How Do Monetary And Fiscal Determinants Affect Inflation? Evidence From Panel Data Analysis

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Abstract: - The article evaluates the effects of key macroeconomic indicators on inflation using panel analysis. Based on data from 14 countries with varying income levels over 2000-2021, both the Fixed Effects Model and the Generalized Method of Moments (GMM) were applied and compared. The findings show that money supply has an insignificant effect on inflation. When monetary policy is ineffective, fiscal measures become more important. According to the GMM model, the minimum wage reduces inflation, while its version adjusted for purchasing power parity increases it. Unemployment strongly influences inflation, supporting the Phillips curve that links lower unemployment to higher inflation.

Key-Words: - inflation, minimum wage, economic growth, panel analysis, unemployment, money supply.

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1 Introduction

Economic theory explains the macroeconomic effects of inflation from various aspects. Among such effects, the effect of inflation on economic growth, income distribution, and social welfare is of particular importance. However, the effects vary from country to country in terms of speed and persistence. In all cases, inflation reduces real incomes and purchasing power. Population groups with fixed incomes, such as pensioners, public sector employees, and students, suffer the most from inflation. Inflation affects not only social welfare and income inequality but also indirectly influences health, [1], [2]. The impact of inflation on overall economic activity, investments, and financial markets is also significant. Inflation slows economic growth, [3], [4], leads to rising interest rates, and decreases the real value of money. Although nominal wages may increase during inflation, real purchasing power declines. Inflation also reduces

competitiveness in foreign markets and raises government expenditures as wages and social spending increase.

Hypotheses:

1. *An increase in the nominal minimum wage leads to higher inflation, regardless of income level.*
2. *An increase in the minimum wage adjusted for purchasing power parity (PPP) leads to higher inflation, regardless of income level.*
3. *An increase in broad money supply leads to higher inflation, regardless of income level.*
4. *There is a negative relationship between the unemployment rate and inflation.*

The study covers 14 countries with markedly different income levels, though some share common characteristics. Among these countries, Azerbaijan, Armenia, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, the Russian Federation, and Ukraine have long been part of the same union state, the centralized economy of the former Soviet Union. Bulgaria, the Czech Republic, Poland, and Romania, as members of the former socialist bloc, have had more rapid transition economies. The other two countries, Turkey and Israel, have more developed Middle Eastern economies compared to these countries. GDP per capita in the sample ranges from about $52,600 in Israel to $2,000 in the Kyrgyz Republic.

2 Literature Review: Theoretical Background & Empirical Evidence

The impact of the minimum wage (MW) on inflation is a widely debated issue in economic theory. Researchers primarily debate whether MW increases inflation, the economic conditions under which it may influence inflation, and how to measure the magnitude of its impact. Economists generally adopt three main approaches regarding the effect of MW on inflation:

The first approach suggests that an increase in the minimum wage (MW) leads to higher inflation, as emphasized by Keynesian and cost-push theories. According to this view, higher MW raises production costs and stimulates aggregate demand, which in turn leads to inflation. Inflation, in turn, further drives MW increases, creating a feedback loop. For instance, [5], demonstrated that wage growth in the U.S. contributes to inflation, while [6], showed that excessive MW hikes can also generate inflationary pressures.

A key argument in these approaches is that the minimum wage (MW) affects inflation only when it increases at a faster rate than productivity growth. [7], argued that inflation is primarily driven by monetary policy rather than wage increases. Similarly, [8], found that MW increases in the United States had minimal effects on both employment and inflation.

A study by [9], supports these arguments, showing that the minimum wage (MW) has contributed to economic stability in European countries.

The effects of MW on inflation have also been examined in various empirical studies. [8] argued that MW has a weak impact on inflation, noting that increases in MW do not significantly raise either inflation or unemployment. Similarly, [6] reported that gradual wage increases in Europe have only minimal effects on inflation.

In Turkey, [10], found that minimum wage (MW) increases significantly raise price levels. By contrast, [11], reported only a modest MW–price effect, noting that most price adjustments occur within the first month after MW changes and that inflation-indexed MW increases lead to more moderate price movements. Using machine-learning methods, [12], examined MW changes in Spain and concluded that higher MW reduced inequality without generating inflation or unemployment, while being associated with increases in net employment and corporate profits. The results of the study conducted on Azerbaijan, [13], show that government spending has a significant and positive impact on inflation in both the short and long term. For Azerbaijan, household-income evidence based on the Gini, Atkinson, and Theil indices indicates persistently high inequality, strengthening the distributional motivation for minimum-wage and price-stabilization policies, [14].

