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What Drives Inflation in OIC Economies? A Fixed-Effects Panel Approach

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Abstract

This research looks into the factors that influence inflation by investigating the impact of broad money supply, crop production index, GDP growth, gross capital formation, and electricity production from oil and gas, along with the imports and exports of goods and services on inflation in Organization of Islamic Cooperation 13 countries for the years 1990 to 2022. The data structured as a panel is collected from the World Bank, and according to the Hausman test ($p < 0.05$), the fixed-effects model is determined to be the most fitting estimation technique. The empirical evidence reveals that while trade openness (TO) and investment (INV) have a negative correlation with inflation when considered separately, their combined effect (TO×INV) produces a positive and significant influence, signifying that the countries where both trade and investment are growing are likely to see an increase in price levels. It implies that though trade and investment can separately be relied upon for inflation stabilization, their joint link can create demand pressures or structural weaknesses that drive up inflation. The implications of such studies require traders to be highly aware and thus tailor their operations to the movements of the economy when opening up the market. Such is the case with inflation; thus, it should not just be treated as an economic issue requiring intervention only if monetary policy is involved, but rather a combination of policies should be considered.

Keywords: *Inflation, Crop Production Index, Trade Openness, Real Effective Exchange Rate, Energy Production, Fossil Fuels*

JEL Classification: *F1, F12, F60*

1. Introduction

Inflation, which is characterized as a continuous rise in prices of the whole range of goods and services, still is one of the most intricate and highly discussed macroeconomic problems. Economists and policymakers are still baffled by the nature of inflation duality even after several decades of research: moderate inflation can stimulate demand, investment, and economic activity whereas, persistent or volatile inflation can erode purchasing power, distort investment decisions, and, consequently, undermine public trust in monetary institutions (Cecchetti & Groshen, 2000). Therefore, the central bank has to maintain price stability as a major goal throughout the whole modern economic policy framework. The accurate monitoring of inflation, especially over the short term, is a challenging task assigned to central banks (Cecchetti & Groshen, 2000).

In the last 20 years global inflation patterns have changed significantly, which was mainly caused by disruptions in supply chains, energy markets and capital flows. The COVID-19 pandemic was a major factor that increased inflationary pressures even in the advanced economies reviving the previous belief that high inflation was no longer a significant risk (Podrugina & Lysenko, 2023). The global inflation of this period is substantial and thus a great challenge, with the transition to a high inflation regime, which makes economic stability harder to achieve(Podrugina & Lysenko, 2023). The inflation of global factors is greatly highlighted by the recent supply chain bottlenecks after the COVID-19 pandemic, rise of food and energy prices due to geopolitical conflicts, and thus the global factors playing a very significant role (Nell, 2023). The inflation booms of the supply shock, although big, are not as long-lasting as in the former decades, part of which is due to central banks having credible inflation targets(Bernanke & Blanchard, 2024). Nevertheless, these structural changes mixed

with growing inflation have led central banks and governments to tighten monetary policy and realign fiscal policy for a long period (Binici et al., 2022). The great increase in demand that took place in late 2020 alongside disruptions to supply chains and restrictions on overall output created unbalances that brought about extraordinary inflation (Goryunov et al., 2023). This has led to a discussion on the alignment of fiscal and monetary policy, especially in emerging and developing economies, which have weaker institutional capability and more unstable macroeconomic environments than advanced economies (Banerjee et al., 2024). The inflation risks and their drivers have become a major concern in the policy discussions for both advanced and emerging market economies (Banerjee et al., 2024).

The inflation dynamics in the developing countries are the result of a complicated interplay of monetary, fiscal, structural, and external factors (Asfuroğlu, 2021). The monetary factors like the independence, transparency, and credibility of the central bank are the ones that mostly keep inflation expectations under control. But, in numerous EMDEs, the expectations are not anchored properly because of the fiscal dominance, fluctuations in the exchange rates, and lack of institutional credibility (Nell, 2023). The fiscal imbalances create further pressure on the entire process: increasing government spending or public debt often causes inflationary pressure, while fiscal consolidation usually results in monetary tightening and keeps the expectations stable. To give an example, a sudden increase in oil prices could lead to cost-push inflation in several countries at once, so that various types of goods will be affected and the different countries will have to conduct their policies very carefully, especially where oil is being produced (Elsherif, 2024).

One of the major challenges in the management of commodity-induced inflation is that often the solution involves the adoption of various price stabilization policies like subsidies and setting limits on fuel prices, particularly in regions that have different institutional structures (Singagerda et al., 2025). It is important that the policy responses are tailored to the specific characteristics of each country or sub-region if the aim is to manage inflation effectively and reduce the impacts of external and internal shocks (Nsafoah et al., 2024). The inflation dynamics in the developing countries are the result of a complicated interplay of monetary, fiscal, structural, and external factors (Asfuroğlu, 2021). The monetary factors like the independence, transparency, and credibility of the central bank are the ones that mostly keep inflation expectations under control. But, in numerous EMDEs, the expectations are not anchored properly because of the fiscal dominance, fluctuations in the exchange rates, and lack of institutional credibility (Nell, 2023).

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Empirical research has been conducted on the interaction between trade openness and gross capital formation in OIC countries. Thus, the current study becomes a significant empirical contribution, since it points out the interlinkage between trade, investment, and price stability in developing cases. The results suggest that the inflation in these countries is determined by the interaction of structural and policy factors rather than single economic indicators alone, thus integrating macroeconomic frameworks becomes an urgent need. Meanwhile, it also refers back to the existing literature highlighting the various ways through which development assistance, including aid for trade, can impact inflation taking into account trade openness, export product diversification, and foreign direct investment as factors (Gnangnon, 2020).To sum up, this work brings to the inflation literature the focus on a less studied group of countries, the revelation of new interaction effects and the clarification of how trade and investment jointly influence inflationary dynamics. These results then provide an important groundwork for future studies and at the same time assist the policymakers of OIC countries to develop more unified, robust and situation-specific inflation handling strategies.

2. Literature Review

The theoretical foundations of inflation have long been shaped by two dominant schools of thought: the Quantity Theory of Money and the Keynesian perspective.Expressed in the equation of exchange, M x V = P x Y, where M is money, V is the velocity of money, P is the price, and Y is the output. The increase in money supply (M) with the same velocity (V) and output (Y) has been the reason for the rise in price (P) (Lucas, 1980). The recent findings that have been reviewing the QTM's validity over long periods for industrial countries have confirmed a long-run relationship between excess money growth and inflation (Jung, 2024). There are empirical studies conducted in several developing economies like Angola and Pakistan that indicated money supply as a key factor to determine inflation and that money growth as a main cause (António, 2024; Stylianou et al., 2024). However, the assumption of constant velocity has ceased to be valid in recent decades as technological advancements and financial digitalization have changed the money circulation (Mumtaz & Smith, 2020). In countries with low inflation, the direct relationship between money growth and inflation is often weak, especially if one does not take into account the variations in output growth and the opportunity cost of money (Teles et al., 2015).

