

EXCHANGE RATE REGIMES AND FINANCIAL RESILIENCE: A COMPARATIVE ANALYSIS OF NORTH MACEDONIA AND TURKEY

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Abstract

In this paper we study the financial stability and resilience of two emerging economies with contrasting exchange rate regimes, in such a comparison not studied before, North Macedonia and Turkey. North Macedonia has maintained a long-term peg to the euro, aiming for economic stability but limiting monetary flexibility, while Turkey's flexible exchange rate regime allows for greater policy discretion and higher volatility.

Using quarterly data from 2010 to 2024, from relevant international and domestic financial institutions, we employ the VAR models augmented with global exogenous factors (VARX), to analyze the relationships between the real effective exchange rate, the current account balance, foreign reserves, and financial indicators. Through impulse response analysis, we found different transmissions of the external shocks, such as price changes and interest rate to these two economies.

Moreover, their response was different, while our results show that North Macedonia's fixed exchange rate regime ensures short-term stability of the denar but increases its sensitivity to external imbalances, while Turkey's flexible exchange rate allows for faster adjustment to the costs of the volatility of the Turkish lira exchange rate. Our findings show that no single exchange rate regime fully protects economies from global shocks, and therefore resilience depends on the good management and coordination between monetary and fiscal and overall macroprudential policies. This paper contributes to the debate on exchange rate strategies in emerging economies and their implications for stability, linking monetary policy, financial openness and external balance.

Keywords: Exchange rate regime, emerging economy, sustainability, geoeconomic resilience, REER

Introduction

Financial integration is developing rapidly and the global economy has experienced frequent episodes of external shocks. These shocks include changes in the monetary policy of developed economies and volatile commodity prices. They represent important for the macroeconomic stability of small and developing economies, as they determine key indicators including inflation, current account balances and foreign exchange reserves. A key factor determining the transmission of such shocks in any country is the exchange rate regime. This factor determines the adjustment mechanisms that can be used by policymakers to determine the resilience of the country's economy to external shocks. The Mundell-Fleming trilemma is the theoretical basis of this relationship. It argues that an economy cannot maintain a fixed exchange rate, free capital mobility and independent monetary policy at the same time. Countries decide to manage this trilemma by choosing between two different scenarios. They will either focus more on fixed exchange rates to maintain credibility and stability in trade, or will focus more on flexible regimes to maintain monetary freedom and absorb external shocks through exchange rate flexibility.

The effect of these regime decisions on the transmission of external shocks is little studied through empirical analysis in developing economies, especially in a comparative context considering their

policy structures. This paper contributes to filling this gap through a comparative study of two opposing regimes, such as North Macedonia, which is de facto pegged to the euro, and Turkey, which manages a floating exchange rate and, with a target in inflation. The analysis focuses on two main sources of external disruptions. Monetary policy shocks of the European Central Bank (ECB), and global commodity price shocks represented by the price of Brent crude oil.

Our hypothesis states that external shocks will be transmitted more strongly to the country with a fixed rate than to the country with a floating rate. Therefore, to answer these questions, in this paper we will use econometric time series analysis with quarterly data between 2010Q1 and 2024Q4. We analyse it by building country-specific Vector Autoregressive models, adding global exogenous variables (VARX).

Also, we measure the dynamics and relative importance of external shocks using impulse response functions and forecast error variance decomposition. Through this method, we enable a clear separation of the transmission channel in the exchange rate adjustment of each country. The results show that there is a fundamental difference in the transmission of shocks. North Macedonia shows a full pass-through of the ECB's monetary policy, and this affects the currency's appreciation, and as a result increases the current account and brings disinflation. It also increases the sensitivity to commodity-based inflation. Turkey's floating exchange rate, in contrast, expects the exchange rate to fall with the same shocks, in order to include a buffer while maintaining monetary independence. The exchange rate captures a higher share of the variance in external shocks. Furthermore, this increases current account tensions and inflation pass-through. Through variance decomposition, we show that external shocks account for 60 percent of the variance in inflation in North Macedonia and 45 percent in Turkey.

This paper can be considered an addition to the international economic literature in several ways. First, the paper provides a cross-regional comparison of shock transmission in two less studied regimes in Europe. Second, we go beyond the theoretical statements of the trilemma, as we measure the actual costs of price regulation against the costs imposed by each regime. Third, the findings of the paper can serve policymakers in these economies in determining the trade-offs between stability, autonomy and resilience. These results highlight the fact that there is no economy with dominant regimes. Each of them presents different trade-offs of resilience and vulnerability. Therefore, they need to be addressed with complementary policies.