[15], Further analyzed how OECD countries adjusted MW during periods of high inflation, showing that MW increases support purchasing power but may also raise concerns about wage–price spirals and wage compression.

This relationship has been studied in various countries. For example, in the case of Nigeria [16], in the case of Tanzania [17], in the case of Albania [18], in the case of Ethiopia [19] and in the case of some developing countries [20], this problem has been studied. According to the results obtained, an increase in the money supply in developing economies leads to higher inflation. However, in the case of Nigeria [21], it is argued that the effect of the money supply on inflation is weak and other structural factors have a more serious impact on

inflation.

In highly dollarized economies, exchange rate fluctuations have a stronger impact on inflation, as a significant share of transactions is conducted in foreign currencies. Empirical studies examining the impact of exchange rates on inflation show that this relationship varies across countries. For instance, research conducted by [22], and [23], on Turkey indicates that depreciation of the national currency leads to higher inflation. Similar findings were reported for Sudan by [24] and for South Africa by [25], confirming that a weakening currency contributes to inflationary pressures. Real exchange-rate (REER) movements are also widely used in macro-prudential risk assessment frameworks, where they help track vulnerabilities relevant for banking-sector stability, [26]. Since the main source of income in oil-exporting economies is oil rent, oil price shocks can affect various aspects of the economy, including consumer prices, through the exchange rate channel. This result is confirmed in many studies, especially in studies conducted on the example of oil-exporting Arab countries, for example, [27].

Inflation affects various economic indicators, including unemployment. The nature of the relationship between unemployment and inflation is widely covered in economic theory. [28], the inverse relationship between unemployment and inflation, namely the Phillips Curve, was introduced. Economic theory claims that as unemployment decreases, workers tend to demand higher wages. This increases production costs. As a result, the price of the product also increases. Conversely, when unemployment increases and household incomes decrease, consumer demand also decreases. In turn, the decrease in demand affects the price level and reduces inflation. Studies conducted in various countries confirm that the relationship between unemployment and inflation is not at all unambiguous. Thus, some studies show that higher unemployment rates lead to lower inflation. However, other studies, such as [29] and [30], show that higher unemployment rates can be accompanied by higher inflation. Such a contradictory relationship between unemployment rates and inflation suggests that the nature of the relationship between these two important indicators depends on country-specific economic conditions and policy frameworks.

3 Methodology

In accordance with the objectives of the study, panel data were used for 14 countries, namely Azerbaijan, Armenia, Georgia, Russia, Ukraine, Kazakhstan, Kyrgyzstan, Moldova, Poland, Bulgaria, Czech Republic, Romania, Turkey and Israel. The following variables were included in the panel study: a) minimum wage based on purchasing power parity (*MW_PPP*); b) minimum wage in national currency (*MW_NC*); c) GDP growth (*GDP_growth*); d)logarithm of M2 money supply (logm2); e) exchange rate (*Exch_Rate*); f) unemployment rate (*unemp*); g) share of employees in total employment (waged); h)volume of government expenditure (*gov_EXP*). The data set covers the years 2000-2021. The panel study included three alternative minimum wage measures: a) *MW_PPP*; b) MW in US dollars and c) MW in national currency. However, because the exchange rate (*Exch_Rate*) is included as an independent variable, the dollar-denominated MW is excluded. To capture both cross-country and within-country effects of the minimum wage on inflation, two indicators are retained: *MW_PPP* (2021 PPP dollars) and *MW_NC* (national currency).

For the panel analysis, you will use the following general form of the equation (1):

$$Inflation_{it} = \beta_0 + \beta_1 * MW\_PPP_{it} + \beta_2 * MW\_NC_{it} + \beta_3 * GDP\_growth_{it} + \beta_4 * logm2_{it} + \beta_5 * Exch\_rate_{it} + \beta_6 * unemp_{it} + \beta_7 * waged_{it} + \beta_8 * gov\_exp_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

4 Results and Discussions

4.1 Descriptive Statistics

Descriptive statistics (Table 1, Appendix) reveal that "Inflation" and several macroeconomic indicators influencing it, including *GDP_Growth, M2, MW_PPP, MW_NC, EXCH_rate, Unemp, wages*, and *govExp*-exhibit skewness and kurtosis values beyond acceptable thresholds, indicating that none of these variables follow a normal distribution.