The modern studies show that the money velocity change affected by the issuance of new digital currencies can also lead to a decrease in inflation rates (Hermawan et al., 2024). On the contrary, the Keynesian viewpoint sees inflation as a result of aggregate demand exceeding supply instead of money supply only (Keynes' Theory and Inflation). The theory further states that government spending and other fiscal policies, not only output increases, are the main causes of inflation (Javed, 2019). As an example, the government has been involved in stabilizing economies through fiscal and monetary policies which led to demand increase, production support, and affected GDP growth and inflation rates (Oladejo et al., 2025). The experience of OECD countries in the wake of the pandemic confirms the fiscal stimulus as the main cause of short-term inflation rise (Barro & Bianchi, 2023).

A study covering 37 OECD countries for 2020-2023 indicates that there is a strong positive correlation between government-spending variable and inflation which implies that the government financing through the inverse effect of unanticipated inflation on public debt was a significant factor (Barro & Bianchi, 2023). Therefore, the Keynesian position stresses policy coordination, maintaining that the existence of price stability in the long run needs the joint application of fiscal and monetary measures, particularly, in the context of public debt, the economy brings big crises and requires stabilization measures (Bianchi et al., 2020; Bonam et al., 2024). The empirical research is still ongoing that money supply is a major inflation driver. Developing countries in particular demonstrate the strongest positive correlation, where the rise in broad money precedes the rise in prices (António, 2024; Stylianou et al., 2024). For instance, the International Monetary Fund’s analyses in the region of Sub-Saharan Africa have shown that money growth attracts inflation risk and determines it, thus being a main factor (Okedigba & Insua, 2023).

The impact of monetary policy transmission in developing and emerging markets is controversial, nevertheless, it has been shown that interest rate increases slow down output growth and inflation via exchange rate adjustment (Brandão-Marques et al., 2020). Digital payment systems and e-money acceptance have caused changes in money velocity, which calls for the rethinking of monetary transmission (Hermawan et al., 2024; Mumtaz & Smith, 2020). New measurement methods based on micro-level transaction data help in getting a clearer picture of money velocity at the individual consumer level, thus making comparisons within subgroups possible (Mattsson et al., 2022). Government spending, accumulation of debt, and institutional ability are all factors that influence the dynamics of inflation. If the Keynesian theory considered government spending to be a factor of inflation throughout history, the findings indicate that government expenditures have different effects on the inflation differentiation across countries and their effectiveness (Mo, 2017). The governments' fiscal measures during the pandemic made the private sector to have a more favorable view of the fiscal framework, thus speeding up the process of recovery but simultaneously contributing to the inflation of the fiscal sector (Bianchi & Melosi, 2022).

In the same way, there are some structural features like stiff wages, dependence on energy, and the presence of labor-market frictions together with logistics disruptions that help inflation to grow. Researchers

have demonstrated that energy price shocks have a big effect on inflation through steady sectoral channels whereby the depending on their structure, the like energy dependence and price flexibility plays a decisive role (Álvarez & Kroen, 2025; Wildauer et al., 2023). Labor supply restrictions along with supply chain problems have been pointed out as key contributors to the increase in inflation that has recently happened (Amiti et al., 2023; Bańbura et al., 2023). All these factors have forced the economists to revise their hybrid frameworks and now those are the ones that combine both monetary and real-sector variables to explain persistent inflation in uncertain environments as it is now, and therefore separating demand and supply factors (Eickmeier & Hofmann, 2023).

In open economies, exchange rate fluctuations indeed constitute one of the major inflation channels. A currency devaluation automatically raises the prices of imports which subsequently results in consumer inflation going up directly (Ortega & Osbat, 2020). The effects of the exchange rate on domestic import prices have been confirmed by several studies on different economies, and even though the pass-through is considerable, it can be at times incomplete and slow (Helmy et al., 2018). According to cross-country studies, the extent of exchange rate pass-through differs from one country to another, with monetary policy shocks being linked to a higher pass-through (Ha et al., 2020). Pass-through is usually lower in countries where a combination of flexible exchange rate regimes along with credible inflation targets is practiced (Ha et al., 2020). The evidence on government spending, exchange rate, and GDP growth, however, remains mixed with some studies indicating no significant effect of these variables on inflation while the theoretical predictions show the need for further research (Edwards & Cabezas, 2022). The linkage between inflation and trade openness can be intricate; though some analyses point to openness as a factor that can lower inflation, its influence is dependent on the economic condition (Johar et al., 2020; Shah & Lavanya, 2021).

New inflation factors are revealed by rising studies. Technology transformations can, for one, cut down the costs incurred during the production process and indirectly hold back inflation through the interventions in the form of increased productivity to name efficiencies (Ahmad et al., 2024; Bughin et al., 2019). To exemplify, AI incorporation can affect demand-pull and cost-push inflation at the macroeconomic level, whereas on the microeconomic level it is connected to augmented productivity and efficient resource allocation which can lead to a greater sharing of costs among the players and the adoption of a lower price strategy which is also by means of an able competition (Geetha et al., 2024). The use of AI and robots could give a push to productivity and hence GDP growth, thereby changing the global employment scene (Bertani et al., 2020). On the other hand, in the realm of inflation and deflation, climate change has been a decisive factor in causing severe unavailability of supply especially in areas like food and energy.

Natural calamities like floods and storms among others, can be a reason for the halt in the movement of goods and consequently, inflation (Cevik & Gwon, 2024). It is further postulated that the influence of weather disturbances on supply chains and inflation variations will be a lot more evident as the earth's temperature continues to rise and that natural calamities caused by climate change have also been a factor that has caused inflation (Cevik, 2023; Cevik & Gwon, 2024). The latest research brings to light the necessity for empirical frameworks that are responsive to change and that combine the elements of digitalization, climate risk, and geopolitics. Though OIC countries have unique fiscal structures, commodity dependence, and being exposed to currency volatility, research on their inflation still remains scant. There are various monetary and fiscal problems as well as unstable expectations that make OIC economies an important but neglected subject of study.