The structure of the paper consists of several sections as follows. In Section 2 we describe the background literature. In Section 3 we continue with the empirical data and methodology. It also shows the strongest findings that include unit root tests, cointegration, VAR estimates, impulse responses and variance decompositions, a diagnostic analysis and robustness checks. In Section 5 we discuss the findings, interpret them by comparing them with the economic literature and assess the policy implications. Section 6 summarizes the concluding remarks.

Literature Review

The choice of exchange rate regime remains a central issue for world economies, especially for developing countries that face volatile global capital flows and external shocks (Frankel, 1999). The theoretical basis for this analysis is derived from the Mundell-Fleming trilemma (Mundell, 1963; Fleming, 1962), which states that countries cannot simultaneously maintain fixed exchange rates, free capital mobility, and independent monetary policy. This framework predicts that different regimes must decide to sacrifice something in whichever exchange rate regime they choose. Subsequent modifications, including the fear of exchange rate volatility hypothesis by Calvo & Reinhart (2002), argue that even countries with declared floating exchange rates often intervene

too much, blurring the clear dichotomy but reinforcing the underlying trade-off. Based on this assessment, the theory of the optimal currency area (OCA) (Mundell, 1961; McKinnon, 1963) identifies conditions such as labor mobility, economic integration, and shock symmetry in which fixed exchange rates or monetary unions are necessary. For developing economies, the credibility gains from fixed exchange rates according to Giavazzi & Pagano (1988) must be weighed against the loss of the exchange rate as a shock absorber, especially for asymmetric real shocks. The empirical validity of the trilemma is supported in modern, financially integrated contexts (Obstfeld, Shambaugh, & Taylor, 2005). However, some scholars conclude that it has evolved into a “dilemma” due to the dominant global financial cycle (Rey, 2015).

A large number of empirical studies examine how external monetary shocks are transmitted across borders, considering the moderating role of the exchange rate regime. Studies using Vector Autoregression (VAR) methodologies have found that fixed regimes have a more complete transmission of interest rate changes and domestic inflation. Shambaugh (2004) shows that interest rates in fixed economies closely follow those of the core country, while floating regimes exhibit a significant decoupling. Studies in the euro area confirm significant spillovers from ECB policy to both member and non-member economies in the European periphery, with transmission being stronger for countries with fixed exchange rate agreements or deep financial linkages (Georgiadis, 2016). Among these countries is North Macedonia, as the majority of banks operating in the country are composed of capital coming from Europe. However, these studies often pay less attention to differential transmission in specific macroeconomic variables such as the current account and reserves, which are central to external stability. This is where the contribution of this paper comes into play, as it includes a wider range of variables.

Regarding external shocks, for developing economies that import goods, price shocks pose a major challenge. Recent research shows that exchange rate regimes create the burden of adjustment between prices and quantities. Under flexible rates, nominal depreciation can partially compensate for the deterioration in the terms of trade, spreading the adjustment throughout the economy (Broda, 2004). Under fixed rates, the full impact is borne by domestic absorption and prices, worsening inflation (Edwards, 2006). Cuestas & Gil-Alana (2018) study confirm that in Central and Eastern European economies, oil price shocks have stronger persistent inflationary effects in fixed regimes. However, comparative studies that analyze the responses of fixed versus floating exchange rates using harmonized data remain scarce, especially for the Western Balkans and Turkey.

The empirical literature has evolved to the use of factor-based models that better identify exogenous shocks. The use of sign constraints (Uhlig, 2005) and global VAR (GVAR) (Pesaran, Schuermann, & Weiner, 2004) has improved the analysis of international spillovers. However, Rey (2015) has argued that the “global financial cycle” can reduce monetary autonomy even under floating regimes. This changes the traditional trilemma into a “dilemma”. It also highlights the need for updated comparative studies that focus on regimes and that take financial integration into account and use robust identification strategies to isolate different types of shocks (Jordà, Schularick, & Taylor, 2020).

Countries in the Western Balkans, including North Macedonia, aiming for eventual EU membership have adopted a de facto fixed exchange rate regime to the euro as an anchor of stability. Studies on the transmission of shocks in this region also highlight the vulnerabilities to eurozone business cycles and monetary policy. As a result, the synchronization of business cycles with the eurozone is often imperfect (Hildebrandt, & Moder, 2015). However, most studies focus on country-based analyses. Some studies focus on broader convergence criteria, creating limited comparative analysis of non-candidate floating regimes, using data with a frequency to capture recent global shocks.