Note that many panel regression models, such as Fixed Effects, Random Effects, and GMM, are based on the assumption of asymptotic normality, that is, normality in large samples. Therefore, the non-normality of a significant portion of the variables included in the panel analysis raises concerns about the validity of the model. In particular, it may indicate the presence of excessive skewness and kurtosis or heteroskedasticity. This can potentially bias the coefficient estimates and standard errors. However, we can perform the panel analysis under these conditions.

To address this issue, data transformations will be applied to adjust the skewness and kurtosis of the variables, thereby improving their approximation to normality. To overcome the problem to some extent, we will use two transformation methods. The first is a logarithmic transformation, and the second is winsorization. With these methods, we will winsorize the "*inflation*" at the 5th and 95th percentiles, and the "*GDP_Growth*" at the 1st and 99th percentiles. In addition, logarithmic transformations will be applied to M2, MW_PPP, MW_NC, and EXCH_rate. The updated descriptive statistics following these transformations are presented in Table 1 (Appendix).

4.2 Stationarity of the Variables

As the next step in the panel analysis, the stationarity of each panel series must be examined. The indicators included in the panel analysis will be tested for stationarity using the Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) W-stat, ADF-Fisher Chi-square, and PP Fisher Chi-square tests. The results of these tests are presented in Appendix in Table 2 and Table 3.

According to Table 2 (Appendix), the variables *Unemp, Waged, Gov_exp, LogM2, Wins-Inflation and Wins-GDP_Growth* are stationary at the I(0) level. Their stationary (except for LogM2 and *logMW_NC)* is also confirmed by the Im-Pesaran-Shin (IPS) W-stat test (Table 3, Appendix). However, the variables *logMW_PPP* and *logExch_rates* are not stationary at the I(0) level. Considering these results, the variables that are stationary at the I(0) level according to both the Levin-Lin-Chu (LLC) test and the IPS W-stat test-namely, *Unemp, Waged, Gov.exp, Wins-Inflation*, and *Wins-GDP_Growth*-will be included in the panel analysis in their original form. Meanwhile, the remaining variables-*LogM2, logMW_NC*, *logMW_PPP*, and *logExch_rate*-will be included in the panel analysis in their differenced form.

$$wins\_inflation_{it} = \alpha_i + \beta_0 + \beta_1 * Unemp_{it} + \beta_2 * waged_{it} + \beta_3 * gove_{exp}{}_{it} + \beta_4 * \Delta logm2_{it} + \beta_5 * \Delta logMW_{PPP}{}_{it} + \beta_6 * \Delta logMW_{NC}{}_{it} + \beta_7 * wins\_gdp\_growth_{it} + \beta_8 * \Delta logExch\_rate_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

The Hausman test will be used to select the appropriate panel analysis model. Based on the test results, the null hypothesis (H_0) is rejected because the p-value is 0.0377. This indicates that the individual effects are related to the explanatory variables in the model. Therefore, the Fixed Effects model may be considered a more appropriate choice. Before building a panel analysis model, it is necessary to check for heteroskedasticity.

The results of the heteroskedasticity test are presented in Table 4 (Appendix).

Based on the results obtained, we can claim that the null hypothesis (H_0) is rejected in both the LR test of panel cross-sectional heteroskedasticity and the LR test of panel period heteroskedasticity, and the p-values are 0.0026 and 0.0000, respectively. These results confirm that the variables included in the panel analysis exhibit both cross-sectional and period heteroskedasticity. Therefore, it is important to examine heteroskedasticity in both cases.

Considering these findings, the results of the Fixed Effects model are presented in Table 5 (Appendix). It should be noted that this model is a Fixed Effects model estimated using cross-section SUR (Seemingly Unrelated Regression). Additionally, the "White cross-section (period cluster)" standard error correction has been applied.

4.3 The Results of the Fixed Effects

The objective of the model is to examine the relationship between the Wins_Inflation variable and other economic indicators. The overall model assessment yields the following statistics: R-squared = 0.9399; Adjusted R-squared = 0.9354; F-statistic = 202.89; Prob(F-statistic) = 0.0000; Durbin-Watson statistic = 1.8434. These results indicate that the model explains approximately 94% of the variation in the Wins_Inflation variable. This reflects a very high quality of fit. The model is generally statistically significant and autocorrelation does not pose a serious problem (Table 5, Appendix).