Emerging markets research points at the involvement of trade openness, foreign-debt exposure, and investment cycles in shaping the inflations dynamics after COVID ("International Trade, Economic Development, and Inflation: Panel Data Analysis from South Asian Economies," 2024; Lee & Rabago, 2024). It has been recognized that trade aid flows affect inflation in recipient countries positively (Gnangnon, 2020). The present study fills this void by looking at the co-action of trade openness and gross capital formation (TO×INV), to find out that while each of the two variables is insignificant alone, their union has already a significant influence on inflation. This is in line with the new theories that claim trade, investment, and structural productivity in developing economies to be interdependent.

3. Methodology and Model

3.1 Research Design

This research introduces a quantitative and empirical methodology based on panel data in order to identify the causes of inflation which is represented by the Consumer Price Index (CPI), in the case of the 13 chosen OIC member nations: Pakistan, Bahrain, Bangladesh, Indonesia, Morocco, Iran, Cameroon, Qatar, Kuwait, Malaysia, Saudi Arabia, Tunisia, and Turkey. The time frame of the research is from 1990 to 2022, thus giving 32 years of longitudinal data for thorough cross-country and time-series analysis. The data collected for the study will be tested using panel data regression techniques which will enable to control for both cross-sectional heterogeneity (the differences between countries) and time effects (the changes over the years) (Baltagi, 2021). In particular, the research will involve the Fixed Effects Model (FEM), and additional robustness checks will be carried out with the Random Effects Model (REM) and the Hausman specification test for identifying the more suitable estimator (Hausman, 1978).

3.2 Variables and Their Economic Justification

The variables of the study are classified into dependent and independent variables, as stated below:

Figure 1: Flow Diagram

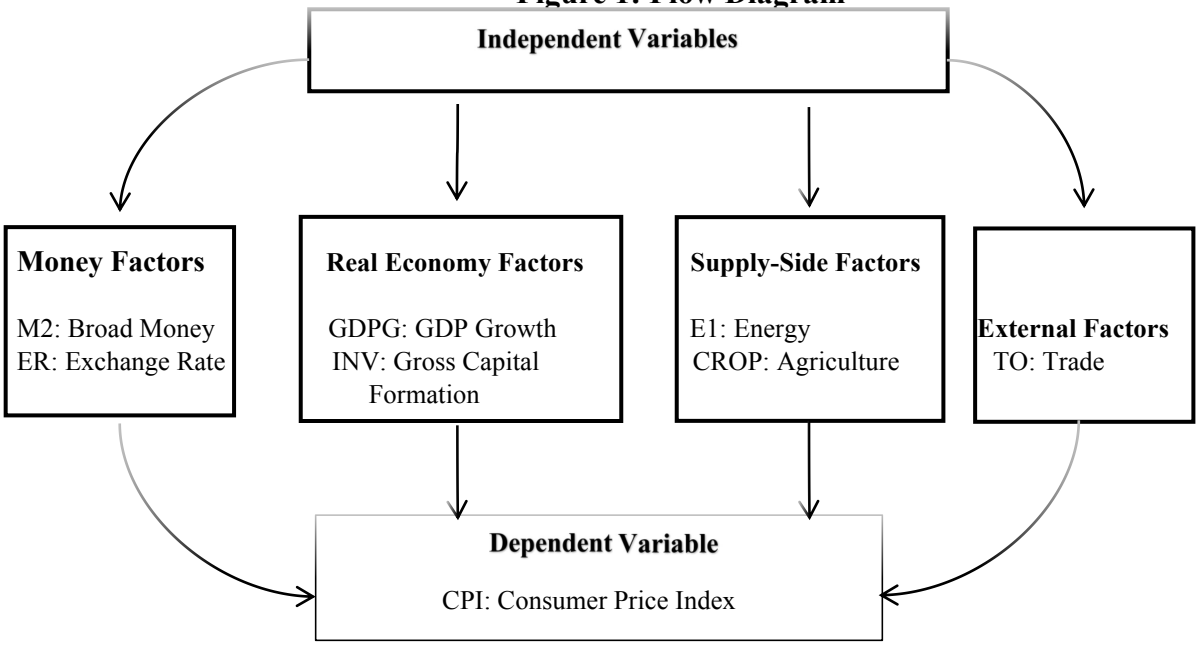
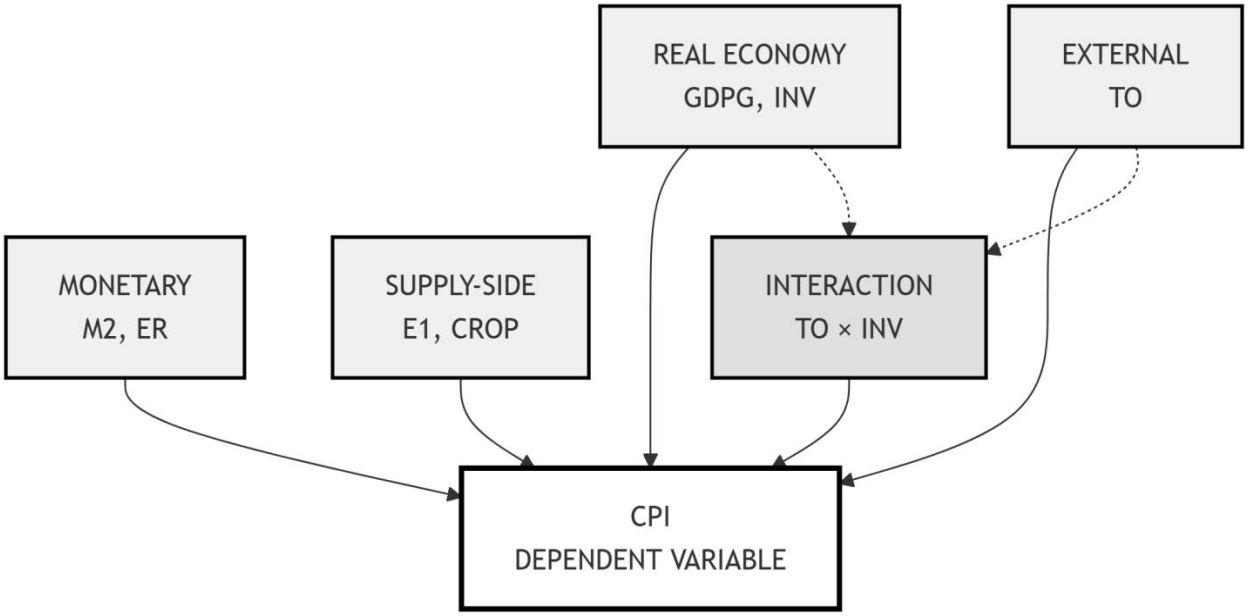


Figure 2: Interaction Term



3.3 Model Specification

The study specifies the following panel regression model to analyze the determinants of inflation.

