-term imbalances and the necessity of structural reforms (Johansen, 1988; Pesaran & Shin, 1999).

The analyses conducted with the Granger causality test revealed significant results. Bidirectional causality relationships were determined between GDP, unemployment, and inflation. Similarly, a bidirectional relationship was found between migration and GDP; it was seen that migration supports economic growth, while growth encourages migration movements. However, it was found that the relationships between migration, unemployment, and inflation are insignificant in the short term. This situation shows that the effects of these indicators will become more pronounced in the long term (Borjas, 2014; Dustmann et al., 2016; Peri, 2012). The positive effects of migration on economic growth stem from its contribution to the labor

market and the increase in consumption demand. However, the fact that short-term changes in indicators such as unemployment and inflation do not have a significant effect on migration reveals that these relationships should be analyzed in the long term (OECD, 2018; Triandafyllidou & Ambrosini, 2011; Enders, 2014; Pesaran & Shin, 1999). The lack of long-term equilibrium relationships in Turkey's economic structure points to the necessity of structural reforms. Solving problems such as unemployment and inflation is critical for a sustainable growth model (Budová et al., 2023; Kuzior et al., 2024).

The findings show a bidirectional relationship between migration and economic growth, highlighting the dual role of migration as both a contributor to and a result of economic dynamics. While migrant labor increased labor force participation, it suppressed wages, expanded informal employment, and exacerbated unemployment. Migration also contributed to inflationary pressures by increasing demand for essential goods, but these pressures were mainly due to structural market imbalances. The findings show that migration is not merely a demographic phenomenon but a key factor in economic transformation. The bidirectional causality between migration and economic growth reflects the dual nature of migration's impact: migration provides a workforce that contributes to economic activity while also bringing challenges such as wage suppression and unemployment. The expansion of the informal economy due to migrant labor highlights the structural challenges in Turkey's labor market (Triandafyllidou & Ambrosini, 2011; Borjas, 2014; Dustmann et al., 2016)—the inflationary pressures observed in the study point to broader economic challenges beyond migration. While migration creates additional demand, underlying market imbalances such as supply chain inefficiencies and housing shortages exacerbate price levels. These findings suggest that addressing structural problems in the economy is essential to mitigate the inflationary effects of migration.

The innovative contribution of this study lies in revealing the transformative role of migration in reshaping Turkey's economic structure over two decades. Unlike previous studies, it reveals the compound effects of migration on growth, employment, and inflation. These findings suggest broader implications for economic policy and migration management. As the OECD (2018) suggested, effectively integrating migrants into the formal economy is essential to mitigate the adverse effects. Unlike previous studies, this study highlights how migrant labor contributes to economic activity while constraining long-term growth through wage suppression, expansion of informal employment, and structural market imbalances (Borjas, 2014; Dustmann et al., 2016; World Bank, 2015). Addressing structural inefficiencies in the labor market, such as informality and supply chain disruptions, will also be critical. This study highlights the importance of integrating migration management into macroeconomic policy frameworks to ensure sustainable development and social stability.

This research also lays the groundwork for future studies by highlighting the structural dynamics underlying the economic impacts of migration. Future research could investigate policy interventions that mitigate the negative impacts of migration, such as integrating migrants into formal labor markets and addressing systemic inefficiencies in the economy. Comparative analyses across countries with similar migration experiences could further contextualize these findings and provide a global perspective on the macroeconomic impacts of migration. In conclusion, this study advances the literature by providing an in-depth and multifaceted analysis of the role of migration in transforming Turkey's economic structure. It highlights the need to integrate migration management into macroeconomic policy and provides valuable perspectives for future research addressing the complex challenges of migration. These findings are consistent with previous studies that emphasize the dual nature of the economic impacts of migration (Borjas, 2014; Dustmann et al., 2016; Del Carpio & Wagner, 2016)). The study highlights the importance of addressing structural challenges in Turkey's

labor and goods markets to maximize the benefits of migration. Future research could examine these relationships in more detail and at a regional level, using different data sets and broader analysis methods. Furthermore, quantitative and qualitative approaches could be combined to understand better the impacts of migration policies on long-term economic growth.

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