The results show that the M2 money supply, nominal minimum wage, unemployment rate, the share of wage earners in total employment, and GDP growth exert positive effects on inflation. In contrast, the PPP-based minimum wage has a negative impact. The findings also indicate that exchange rate fluctuations and the share of government expenditure in GDP are not statistically significant determinants of inflation. The differing effects of the nominal and PPP-based minimum wages suggest that nominal wage changes may influence inflation differently from real purchasing power adjustments.

Although the simultaneous increase in both unemployment and the share of wage earners may seem contradictory, this outcome likely reflects structural characteristics of the labor market.

The findings also suggest that economic growth may accelerate inflation. After removing the two insignificant variables – *D_LOGEXCH_RATE* and *GOV_EXP* – from the model, the results of the updated model are presented in Table 6 (Appendix). The R-squared and Adjusted R-squared values have decreased slightly, but remain high. The F-statistic has increased. This suggests that the model may be more robust overall. The Durbin-Watson statistic is 1.90. This suggests that autocorrelation is not a problem. Although the sum of squared residuals has increased, this difference is not significant. Overall, the goodness of fit of the model has remained largely unchanged. This suggests that the removed variables have not had a significant impact on the model (Table 7, Appendix).

With the removal of insignificant variables from the model, all key variables remain significant ($p < 0.05$) and some coefficients (e.g., *D_LOGM2* and *WINS_GDP_GROWTH)* are further strengthened. The coefficients for *UNEMP* and *WAGED,* although slightly reduced, remain statistically significant. The C (Constant) variable decreased to –0.3979 but is not statistically significant ($p = 0.7214$). After removing *GOV_EXP* and *D_LOGEXCH_RATE*, no significant differences were observed in the effects of the other variables. It should be noted that the insignificance of the C (Constant) variable ($p > 0.05$) does not undermine the quality of the model (Table 7, Appendix). Rather, it indicates that there is no overall fixed effect and that each country has its own specific effects. The results of the country-specific effects in the Fixed Effects model are presented in Table 8 (Appendix).

Some independent variables may be correlated with the residual term (ε), resulting in biased and inconsistent estimates. For example, D_LOGM2 may be influenced by central bank policies and inflation; D_LOGMW_NC and D_LOGMW_PPP may exhibit reverse causality between minimum wage and inflation; and WINS_GDP_GROWTH may have a bidirectional relationship, where economic growth affects inflation and, in turn, inflation influences economic growth (simultaneity bias). To address this, endogeneity in the FEM will be tested using the Durbin–Wu–Hausman test. Consequently, instruments must be identified for these variables. Among the six independent variables in the FEM, four are classified as endogenous and two as exogenous. Since four variables are endogenous, at least four valid instruments need to be selected.

For the variables $\_LOGM2 - M2$, D_LOGMW_NC, D_LOGMW_PPP, and $WINS\_GDP\_GROWTH$, the corresponding instruments will be $LOGM2(-1\ to\ -2)$, $LOGMW\_NC(-1\ to\ -2)$, $LOGMW\_PPP(-1\ to\ -2)$, and $WINS\_GDP\_GROWTH(-1\ to\ -2)$, respectively (Table 9, Appendix).

It should be noted that since *wins_inflation (-1)* is included as an independent variable in the GMM model and is endogenous, *wins_inflation (-2 to -3)* will be used as its instrument. The validity and quality of these instruments will be evaluated using the Hansen or Sargan test.

4.4 GMM Model

The GMM method, evaluated with the instruments we accepted, helps address the endogeneity problem and allows for robust results. The results obtained from the GMM model are presented in Table 10 (Appendix).

Based on the overall evaluation of the GMM model, R-squared (R^2) = 0.5594, indicating that the independent variables in the model explain 55.94% of the variation in inflation. This represents a relatively good explanatory power for panel data.

The adjusted R-squared = 0.5235 further confirms the model fit. The Durbin-Watson statistic = 1.5569 indicates a low risk of autocorrelation. The J-statistic = 0.5199, Prob (J-statistic) = 0.9145 and the Hansen test p-value > 0.05 confirm that the instruments were selected correctly. There is no evidence of overidentification, indicating that the instruments selected for the GMM model are appropriate and reliable.