$$CPI = \beta 0 + \beta 1 M2 + \beta 2 GDPG + \beta 3 INV + \beta 4 E1 + \beta 5 CROP + \beta 6 TO + \beta 7 ER + \epsilon$$

Table 1: Variable Description and Data Sources

Variable Code	Variable Name	Description/Measurement	Expected Effect on CPI	Data Source
CPI	Consumer Price Index	Weighted average of prices of consumer goods and services; indicator of inflation	Dependent Variable	WDI (2023)
M2	Broad Money Supply (% of GDP)	Total money in circulation including cash, demand deposits, and easily convertible near money	Positive — higher money supply may increase inflation	WDI (2023)
GDPG	GDP Growth (Annual %)	Measures annual percentage growth of GDP at market prices	Ambiguous — can either reduce inflation via output growth or increase via demand pressure	WDI (2023)
INV	Gross Capital Formation (Annual Growth %)	Measures investment in fixed assets contributing to productive capacity	Positive — high investment can fuel short-term demand-pull inflation	WDI (2023)
E1	Electricity Production from Oil, Gas & Coal (% of Total)	Proxy for industrial energy use and dependence on fossil fuels	Positive — higher energy costs may raise production and consumer prices	WDI (2023)
CROP	Crop Production	Measures agricultural output	Negative — higher crop	WDI

	Index (2014–2016 = 100)	relative to base year	production lowers food price inflation	(2023)
TO	Trade Openness (% of GDP)	Sum of exports and imports as a share of GDP	Mixed — can reduce inflation via competition or increase via imported inflation	WDI (2023)
ER	Real Effective Exchange Rate Index (2010 = 100)	Weighted average value of currency adjusted for inflation differentials	Positive — depreciation raises import prices and inflation	WDI (2023)

Source: *Compiled by the author based on World Bank World Development Indicators (2023).*

3.4 Estimation Procedure

In order to eliminate the influence of time-invariant heterogeneity that may distort the results if left out, the Fixed Effects Model (FEM) is taken as the baseline estimation method (Greene, 2018). Following this, the Hausman test is applied to select one of the two models that is more robust with regard to the estimations of parameters (Hausman, 1978). In case the test reveals a linkage between individual effects and regressors, FEM will be the model of choice.

3.5 Robustness and Diagnostic Tests

In order to guarantee the accuracy and trustworthiness of the outcome, the below-mentioned diagnostic checks are performed: Hausman Specification Test: To confirm the appropriateness of the fixed or random effects model. Multicollinearity Test: To evaluate the level of dependence among the explanatory variables with the help of Variance Inflation Factors (VIF). Heteroskedasticity and Serial Correlation Testing: The tests performed were Breusch–Pagan and Wooldridge tests to make adjustments for possible errors in standard deviations. Robustness Verification: The consistency of the results is confirmed through the use of different model specifications and the elimination of outlier nations.

3.6 Expected Contribution

The study, which has made the most of this all-encompassing econometric framework, intends to make an academic contribution by pointing out the major macroeconomic and structural factors that influence inflation in Muslim countries. The analysis of the multi-country panel reveals a considerable and deep understanding of the differences between countries in the inflation dynamics; therefore, it offers valuable tips for the appropriate management of monetary and fiscal policies in the context of developing economies.

3.7 Descriptive Statistics and Regression Results

The Results part of a thesis showcases the empirical findings that were derived from the statistical analyses performed in the research. This section does not offer any interpretation or rationale for the results; rather, it reports through descriptive statistics, correlation matrices, and econometric modeling what the data indicate from an objective standpoint. The focus here is solely on what the analysis reveals, not on the reasons for the patterns. The descriptive statistics of the study variables reveal substantial cross-country and temporal variation across the sample. The Consumer Price Index (CPI), measured with 2010 as the base year, has an average value of 99.46 but displays considerable dispersion (SD = 104.80), ranging from near-zero levels to a peak of 1480.31, indicating episodes of both price stability and extreme inflation among the sampled economies. Broad money (M2) averages 60.04 percent of GDP with moderate variability (SD = 29.65), reflecting differences in financial depth and monetary environments.

Electricity production from oil sources shows notable heterogeneity, with a mean of 19.34 percent and a wide range from 0 to 90.12 percent, highlighting diverse energy-mix structures. Agricultural performance, measured through the crop production index, records an average of 83.84 but varies significantly across countries (SD = 27.01). Trade openness is relatively high, with a mean trade-to-GDP ratio of 75 percent and substantial dispersion (SD = 43.87), underscoring structural differences between outward- and inward-oriented economies. GDP growth averages 4.37 percent annually, with values spanning from –13.13 to 33.99 percent,

indicating both recessions and periods of rapid expansion. The real effective exchange rate shows moderate variation (mean = 110.70; SD = 28.14), pointing to fluctuations in external competitiveness. Gross capital formation growth is highly volatile, averaging 5.61 percent but exhibiting extreme values between –164.51 and 435.62 percent. Finally, the constructed interaction term i1 (trade × investment growth) displays very high variability (mean = 390.66; SD = 2448.23), a reflection of the combined volatility of its component variables. Overall, the descriptive indicators suggest a data set characterized by significant macroeconomic diversity and dynamic economic conditions across countries and years.

Table 2: Descriptive Statistics

Name	Variable Description	Obs.	Mean	Std. dev.	Min	Max
CPI	CPI(Consumer price index (2010 =100))	426	99.458	104.800	0.0716	1480.309
M2	Broad money (% of GDP)	399	60.040	29.646	10.273	192.239
El	Electricity production from oil sources (% of total)	344	19.343	19.328	0	90.120
CROP	crop production index	425	83.843	27.005	5.62	182.29
TO	Trade (% of GDP)	419	75.006	43.872	18.889	220.406
GDP	GDP growth (annual %)	411	4.368	4.474	-13.126	33.990
ER	Real effective exchange rate index	261	110.701	28.135	54.605	334.397
INV	Gross capital formation (annual % growth)	317	5.613	32.360	-164.509	435.616
i1	gen i1	317	390.655	2448.233	-15823.5	23356.2