Turkey represents a large emerging economy. It maintains a managed floating regime and an inflation-targeting regime. Since the 2001 crisis, Turkey has adopted greater exchange rate flexibility, albeit with ongoing interventions (Kara, 2012). Studies on Turkey's capacity to absorb shocks have yielded conflicting findings. Some argue that exchange rate flexibility has helped to cushion external shocks after 2001 (Yörükoglu & Atasoy 2011), while others highlight the need for a continuing trade-off between exchange rate volatility and inflation control (Ilhan, Akdeniz, & Özdemir, 2023).

Despite the existing literature, there are important gaps to be studied. These include the lack of direct comparison and harmonized methodologies. Most studies examine fixed or floating regimes, or use large panels where country-specific mechanisms are not exposed directly. There are few studies have used identical empirical models such as VARX to compare the transmission channels between two distinct regimes during turbulent periods. Also, the comparison between the pegged euro exchange rate in North Macedonia and the managed floating exchange rate in Turkey, has not been studied. Many studies analyse inflation or output, while few studies analyse the triangular response of the current account, reserves, and exchange rate to various shocks, which is essential for assessing external resilience (International Monetary Fund, 2022).

With this paper, we contribute by conducting a direct analysis using harmonized VARX models for two regimes over the same period (2010–2024). We also compare the transmission of monetary policy (ECB) and commodity (oil) shocks to the set of key external and domestic variables. By filling these gaps, this study offers policymakers evidence-based insights into the resilience profile of their exchange rate regime choices in similar economies.

Methodology

Data and variables

In this study, we use time series to analyze the transmission of external shocks and the financial stability mechanisms of the two countries. We use two different exchange rate regimes, a euro-pegged regime in North Macedonia and a floating regime managed with inflation targeting in Turkey. We have prepared the data in quarterly observations from the first quarter of 2010 to the fourth quarter of 2024. It is important to note that this period includes several global shocks, including the post-2008 financial crisis, the European debt crisis, the COVID-19 pandemic, and the recent energy crisis.

The data is collected from the IMF's International Financial Statistics (IFS), the World Bank Data, and the respective national central banks (National Bank of North Macedonia and Central Bank of Turkey). In the data set, we have included endogenous variables such as: the real effective exchange rate (REER, based on CPI) that measures competitiveness and adjustment; the current account balance (% of GDP) to capture stability; total reserves (months of imports) as a proxy for shock absorbers; consumer price inflation and GDP growth as macroeconomic control variables; imports of goods and services (% of GDP) that measure openness and exposure; and net FDI and portfolio inflows (% of GDP) to capture financial integration channels and energy use (kg of oil equivalent per capita). We include the ECB policy rate (MRO) and the price of Brent crude oil as exogenous regressors, or external shocks.

Empirical Models

To analyze how external shocks are transmitted under different exchange rate regimes, we use country-specific Vector Autoregressive (VAR) models. We also apply VAR models augmented with global exogenous factors (VARX). Below we present the models and equations used in this paper. Unit-root testing (ADF) Augmented Dickey–Fuller (ADF) regression of the form below is estimated at levels and at first differences.

$$\Delta X_t = \alpha + \rho X_{t-1} + \sum_{i=1}^p \gamma_i \Delta X_{t-i} + \varepsilon_t \quad (1)$$
$$H_0: \rho = 0, \quad H_1: \rho < 0$$

Johansen cointegration framework:

$$\Delta y_t = c + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + u_t, \quad \Pi = \alpha \beta' \quad (2)$$

After the data preparation process, the first analysis is the Augmented Dickey Fuller test, which shows that all the main variables are non-stationary in the levels. However, they become stationary in the first differences for both countries. This allows us to apply the differentiated VAR/VARX specifications for the dynamic analysis. Also, the cointegration test using the Johansen trace test does not show a stable long-run relationship between the level variables for these countries, although the individual variables have stochastic trends. We estimate the optimal lag length (AIC/SBIC/HQIC) for each country separately and based on the best result. For the best result we use an optimal lag of 1 for North Macedonia and 2 for Turkey. Both VAR systems meet the stability conditions (all eigen values lie inside the unit circle). (the exact results are presented in the appendix). This result confirms that the models are stationary and suitable for impulse response analysis. Therefore, we proceed with the estimation using VAR/VARX in first differences.