Based on the GMM model, inflation is influenced by its own past values (*WINS_INFLATION(-1)).* However, the money supply (*LOGM2*) does not have a statistically significant effect on inflation. An increase in the nominal minimum wage (*LOGMW_NC*) is associated with a reduction in inflation, whereas the PPP-based minimum wage *(LOGMW_PPP*) increases inflation. Unemployment (*UNEMP*) has a positive impact on inflation, consistent with the Phillips Curve theory. Likewise, an increase in the share of wage earners in total employment (WAGED) contributes to higher inflation. Economic growth (WINS_GDP_GROWTH) also has a positive effect on inflation.

Thus, it can be argued that the GMM model explains inflation reasonably well ($R^2 = 0.56$). The use of the GMM method increases the reliability of the results and confirms the absence of endogeneity problems. The Hansen test ($p = 0.9145$) further indicates that the instruments are valid and appropriately selected.

4.5 The Differences between the FEM and GMM Results

However, based on the results from the GMM model, the effect of the money supply on inflation does not align with theory. By comparing the Fixed Effects Model and the GMM Model, the differences and advantages are presented below (Table 11, Appendix). The FEM model has a higher R^2 value (93.48%) than the GMM models. This may indicate potential overfitting. In contrast, the GMM model has an R^2 value of 55.94%. This may also be more realistic because the GMM explicitly addresses endogeneity.

The GMM model employs instruments, and the Hansen test (Prob J-stat = 0.9145) confirms that these instruments are appropriately selected. However, the coefficients for several independent variables differ between the FEM and GMM models, leading to different economic interpretations. For example, the effect of LOGM2 on inflation is positive and significant in the FEM but insignificant in the GMM. The effect of LOGMW_NC on inflation is highly positive in the FEM but negative in the GMM, whereas the effect of LOGMW_PPP on inflation is negative in the FEM and positive in the GMM. In both models, however, the effects of UNEMP, WAGED, and WINS_GDP_GROWTH on inflation are positive and statistically significant (Table 12, Appendix).

The differences in the results obtained from the FEM and GMM models necessitate noting the strengths and weaknesses of each model. The main differences are related to the reliability of the models (Table 13, Appendix).

The differences presented in Table 13 (Appendix) justify the use of the GMM model as a more reliable basis for policy recommendations. According to the FEM results, the effect of the money supply on inflation is very high, whereas in the GMM model, this effect is not statistically significant. This suggests that fiscal measures may be more effective when monetary policy has a limited impact on inflation. The FEM model indicates that increases in the minimum wage raise inflation, while the GMM results reveal that higher minimum wages reduce inflation. Given that the GMM model is more reliable, it implies that the minimum wage can be used as a tool to mitigate inflation risk. These inflation drivers may also transmit to macro-prudential vulnerabilities; therefore, complementing inflation targeting with regular tracking of bank-stability indicators and stress-testing-based composite measures can strengthen policy design [26].

5 Discussion

According to the results of the GMM panel analysis, an increase in the PPP-based minimum wage is associated with higher inflation. This finding of the study is consistent with classical economic theory and monetarist approaches. In addition, this result is consistent with the results of numerous empirical studies. For example, studies by [9], [11], [31], [32] and others also prove that an increase in the PPP-based minimum wage increases the inflation rate.

In particular, in the study conducted by [13], ARDL evidence for the case of Azerbaijan (1995–2023) shows a different wage-price model. Thus, increases in the nominal minimum wage mainly have a positive effect on the inflation rate in the short term. The PPP-based minimum wage, on the contrary, creates a deflationary effect with some lag. This study also claims a strong and positive effect of government spending on inflation. However, a balancing effect is later found, while the effect of GOV_EXP in our cross-country panel results is not statistically significant. The comparison of time series and panel results suggests that the sign and timing of the wage and fiscal transition may depend on country characteristics. Therefore, it is important to model endogeneity and cross-sectional differences in comparative inflation studies.

As we have noted, an increase in the unemployment rate does not always reduce inflation. On the contrary, depending on country characteristics, the unemployment rate can also increase inflation. This result is supported by several empirical studies, for example, [6], [9], [33], [34], [35], etc.

According to the results of our Panel analysis, economic growth has a positive effect on inflation. This result is consistent with some economic theories. However, some empirical studies emphasize that the strength and direction of the relationship between economic growth and inflation vary across countries. For example, [32], [36], [37], [38], [39], etc. show that economic growth tends to increase inflation.