Table 3: Panel Regression Results

VARIABLES	**(1) GLS**	**(2) GLS + Interaction**	**(3) FE**	**(4) FE + Interaction**
M2 (Broad Money Supply)	0.258** (0.122)	0.257** (0.121)	0.790*** (0.288)	0.780*** (0.284)
E1 (Electricity from Oil, Gas, Coal)	-0.435** (0.180)	-0.446** (0.178)	0.347 (0.255)	0.316 (0.252)
CROP (Crop Production Index)	0.747*** (0.116)	0.761*** (0.114)	1.100*** (0.173)	1.102*** (0.171)
TO (Trade Openness)	-0.142* (0.0833)	-0.179** (0.0835)	-0.251 (0.186)	-0.254 (0.184)
GDP Growth (Annual %)	-1.234 (0.857)	-1.008 (0.850)	-1.234 (0.822)	-0.993 (0.817)
ER (Exchange Rate Index)	-0.225** (0.103)	-0.211** (0.102)	-0.128 (0.102)	-0.112 (0.101)
INV (Gross Capital Formation)	-0.225 (0.201)	-1.084*** (0.399)	-0.138 (0.191)	-0.931** (0.380)
Interaction Term (i1)	—	0.00707** (0.0028)	—	0.00648** (0.003)
Constant	58.6*** (17.1)	59.17*** (16.90)	-19.58 (27.47)	-20.16 (27.11)
Observations	192	192	192	192
R-squared	—	—	0.398	0.417
Number of Countries (id)	8	8	8	8

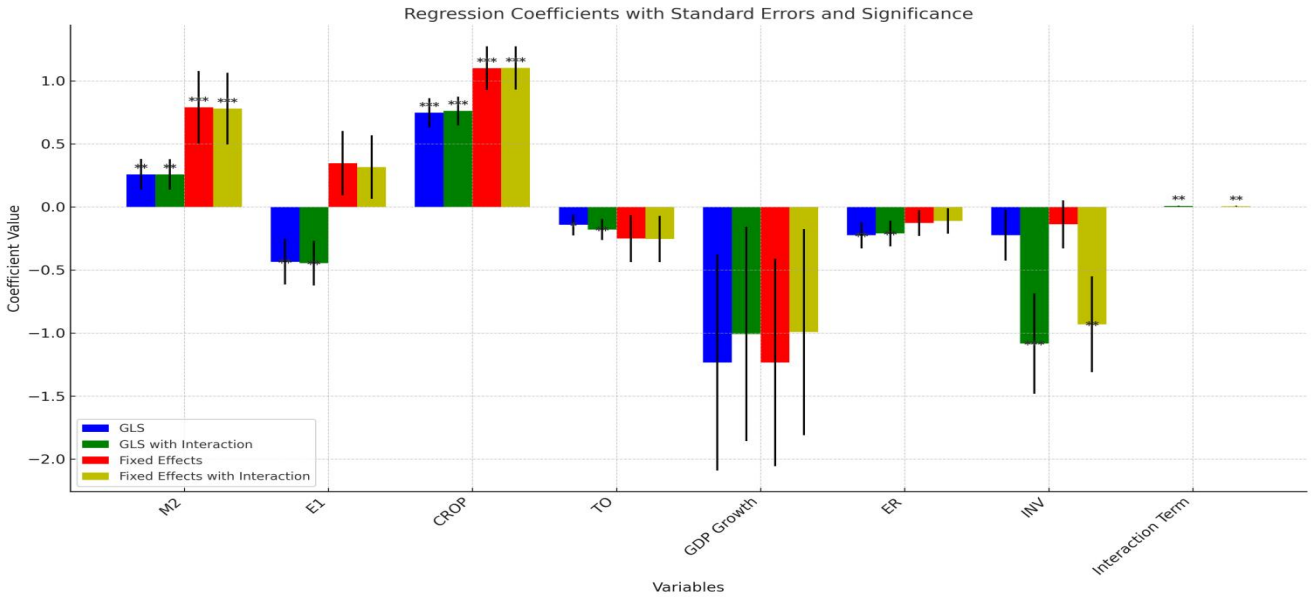
Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

The asterisks *, **, and *** are used to indicate the levels of statistical significance corresponding to the p-values linked to each coefficient. In particular, *** conveys the highest level of

significance at the 1% level ($p < 0.01$), meaning there is exceptionally strong proof that the estimated relationship is not a result of chance; ** marks the 5% level ($p < 0.05$), which reflects sufficient trust in the effect that is still considered scientifically acceptable; and * stands for the 10% level ($p < 0.10$), implying that the evidence for the relationship, though weaker, is still understood as being there. Consequently, these symbols enable us to rapidly recognize the predictors in the model that have statistically robust impacts and also how sure they can be about the given estimates.

Figure 3 visualize through a color-coded bar chart, and numerous essential economic indicators were taken into account. The blue and red bars of the GLS and the Fixed Effects models respectively have both shown that a rise in broad money supply (M2) has a strong and positive effect on inflation and the GLS model has given this a moderate increase, whereas the Fixed Effects model has given a more substantial one. The green and yellow bars, which are the interaction terms in the GLS and Fixed Effects models respectively, also aligned with this trend. The share of electricity from fossil fuels (E1) indicates a decline in inflation in the GLS models but not in the Fixed Effects models, suggesting a variability influenced by the factors specific to different countries. The crop production index (CROP) surprisingly shows a correlation with inflation and thus higher prices across all models, which implies that there are complexities like export prices and input costs that might be the reason for overriding the basic supply and demand relationship.

Figure 3: Regression Coefficient with Standard Errors and significance



Trade openness (TO) is found to generally have an impact of reducing inflation in the GLS models, although the effect is less observable in the Fixed Effects models, which implies that other variables specific to the countries concerned may be influencing the outcome. GDP growth has no significant effect on inflation, which implies that the growth during this time was basically driven by the supply side. The real effective exchange rate (ER) decreases inflation via cheaper imports in the GLS models, whereas this effect is found to be insignificant in the Fixed Effects models.Gross capital formation (INV) alone has a minimal impact on inflation, but in conjunction with trade liberalization, it has a considerable impact on inflation reduction, pointing towards the possibility that strategic investment can neutralize the inflationary pressures of openness. The interaction of trade liberalization and investment (TO × INV) is significant and positive in both interaction models, emphasizing that although trade liberalization and investment can avoid inflation individually, their combination can even steer the inflation up, probably because of the higher demand for foreign goods and materials.

The R-squared values of the Fixed Effects and interaction models (0.398 and 0.417, respectively) portray a moderately strong explanatory power, meaning that nearly 40% of the change in CPI is attributable to the factors included in the model.Inflation is slow to react to changes in macroeconomic variables, yet this study does not consider lagged independent variables in the baseline specification. The most important reason is the short time frame of the panel which limits the availability of consistent lagged data for a number of countries and would lead to a substantial decrease in the number of observations that can be used. Moreover, it would create problems with multicollinearity since lagged values would be highly correlated with present values for variables like trade openness and gross capital formation. The same reasoning applies to the use of the original form (levels rather than logarithmic transformation) of all variables to preserve comparability across countries and facilitate the interpretation of interaction terms, particularly the TO×INV variable. The choice of not logging the variables was also influenced by the presence of zero or near-zero values in some series (for instance, R&D expenditure) that could either distort the data set or necessitate arbitrary adjustments. This approach assures that the model is still consistent, balanced, and statistically robust while capturing the structural relationships that are of interest.