Baseline VAR(p):

Let y_t denote the vector of domestic variables and x_t the vector of exogenous shocks.

$$y_t = c + \sum_{i=1}^p A_i y_{t-i} + u_t, \quad u_t \sim i.i.d. (0, \Sigma_u) \quad (3)$$

VARX(p, q) with exogenous global shocks:

$$y_t = c + \sum_{i=1}^p A_i y_{t-i} + \sum_{j=0}^q B_j x_{t-j} + u_t \quad (4)$$

The VARX(p, q) specification includes exogenous shocks x_t (ECB_MRO and Oil price).

Operational specification in first differences:

$$\Delta y_t = c + \sum_{i=1}^p A_i \Delta y_{t-i} + \sum_{j=0}^q B_j \Delta x_{t-j} + u_t \quad (5)$$

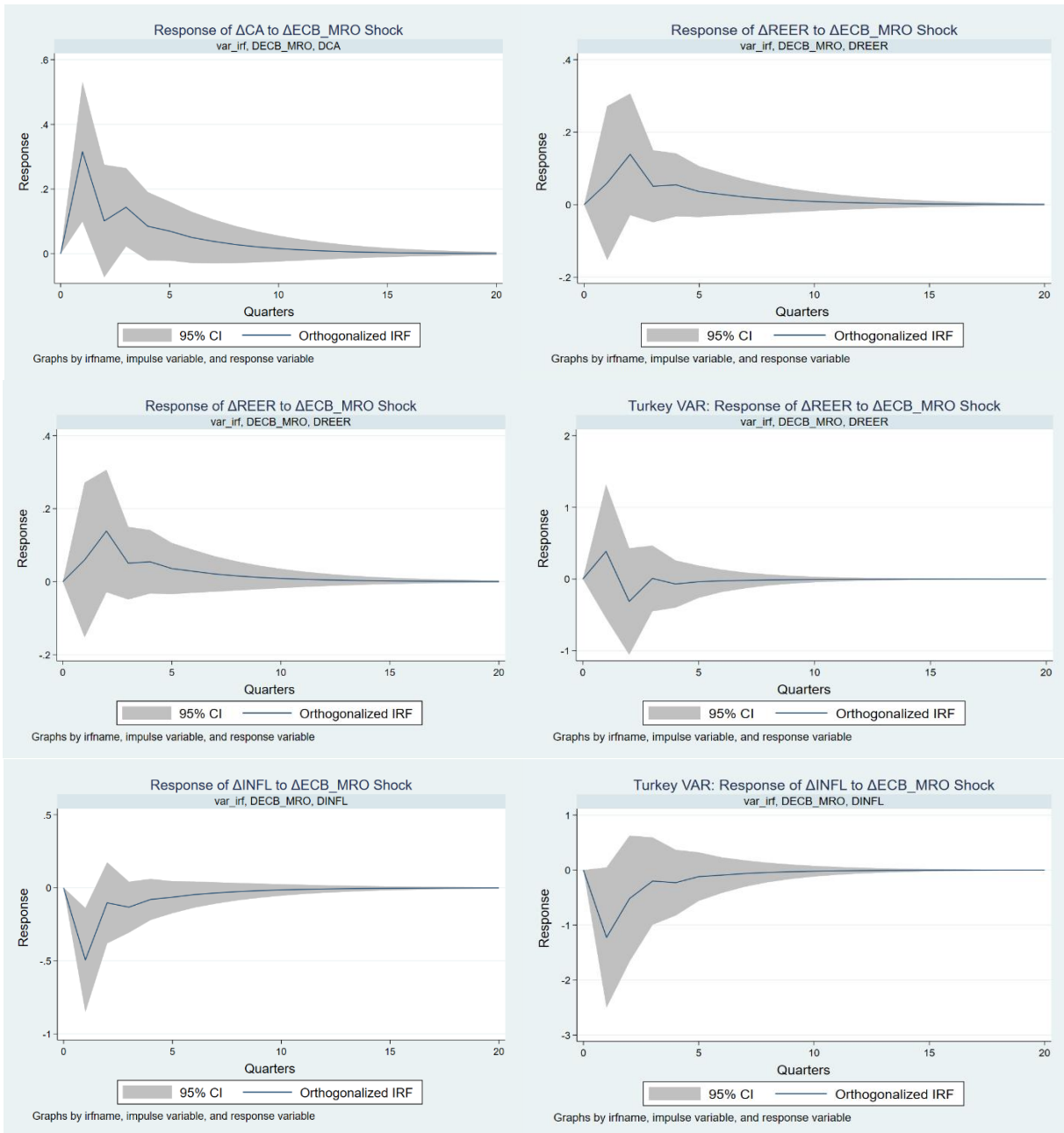
Empirical results

Impulse Response Analysis

The operational models are estimated in first differences to ensure stationarity and avoid spurious regression. All estimated systems satisfy the stability conditions (characteristic values inside the unit circle). We calculate the impulse response functions (orthogonalized IRFs) using the Cholesky decomposition in the order: $\Delta REER \rightarrow \Delta CA \rightarrow \Delta RES \rightarrow \Delta INFL \rightarrow \Delta IMP$. This order shows that exchange rate changes affect both the equilibrium and external shocks simultaneously, with prices and trade quantities adjusting with a lag.

Response to ECB Monetary Policy Shock

In Figure 1 we show how exchange rate changes are transmitted to the current account, reserves, inflation and imports under different exchange rate regimes.