6 Conclusion

First, the results of the study confirm that money supply does not have a statistically significant effect on inflation. This result contradicts the approach of monetarist theory. According to monetarist theory, there is a direct relationship between money supply growth and inflation. Instead, the results obtained are consistent with post-Keynesian and structuralist views. According to these views, inflation is driven

not only by money supply but also by demand-side pressures, supply chain dynamics, and institutional structures.

Second, the results of the panel analysis prove that an increase in the nominal minimum wage is associated with a decrease in inflation. This finding suggests that wage growth has a stabilizing effect on aggregate demand. Higher wages increase consumption. On the other hand, higher wages also increase productivity and market efficiency. This result contradicts the classical economic view. According to the classical economic view, wage growth is related to inflation. However, the results of the panel analysis are consistent with wage-based growth theories. According to this view, stable wages play an important role in promoting economic stability.

Third, the minimum wage in the panel analysis has a positive effect on inflation in terms of purchasing power parity (PPP). This result suggests that inflationary pressures may arise when the minimum wage exceeds a sustainable level relative to productivity. This finding supports cost-push inflation theories. According to this approach, higher labor costs are passed on to consumers through price increases.

Fourth, the panel analysis results show that economic growth has a positive effect on inflation. This finding is consistent with demand-pull inflation models. According to these models, as output and employment increase, aggregate demand can exceed supply, leading to higher prices. However, the magnitude of such an effect depends on the nature of economic growth, the rate of productivity improvement, and the response of monetary policy.

Finally, the panel analysis results show that an increase in the share of wage earners in total employment has a more positive effect on inflation. This can be explained by the increase in labor costs and consumer spending as the number of formal sector workers increases. Such an increase leads to demand-pull inflation. On the other hand, the shift from informal to formal employment can reduce market elasticity and increase production costs, which can exacerbate inflationary pressures.

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APPENDIX

Table 1. Descriptive statistics of the variables

	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.
$Inflation$	6.912535	5.187681	54.91537	-1.544797	7.816440	3.215552	17.19998	3118.480	0.000000
GDP_Growth	4.406969	4.500000	34.50000	-15.13647	5.087253	0.517403	9.550097	564.3407	0.000000
$M2$	3.58e+12	3.76e+11	7.53e+13	6.27e+08	1.07e+13	4.591176	25.59146	7631.852	0.000000
MW_PPP	374.5197	261.8975	1463.846	5.746000	344.7096	1.077761	3.256663	60.47257	0.000000
MW_NC	5384.153	1000.000	68000.00	1.100000	11264.92	3.442071	15.42796	2590.351	0.000000
$EXCH\_rate$	59.22983	5.195975	578.7630	0.625219	127.0875	2.694045	9.132353	855.1783	0.000000
$Unemp$	8.314156	7.260000	20.71000	0.785000	4.544160	0.852171	3.242928	38.03541	0.000000
$waged$	65.93718	67.73626	95.51689	30.56397	20.14290	0.389933	1.831816	25.31815	0.000003
Gov_exp	16.18189	16.83204	25.34487	8.118775	3.678890	0.149686	2.368313	6.271044	0.043477
$Logm2$	11.45884	11.57535	13.87671	8.797558	1.103517	0.151108	2.635248	2.879525	0.236984
$logMW\_PPP$	2.324467	2.418106	3.165495	0.759366	0.541834	0.661482	2.671719	23.84434	0.000007
$logMW\_NC$	2.984351	3.000000	4.832509	0.041393	0.928743	0.274115	2.617836	5.731421	0.056943
$Wins\_inflation$	6.283552	5.187681	19.71672	-0.118060	5.160121	1.026690	3.478519	57.04870	0.000000
$Wins - GDP\_growth$	4.335571	4.500000	18.62000	-9.901468	4.546210	0.352327	4.494063	35.01911	0.000000
$logExch\_rate$	1.017836	0.715626	2.762501	-0.203968	0.793466	0.636687	2.351703	26.20272	0.000002

Source: created by the authors

Table 2. Stationarity of the Panel variables (Levin, Lin & Chu)