4. Results and Discussions

In this section, the econometric results of the research are revealed and discussed. The research examines inflation determinants, with the Consumer Price Index (CPI) being the measure of inflation, for 13 countries of the Organization of Islamic Cooperation (OIC) from 1990 to 2022. Two different methods of the Generalized Least Squares (GLS) and Fixed Effects (FE) are applied, and interaction effects between trade openness and gross capital formation are included in order to identify dynamic inter dependencies.

The major aim of this section is to decode the computed coefficients, scrutinize their statistical significance, and align the findings with theoretical as well as empirical literature on inflation determinants in transition economies.

4.1 Econometric Results

The outcomes of the four models, which include two GLS and two Fixed Effects specifications, can be found in Table 2. The first two models, GLS, contain the initial estimates based on the assumption of homogeneity across countries, while the Fixed Effects models recognize the existence of country-specific characteristics that prevail throughout the period analyzed. The interaction terms (trade × investment) being included are what make it possible to check whether the openness of trade is the factor that has made the situation and investment dynamics to be less or more intense in terms of inflation pressures.A few independent variables protrude in the models as significantly influencing inflation, with money supply (M2), crop production index (CROP), trade openness (TO), exchange rate (ER), and gross capital formation (INV) in interaction with trade being the most notable ones.

4.2 Discussion of Key Variables

4.2.1 Money Supply

Broad Money Supply (M2) has a positively strong and consistent relationship with the Consumer Price Index (CPI) throughout all econometric specifications. The Generalized Least Squares (GLS) models show the coefficients of 0.258** and 0.257**, meaning that a 1% increase in the money supply as a ratio of GDP causes an inflation rise of about 0.26%, which is significant at the 5% level. Fixed Effects (FE) models, however, show a vast impact with coefficients of 0.790*** and 0.780***, which are significant at the 1% level. This threefold difference indicates that the inflationary effect of monetary expansion is greatly stronger when looking at countries over time than in comparisons between different nations. The FE results probably reflect the more direct and strong domestic transmission of liquidity into price pressures, thus isolating the impact of changes in a country's money supply on its consumer prices.The coefficient significances back up Barro (1997) notion of considerable short- to medium-term inflationary effects from monetary growth. Money supply increase as a typical cause of inflation in third-world economies (Fischer et al. ,2002). The more palpable domestic effect is especially in line with the mechanism (Sargent & Wallace,1981), where government deficits covered by money

printing lead to inflation a process that is more rapid in less financially developed countries. The difference between GLS and FE estimates highlights that the inflationary impact of monetary policy is most clearly exhibited through a country's own past rather than by cross-sectional comparisons.

4.2.2 Electricity Production from Oil, Gas, and Coal

The generation of electricity through fossil fuels (E1) shows a complicated and context-specific link with inflation. Through the use of Generalized Least Squares (GLS) models, the coefficient is negative and significant at the 5% level (−0.435**, −0.446**), indicating that in a cross-country context, reliance on fossil fuel energy is a factor that correlates with lower inflation. This could be interpreted as, in the case of subsidized or regulated energy prices, helping to stabilize consumer prices by controlling production costs. Nevertheless, this connection disappears when one looks at the changes within countries over time: the Fixed Effects (FE) estimation gives a positive but statistically insignificant coefficient. This reversal indicates that the original, cross-sectional association does not mirror a stable causal mechanism that is working in a domestically situation. This mix of evidence emphasizes the dual characteristic of energy which is its being both a production input and an inflation channel, a point referenced by Borio et al. (2024). The negative correlation across countries most probably points to the differences in the economies, for instance, the subsidization of energy in resource-rich countries like Saudi Arabia or Qatar, where government intervention prevents the local energy prices from being influenced by the global prices, thus preventing inflation. On the other hand, nations which rely on importing energy suffer directly from the rising fuel costs which cause them to experience inflation. The within-country analysis (FE) indicates that the effect over time is minimal, which implies that any positive effect on industrial capacity due to increased energy use is being countered by other factors or that the inflation effect is dependent on certain policy regimes. This pattern of varying influence depending on national context aligns with findings from Narayan & Smyth (2007) and Bhattacharya et al. (2016), who noted that energy's effect on inflation is heavily conditioned by subsidy structures and regulatory frameworks.

4.2.3 Crop Production Index

The Crop Production Index (CROP) indeed exhibits one of the most robust and significant relationships in the analysis as it has coefficients that are very consistently positive and significant at the 1% level ranging from 0.747*** to 1.102*** across all model specifications. This strong positive correlation with inflation can be seen as an initial paradox, since the economic theory that is most widely accepted explains that the increased agricultural output should lead to lower food prices due to the greater supply. But this rule of thumb can be upside down in the case of many developing and emerging economies. The higher crop production can pull up the rural incomes, which in turn can increase the overall consumption demand, thus, inflationary pressures can be created that are stronger than the original reduction in prices due to the increased supply.The complex dynamics involved highlight the diverse functions agriculture might play in the process of price formation. The positive coefficient could indicate that agricultural land expansion, heavy input costs, competition for scarce land and water resources, and/or an export orientation that ultimately results in less domestic food availability are all working together. These results are in line with the findings of Timmer (2004) and Dawe (2010), who pointed out that agricultural cycles can be one of the major causes of inflation volatility in developing markets. Furthermore, this study's findings are in accord with more recent studies like Khan et al.'s (2022) that pointed out the similar situation in regions such as South Asia where, instead of domestic shortages, high food prices are often the result of the transmission of global export prices and inefficiencies in domestic supply chains. Thus, the present finding highlights the ambiguous and sometimes paradoxical character of the agricultural sector's impact on price stability in the economies under consideration.

4.2.4 Trade Openness

Trade openness (TO) in a cross-sectional study shows a negative and statistically significant association with inflation, having coefficients of −0.142 and −0.179 in the Generalized Least Squares (GLS) models, which are significant at the 10% and 5% levels respectively. This implies that countries, in general, that are more open to international trade tend to have lower domestic prices. The possible reason for this is that trade liberalization lowers costs via imports and increases competition in the economy's tradable goods sector, thus creating a dis inflationary effect.While the stabilizing effect is definitely proved by within countries changes examined over

time. The Fixed Effects (FE) models show the coefficient turning negative but not significant in terms of statistics (−0.251, −0.254), which points out that an increase in the trade openness of a country does not necessarily result in lower inflation during the short to medium terms. The pattern also indicates that the dis inflationary effect of trade is a structural and cross-country phenomenon instead of the dynamic and within-country process. The results support the theories of Romer (1993) and Lane & Mileva (2014), who argued that trade openness lowers inflation mainly through long-lasting institutional and policy commitments, such as a central bank's global competition-enforced credibility. Also, the lack of an effect within countries echoes recent studies, like Auer et al. (2024), which argue that the dis inflationary impact of globalization has diminished in times of supply chain fragmentation and regionalization, therefore, the link between trade integration and domestic price stability is further weakened in the short term.