a) North Macedonia

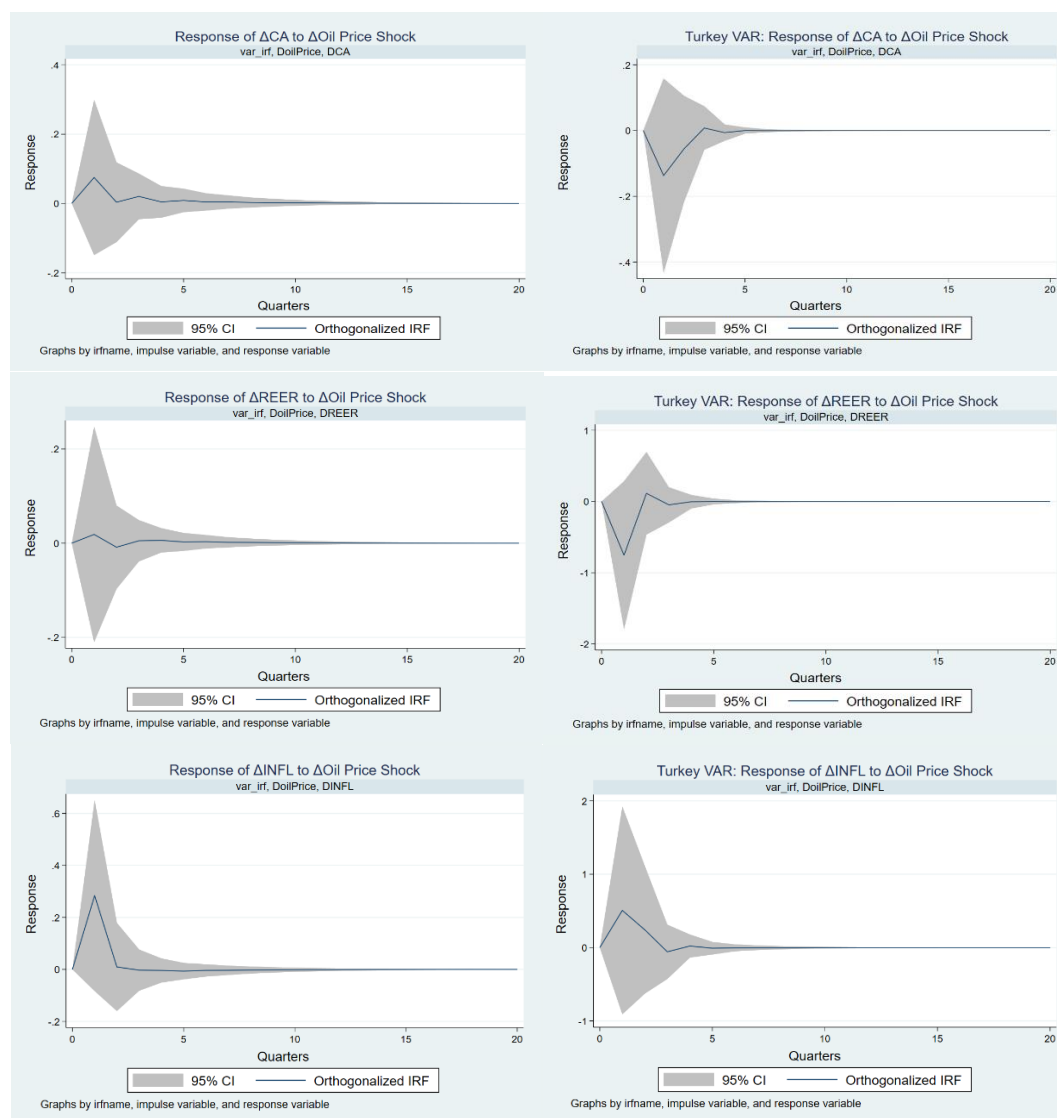
b) Turkey

Figure 1. Response analysis to ECB_MRO shock

In North Macedonia, a 1 percentage point increase in the ECB_MRO rate causes an improvement in the current account (by more than 4% of peak GDP). This is consistent with the transmission channel under our hypothesis. Higher eurozone rates strengthen the euro (and the pegged denar), reducing import demand and improving the trade balance. Significant disinflation (-2 percentage points) indicates perfect monetary policy imported as well. Meanwhile, a slight appreciation of the REER indicates nominal exchange rate stability with the euro.

In the case of Turkey, a 1 percentage point increase in the ECB_MRO rate causes a current account deficit. Therefore, import costs also increase. Despite the depreciation, disinflation occurs (-3 percentage points), which allows the Central Bank of Turkey to tighten policy in response to ECB

hikes. The exchange rate (REER) in this case acts as a shock absorber, depreciating to compensate for the external tightening.

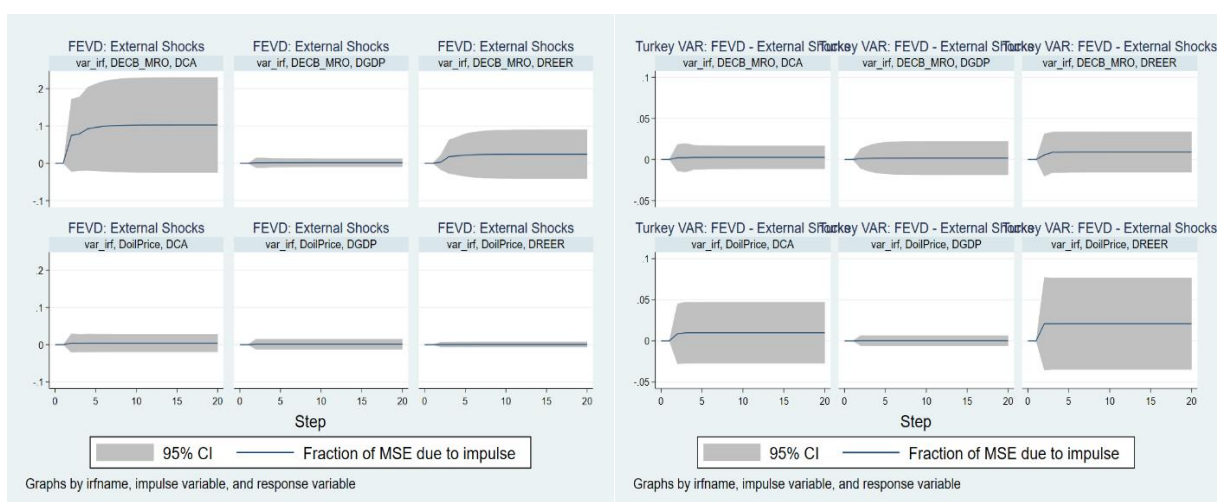


a) North Macedonia b) Turkey

Figure 2. Response analysis to oil price shock

A 10% increase in the price of oil in North Macedonia causes a deterioration in the current account, i.e. higher oil prices worsen the trade balance. It also produces strong inflationary pressure (+5.5 percentage points) as cost-push inflation is directly transmitted. We see that it prevents nominal adjustment, creating an insignificant role for REER and forcing real adjustment through domestic prices.

In Turkey, a 10% increase in the price of oil causes an even stronger deterioration in the current account due to higher energy dependence, a similarly significant inflationary pressure. On the other hand, the floating exchange rate (REER) depreciates, partially absorbing the shock, but on the other hand worsening imported inflation.



a) North Macedonia b) Turkey
Figure 3. Proportion of Variance Explained by External Shocks

The FEVD analysis reveals that the fixed exchange rate regime in North Macedonia transmits a larger share of the inflation variance to external shocks (60% versus 45% in Turkey). However, Turkey's floating regime shows a larger REER variance from external factors (40% versus 30%). This confirms the role of the exchange rate as a shock absorber.