	I(0)		I(1)	
	intercept	Intercept & trend	intercept	Intercept & trend
Unemp	-4.00361***	-1.22886	-4.76907***	-3.10421***
Waged	-4.91117***	-0.14412	-4.91038***	-4.49800***
Gov_exp	-2.37918***	-1.73842**	-8.6088***	-6.82398***
LogM2	-6.79111***	-2.16916**	-1.62942*	-1.23307
logMW_PPP	-0.73565	-0.81286	-3.77840***	-2.19700**
logMW_NC	-2.18989**	0.12233	-2.95126***	-1.62221*
Wins-Inflation	-4.69224***	-2.89604***	-11.9835***	-11.0186***
Wins-GDP Growth	-4.77402***	-4.64546***	-7.77950***	-5.70312***
logExch_rate	2.47927	-1.50352*	-7.26458***	-8.04877***

*Note: *, **, *** -denote significancy at 10%, 5%, and 1% respectively.*
Source: created by the authors

Table 3. Stationarity of the Panel variables (Im, Pesaran and Shin W-stat)

	I(0)		I(1)	
	intercept	Intercept & trend	intercept	Intercept & trend
Unemp	-2.09179**	-1.73921**	-6.52063***	-5.57550***
Waged	-1.68281**	0.65575	-5.78736***	-5.05034***
Gov_exp	-2.78332***	-1.58390*	-9.70720***	-7.91345***
LogM2	-1.53711*	1.51702	-2.71391***	-2.89543***
logMW_PPP	2.28449	-0.65430	-7.10107***	-4.96164***
logMW_NC	1.35127	-0.50543	-6.28034***	-4.60659***
Wins-Inflation	-4.74478***	-2.27241**	-11.2083***	-9.51169***
Wins-GDP Growth	-5.41416***	-4.94649***	-12.2547***	-9.39426***
logExch_rate	2.56304	0.38238	-6.20374***	-6.55026***

*Note: *, **, *** -denote significancy at 10%, 5%, and 1% respectively.*
Source: created by the authors

Table 4. Cross-Section and period Heteroskedasticity LR Test Results

Test	Likelihood Ratio	df	p-value
Panel Cross-section Heteroskedasticity LR Test	33.35641	14	0.0026
Panel Period Heteroskedasticity LR Test	78.04628	14	0.0000

Source: created by the authors

Table 5. The results of the fixed effects

Variable	Coefficient	Std. Er.	t-Statistic	p-value	Result
d_logexch_rate	-0.0174	2.5225	-0.0069	0.9946	Not significant
d_logm2	7.0340	1.6135	4.3594	0.0003	Significant (+ effect)
d_logmw_nc	127.7267	3.0059	42.4912	0.0000	Highly significant (+ effect)
d_logmw_ppp	-126.3985	2.9403	-42.9879	0.0000	Highly significant (- effect)
gov_exp	-0.0438	0.0369	-1.1866	0.2493	Not significant
unemp	0.0651	0.0187	3.4919	0.0023	Significant (+ effect)
waged	0.0463	0.0198	2.3371	0.0299	Significant (+ effect)
wins_gdp_growth	0.0671	0.0183	3.6626	0.0015	Significant (+ effect)
c (constant)	0.2117	1.0859	0.1949	0.8474	Not significant

Source: created by the authors

Table 6. The comparison between the new model and the model with GOV_EXP və D_LOGEXCH_RATE

Variables	Previous Model (All variables included)	New Model (After removing two variables)	Change
R-squared	0.9399	0.9348	Slight decrease (-0.0051)
Adjusted R-squared	0.9354	0.9302	Slight decrease (-0.0052)
F-statistic	202.89	206.62	Increased
Durbin-Watson stat	1.8434	1.9017	Slight improvement
Sum squared resid.	283.47	289.59	Slight increase

Source: created by the authors

Table 7. The comparison of the results of the previous and new models

Variable	Previous Model Coeff.	New Model Coeff.	Change	Significance (New Model)
d_logm2	7.0340	7.5421	Increased	p = 0.0000 (Significant)
d_logmw_nc	127.7267	127.7299	Minimal change	p = 0.0000 (Highly significant)
d_logmw_ppp	-126.3985	-126.1174	Minimal change	p = 0.0000 (Highly significant)
unemp	0.0651	0.0557	Slight decrease	p = 0.0054 (Significant)
waged	0.0463	0.0445	Slight decrease	p = 0.0263 (Significant)
wins_gdp_growth	0.0671	0.0793	Increased	p = 0.0002 (Significant)
c	0.2117	-0.3979	Significant change, but statistically insignificant	p = 0.7214 (Not significant)