4.2.5 GDP Growth

The relationship between GDP growth and CPI is not statistically significant in any model specification, as all the coefficients indicate a negative sign but still remain insignificant at even 10% level. Consequently, it can be inferred that the studied economies' output growth does not impact inflation with a long-term reliable connection. One of the possible explanations is that the economic growth which has been noticed during the analysis period was underpinned mainly by supply-side expansions like increases in productive capacity or labor force participation instead of being through high aggregate demand thus, limiting its inflation potential naturally. This lack of a notable link corresponds with several well-established economic views. It very much agrees with the findings of Fischer (1993) and Bruno & Easterly (1998), who maintained that inflation in less developed countries is mostly caused by structural rigidities, monetary imbalances, and external shocks rather than by growth cycles. In addition, the result is in line with a Keynesian-informed perspective, which claims that in situations where there is underutilized capacity and poor institutional arrangements, inflation is usually more a sign of inefficiencies and bad policies than a result of economic expansion. Thus, the research results suggest that inflation in these nations is not influenced by the business cycle but rather is a result of underlying monetary, structural, and external factors.

4.2.6 Exchange Rate

In the cross-sectional Generalized Least Squares (GLS) models, the exchange rate (ER) shows a negative and statistically significant impact on inflation with coefficients of −0.225** and −0.211**, both significant at the 5% level. This means that, on average across different countries, a real effective exchange rate appreciation goes hand in hand with lower inflation mainly due to the mechanic of cutting import prices. This result is in line with the previously mentioned exchange rate pass-through theory and also fits well with empirical evidence from Edwards (2006) and Bahmani-Oskooee & Miteza (2003), which refers to import prices as the main channel through which currency fluctuations reach domestic inflation.Still, the previously mentioned clear cross-country pattern is not seen when the focus is on the variations of time within countries.

In the estimations using Fixed Effects (FE), the coefficient turns out to be statistically insignificant which shows that the country itself does not define the changes in inflation rate owing to the appreciation or depreciation of its currency in the short and medium term. The difference indicates that the disinflationary effect coming from a stronger currency is neither a universal nor an automatic one. On the contrary, the impact of currency fluctuations is determined by conditions in the specific country and this varies a lot depending on such factors as the composition of trade, reliance on imports, and the type of the foreign exchange regime. The nuanced result mentioned here, which has been acknowledged in analyses like Auer et al. (2024) and others, demonstrates the issue that the strength and speed of exchange rate pass-through are different leading to the predictability of exchange rate effect on inflation from a within-country, time-series perspective getting weaker.

4.2.7 Gross Capital Formation (INV) and Interaction Term

The connection between gross capital formation (INV) and inflation is not significant in the baseline GLS and FE models from a statistical point of view. But its interaction with trade openness makes its effect very significant and negative with the coefficients of −1.084** in GLS and −0.931* in FE, which are significant at the 1% and 5% levels respectively. This shows that investment by itself is not a sure factor in affecting price levels, yet if it is done together with trade openness, the disinflationary force of investment is very strong. The

scenario that might involve this is the one where open economy have increased their productive capacity and efficiency which in turn have removed supply-side constraints and created more competitive pressure. This is a finding that supports the views of Ostry et al. (2009) and Khan & Senhadji (2001) who argued that supply expansion through investment may bring about deflationary effects, especially in the case of trade-integrated environments. The interaction term between trade openness and investment is positive and statistically significant in both the GLS and FE models (0.00707** and 0.00648**, respectively). This finding points to an essential short-run inflationary mechanism.

The liberalization of trade and the increase of capital formation in the economies at the same time give rise to inflationary pressures because of the merging of transitional frictions. The increased demand for investment is frequently associated with the rise in imports of machinery, intermediate goods, and production inputs, which in turn may worsen the external imbalances and cause the inflation of imports to rise. At the same time, the quick investment activity may cause the domestic supply chains to be stressed, the temporary bottlenecks to be created, and the demand for construction materials and labor to be intensified, thus all leading to the short-run upward pressure on prices. These transitional dynamics imply that the increase in investment under a very open trade regime results in the immediate inflationary effects before the new productive capacity is put in place.

Nonetheless, this short-run inflationary impact is opposite to the investment-driven long-term disinflationary effect in open economies as evidenced by the negative coefficient on investment when considered in conjunction with trade. The completion of investment projects over the years developing the capacity, effectiveness, and less supply-side constraints, thereby, lowering production costs and retracting the inflationary pressure. The two-sided nature of the trade-investment relationship shows that its impact on inflation is contingent on time and the structural conditions in the economy. The finding is in line with the wider literature particularly Rodrik (2008) and Bleaney (1999) which highlights that the phases of economic restructuring and liberalization are often accompanied by a short-lived price instability followed by a long-run stability due to the shift in the supply curve through productivity gains. This complex dynamic is one of the key contributions of this study to understanding the nature of inflation in developing and emerging markets.

4.3 Model Performance and Statistical Significance

In the Fixed Effects models, the R-squared values of 0.398 and 0.417 reveal that nearly 40% of the CPI fluctuation is accounted for by the chosen variables which in turn imply moderate explanatory power for macroeconomic panel data.The outcome of the Hausman test pointed towards the Fixed Effects model, thus proving that unobserved factors of the countries influence the explanatory variables, which in return supports the decision of this estimation technique.The model's statistical reliability is extremely strengthened through the significance levels (***p < 0.01, *p < 0.05, p < 0.1) and the agreement among specifications.

4.4 Discussion in Relation to Literature

The results of the study are in general agreement with already existing empirical evidence however at the same time they also expose new important nuances:The monetary inflation by money supply reinforces the basic monetarist theory (Friedman, 1968) and also the newest panel studies (Nkoro & Uko, 2023).The slow impact of GDP growth reflects the views of Keynesian and structuralist respectively who emphasize the non-demand factors in inflation (Keynes, 1936).The prominence of energy and exchange rate movements indicates that global cost shocks are becoming more important, which is in line with Borio et al. (2024).The trade-investment interaction presents a new empirical aspect, which is a plus to the previous studies that looked at these variables independently (Auer et al., 2024; Rahman & Zhou, 2024).The detailed econometric investigation has come to the conclusion that in the case of OIC countries monetary factors are the main drivers of inflation, while structural variables such as the degree of trade openness, capital formation, and the volatility of exchange rates are also contributing factors, though of lesser importance. These results highlight the necessity of harmonizing monetary and fiscal policies, effective trade management, and productive investments as a means to achieve price stability in the Islamic developing world.