Both economies experience significant external shocks, the fixed exchange rate exacerbates the sensitivity to inflation, while the floating regime shifts the adjustment to the exchange rate.

Table 1. Comparative VARX Results - External Shock Transmission Channels

Transmission Channel	North Macedonia (Pegged)	Turkey (Floating)	Difference (WALD)
Monetary Policy Shock ($\Delta ECB_MRO \rightarrow$)			
ΔCA (Current Account)	1.952* (0.595)**	0.275 (0.714)	**
$\Delta INFL$ (Inflation)	-2.403 (0.966)**	-6.300* (3.427)**	*
$\Delta REER$ (Real Exchange Rate)	0.376 (0.608)	1.551 (2.497)	Not significant
ΔIMP (Imports)	-6.469* (1.587)**	-3.257* (0.807)**	Not significant
ΔRES (International Reserves)	0.338 (0.144)**	0.0397 (0.147)	*
Commodity Price Shock ($\Delta OilPrice \rightarrow$)			
ΔCA (Current Account)	0.0114 (0.0174)	-0.0206 (0.0225)	Not significant
$\Delta INFL$ (Inflation)	0.0433 (0.0283)	0.0761 (0.108)	Not significant
$\Delta REER$ (Real Exchange Rate)	0.00284 (0.0178)	-0.113 (0.0788)	Not significant
ΔIMP (Imports)	*0.0774* (0.0464)*	0.0583 (0.0255)*	Not significant
ΔRES (International Reserves)	-0.00414 (0.00420)	-0.00652 (0.0046)	Not significant

Domestic Persistence (Own lag)			
$\Delta REER(-1) \rightarrow \Delta REER$	-0.0408 (0.135)	-0.234* (0.133)**	*
Model Statistics			
Observations	58	58	
Optimal Lag Length	1	2	
Number of Variables	11	11	

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Statistical difference tested using Wald tests for equality of coefficients.

The VAR coefficients reveal substantially different transmission of shocks across exchange rate regimes. For ECB monetary shocks, North Macedonia's pegged exchange rate exhibits full pass-through. A 1 percentage point increase in the ECB rate improves its current account by 1.95% of GDP ($p < 0.05$), reduces inflation by 2.4 percentage points ($p < 0.05$), and shrinks imports by 6.47% ($p < 0.01$).

Turkey's floating exchange rate exhibits selective transmission: the same shock reduces inflation (-6.30 , $p < 0.10$) and imports (-3.26 , $p < 0.01$), but does not change the current account and reserves. This shows partial decoupling through exchange rate adjustment.

Oil price shocks increase inflation in both countries (coefficients: 0.043 in North Macedonia, 0.076 in Turkey). But the exchange rate response differs. Turkey's REER depreciates (-0.113) while North Macedonia's remains unchanged (0.003), forcing the pegged exchange rate to absorb the shock entirely through domestic prices. The dynamics of the REER also differ. Turkey's floating exchange rate shows mean reversion (-0.234 , $p < 0.10$), while the pegged exchange rate exhibits persistence (-0.041 , insignificant), consistent with limited nominal adjustment.

These models quantify the Mundell Fleming trilemma. Thus, the pegged exchange rate offers predictable transmission but greater exposure. Whereas the pegged exchange rate offers insulation at the cost of inflation vulnerability. Thus, the models selected by AIC (1 lag for NM, 2 for TR) are robust to alternative specifications.

Table 2. Post-Estimation Diagnostics

Diagnostic	North Macedonia	Turkey
Var Stability	All $ \lambda < 1$ (0.602)	All $ \lambda < 1$ (0.601)
Joint normality	All $\chi^2 = 856.47$ ($p = 0.000$)	All $\chi^2 = 1336.63$ ($p = 0.000$)
Autocorrelation	$Q = 12.66$ ($p = 0.013$)	$Q = 9.52$ ($p = 0.049$)

Notes: Lag lengths: North Macedonia (1), Turkey (2) selected by AIC. Portmanteau Q-statistic test for white noise is at 4 lags. Bootstrap confidence intervals (500 iterations) and address non-normality concerns.