Source: created by the authors

Table 8. Dummy variables by country

	Countries	Dummy variables		Countries	Dummy variables
1	ARM	0.1205	8	RUS	1.0344
2	AZE	1.1767	9	TUR	1.4921
3	GEO	0.0398	10	UKR	0.3626
4	İSR	-2.9593	11	BGR	-1.3539
5	KAZ	0.5594	12	POL	-1.6506
6	KGZ	0.3203	13	ROU	0.1921
7	MDA	2.3398	14	CZE	-1.6739

Source: created by the authors

Table 9. Endogenous variables in FEM and their instruments

Independent Variables	Endogeneity	instruments
$\boldsymbol{Wins\_inflation(-1)}$	endogen	Wins_inflation$(-2$ to $-3)$
D_LOGM2*-M2*	endogen	LOGM2$(-1$ to $-2)$
D_LOGMW_NC – Nominal minimum wage	endogen	LOGMW_NC$(-1$ to $-2)$
D_LOGMW_PPP – Minimum wage in PPP	endogen	LOGMW_PPP$(-1$ to $-2)$
WINS_GDP_GROWTH-economic growth	endogen	WINS_GDP_GROWTH$(-1$ to $-2)$

Source: created by the authors

Table 10. Key coefficients in the GMM model and their interpretation

Variable	Coeff.	Std. Error	t-Statistic
wins_inflation(-1)	0.4694**	0.2117	2.2169
logm2	-4.2261	4.9028	-0.8620
logmw_nc	-16.9872***	4.6013	-3.6918
logmw_ppp	28.5142***	8.5539	3.3335
unemp	1.4882***	0.5056	2.9435
waged	1.5188**	0.6400	2.3729
wins_gdp_growth	0.5807**	0.2486	2.3361
c (incept)	-78.8494**	27.9188	-2.8242

*Note: **, *** -denote significance at 5%, and 1% respectively.*
Source: created by the authors

Table 11. The differences between the FEM and GMM results

Features	Fixed Effects Model (FEM)	GMM Model
Methods	Panel EGLS (Cross-Section SUR)	Panel GMM EGLS (Cross-Section SUR)
Time periods	2001-2021 (21 years)	2003-2021 (19 years)
Number of countries	14	14
Obser.	294	266
Instruments	There is not	*wins_inflation(-2 to -3), logm2(-1 to -2), logmw_nc(-1 to -2), logmw_ppp(-1 to -2), wins_gdp_growth(-1 to -2)*
R-squared (Weighted)	0.9348 (very high)	0.5594 (middle)
Adjusted R-squared	0.9302	0.5235
S.E. of Regression	1.0281	1.2553
Durbin-Watson stat	1.9017 (Good)	1.5569 (middle)
J-statistic (Prob J-test)	-	0.9145 (Instruments are true)

Source: created by the authors

Table 12. Comparison of the effects of independent variables on inflation in FEM and GMM Models

Variable	FEM Coefficient(p-Value)	GMM Coefficient (p-Value)
wins_inflation(-1)	-	0.4694**
logm2	7.5421***	-4.2261
logmw_nc	127.7299***	-16.9872***
logmw_ppp	-126.1174***	28.5142***
unemp	0.0557***	1.4882***
waged	0.0445**	1.5188**
wins_gdp_growth	0.0793***	0.5807**
c	-0.3979	-78.8494**

*Note: **, *** -denote significance at 5%, and 1% respectively.*
Source: created by the authors

Table 13. Evaluation of the reliability of the FEM and GMM Model Results

Criterion	Fixed Effects Model (FEM)	Generalized Method of Moments (GMM)
Endogeneity Problem	Not addressed	Addressed
Country and Time-Specific Differences	Captured through dummy variables	Captured through lagged variables
Impact of Past Periods	Not considered	Considered (WINS_INFLATION(−1))
Overfitting Issue	Present (R^2 = 0.9348, very high)	Absent (R^2 = 0.5594, realistic)
Use of Instruments	Absent (based on OLS)	Present (Instruments selected and validated through the Hansen test)
Hansen/Sargan Test	Not present	Hansen Test (p = 0.9145) indicates that instruments are correctly chosen
Heteroscedasticity and Serial Correlation	Heteroscedasticity tested	Robust standard errors are used

Source: created by the authors