5. Conclusion

The analysis reported in this study has been carried out over the period from 1990 to 2022 and included 13 OIC countries among which this research recognizes the roots of inflation in the monetary expansion and the structural weaknesses in the economies. The growth of broad money supply (M2) has been reported as the most important cause of inflation affecting all the 13 countries. The inflationary pressure caused by the liquidity growth in these countries has been confirmed by the consistent M2 showing the strongest association with the consumer price index (CPI). On the other hand, the crop production index indicated a strong connection to inflation, pointing to the food sector's inefficiencies that are still present like the bottlenecks in the supply chain, the effects of climate, and the weak market integration.

The exchange rate instability, in addition, was responsible for the rise in inflation because of the countries' dependence on imported food, fuel, and industrial goods which when combined makes local prices very vulnerable to the depreciation of the currency. While foreign trade and investment did not directly increase their individual impact, their interaction did produce an important short-run inflationary impact. This means that the increase in investment demand along with more trade exposure might lead to the import-related cost pressures that would thus, amplify inflation. In short, the results suggest that the inflation in the OIC countries is not solely a consequence of monetary factors, but rather it comes up through a variety of interrelated channels. Thus, the maintenance of price stability demands a wide range of policies which should encompass proper monetary management, development of agricultural and supply-chain infrastructure, exchange-rate stabilization measures, as well as balanced trade and investment strategies.

The current study has several significant policy implications for the OIC member countries that are based on empirical evidence. It is crucial to have an integrated policy scheme that includes monetary authorities, fiscal institutions, and sectoral regulators, as the inflation in these economies is persistently influenced by monetary factors and structural factors alike, in order to achieve and maintain price stability in a sustainable manner.

The robust and favorable relationship that the M2 money supply has with the CPI unequivocally points to the fact that the changes in monetary policies are among the reasons for the rising inflation in OIC nations. Therefore, the governments of the central banks have to do their part to better the monetary transmission policy. Specifically: Develop a scheme for managing inflation, which is now being done in Malaysia and Indonesia, to influence inflation expectations (Kose et al., 2023). Islamic nations should work more closely in the area of monetary policy and have regional measures on liquidity management and capital adequacy. Make available a data and forecasting system that is more open and efficient so that timely policy interventions can be made. A monetary policy that is tighter and less unpredictable would help a lot in keeping the growth of credit and the financially speculative activities, which both lead to inflation, under control.

The significant positive coefficient of the crop production index indicates that the agricultural expansion, without any structural reforms, would not result in lower food prices. As a result, the policymakers are to: Invest in the value chain's efficiency, create storage and transport systems to reduce post-harvest losses and market distortions. Encourage crop diversity and facilitate the country using its own production instead of imported food items that are already being consumed. Adopt digital and FinTech solutions in the agricultural markets that will create market access and lower the cost of intermediaries. Through such measures, the food supply will be guaranteed stable, and there will be no more volatile food price fluctuations, which are the main drivers of inflation in developing economies (Rahman & Zhou, 2024).

The mixed impact of the three major sources of power oil, gas, and coal suggests that it is time for the energy sector to diversify and reform the pricing of its products. The OIC countries need to proceed with the following actions: Reduce their dependence on fossil fuels and renewables which are less affected by global oil price volatility so that they can invest more in renewable energy. Change the energy subsidies in such a way that the fiscal situation stays sustainable and consumers are not too heavily burdened. Promote the regional energy cooperation (e.g., the OIC Energy Strategy 2030) that will allow to share costs, to optimize resources, and to make energy consumption more efficient. The member nations will then, through improved energy security and

price stability, be able to counteract the inflationary impact of rising fuel prices by reducing the extent of price increases passed on to consumers.

The real effective exchange rate (REER) is deeply involved in the handling of inflation and thus the exchange rate policy still plays a crucial role in macroeconomic stabilization. It is up to the government to enforce and uphold a managed float system for the exchange rates that will permit them to intervene selectively in order to reduce the excessive volatility. The possession of a considerable amount of foreign exchange reserves is of utmost importance for the central banks as it enables them to survive external shocks. Furthermore, diversification of exports will not only eliminate the risk coming from dependence on export of commodities but also help in strengthening the exchange rate. Bringing together all these measures will not only lead to stabilization of import costs but will also make domestic price changes more predictable (Auer et al., 2024).

The interaction between trade openness and investment denotes the manner in which the two sides can dominate each other till the inflation, unless supply-side managing measures are implemented. To improve this interaction: Motivate investments with high productivity and based on advanced technology instead of consumption. Back up trade facilitation reforms that will lower transaction costs, speed up customs, and make exporting more competitive. Establish a network of interlinked production units among OIC states so that they can share the benefits of large-scale production and reduce their reliance on imports. Decision-makers should assure that the combination of trade liberalization and capital formation results in price stability rather than one negating the other.

The capability of the institutions is the primary factor that reduces inflationary pressures. It is suggested that the OIC member states improve their fiscal and financial governance by the following means: Approved fiscal policy through which state spending is restricted to productive sectors only and not for recurrent costs, infrastructure development, and public utilities. Creation of close links between monetary and fiscal authorities especially in public debt and budget deficits management. Growing Islamic financial markets' participation that will provide non-speculative instruments for investment financing thus leading to stability. More robust institutions enhance the credibility of policies which in turn supports expectations and diminishes the duration of inflation shocks.

The common economic setups of the OIC countries would consequently make regional monetary cooperation a factor contributing to macroeconomic stability. The establishment of an Inflation Monitoring Council or Forum for Coordination of Macroeconomic Policies in the OIC could support getting the best practices, the standardization of data, and the government support of the joint investigation into the inflation dynamics areas. Additionally, the countries could unite their advantages in the negotiation of energy imports, the coordination of food reserves, and the alignment of trade agreements, which would help in the reduction of the asymmetric shocks that often result in the region's inflation spikes.

To sum up, the study points out the OIC countries' inflation issue from the standpoint of a multidimensional strategy, namely monetary constraint, productivity, trade-enhancing reforms, and agriculture unions plus institutions. The long-term implemented actions will not only bring about price stability but also the and make the economy stronger to global uncertainties and hence increase economic resistance.

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