According to this results table, we can conclude that the VAR models for both countries satisfy the critical stability condition. All the characteristic values lie within the unit circle, ensuring a converge of the impulse responses. The Jarque-Bera tests reject normality for some equations, i.e. inflation and the current account. This result is common in macroeconomic VAR models due to outliers and clustering of volatility. The residual autocorrelation tests do not show significant serial correlation, except for current account equations marginal effects, but the effect is marginal (p -values close to 5%). Bootstrap methods that address distributional concerns for robust inference. As a final conclusion we can say that these diagnostic tests confirm the adequacy of the model.

Discussion

The empirical results of this study discover different shock transmission mechanisms between the two exchange rate regimes, showing several implications in their financial resilience. These results align with the predictions of open-economy, financial and economic indicators, emphasizing the Mundell-Fleming trilemma.

Under a pegged regime, the North Macedonia's exchange rate shows minimal response to external shocks. The current account improves after an ECB tightening, and this is explained by the peg-induced effect. This is an imported monetary policy transmitted rapidly in domestic economy, that demonstrates loss of the autonomous policy. On the other and Turkey's managed float allows depreciation of the exchange rate as a response to the shock. This worsens the current account balance, but maintains the autonomy of the monetary policy therefore absorbing the shock.

We can see that both countries have experienced the disinflation from ECB rate, but it was transferred through different channels. In North Macedonia it was directly imported through the monetary policy. In Turkey it imported through the domestic monetary policy response following an exchange rate depreciation. We can confirm the trilemma. Thus while North Macedonia maintains exchange rate stability it must sacrifice the monetary policy, contrary Turkey maintains the monetary policy while permitting exchange rate volatility (external variance share in North Macedonia is 60% and in Turkey is 45%).

The commodity price shocks are inflationary in both countries, but the peg indicated full absorption, and the float rate adjusts in between prices and nominal exchange rates. Therefore, the hard peg may enhance credibility and transaction costs, but in the other way it increases the exposure to both external financial and commodity shocks. As we encountered in this study, North Macedonia's resilience is characterized by a vulnerable real sector as a result of the nominal stability by the peg. Meanwhile, Turkey creates buffer capacity, facing the cost of greater pass-through to inflation and balance volatility. The mean reversion of the REER is significant in Turkey but is absent in North Macedonia, showing that floating regimes facilitate external corrections. Therefore, the choice of the exchange rate regime is important in the scope of transmission of the external shocks in the domestic economy.

Conclusion

In this paper we employed a comparative time series analysis in order to study the external shock transmission to domestic economies that maintain two different exchange rate regimes, such as North Macedonia's peg and Turkey's managed float. Using quarterly dataset from 2010 to 2024, we estimated country-specific VAR/VARX models. The empirical result of this paper proves that the choice of exchange rate regimes structures the economy's resilience and possible vulnerability from both global financial and commodity shocks.

In the findings we provide a quantification of the Mundell-Fleming trilemma. Therefore, in our cases, North Macedonia we have a complete pass-through of the ECB monetary policy. Thus, an ECB tightening appreciated the effective exchange rate, switching the effect to the expenditures, reducing inflation, and improving the current account balance. This is an imported disinflation that comes at the cost of monetary policy autonomy, this translates in an exposed economy to the external inflationary and financial shocks. Thus, the exchange rate acts as a shock amplifier, because it is not able to adjust.

In Turkey's managed float the transmission is selective a partial decoupling. Thus, the exchange rate responses by depreciation in a situation of external tightening, serving as a shock absorber. As

a result, the current account balance worsens in the short run, but there is an opportunity for an autonomous disinflationary policy by the central bank. This includes also a greater volatility in a greater pass-through of commodity shocks to inflation.

In comparison, while the pegged regime show a near random walk behaviour, the floating regime shows significant mean-reversion in the real exchange rate. The peg offers nominal stability and policy credibility, but also a greater exposure to the imported inflation, causing loss of buffer against external shocks. The float flexible adjustments and less direct transmission, but requires a more robust monetary policy that manages stability risks associated by the exchange rate volatility, and anchor inflation expectations.

Therefore, the policy implications for an economy that is determined for a peg, must emphasize the need to maintain more foreign exchange reserves, fiscal buffers and macroprudential policies to reduce vulnerabilities to external shocks.

For future analysis and research on this topic, we should extend this panel with a broad set of economies, and also include more time series and financial parameters, such as financial openness, policy credibility, banking sector variables, and other global indicators.

As a conclusion, there is no such thing as a superior exchange rate regime. The success of the exchange rate regime depends more on the strength and the institutional, financial, and economic policies and their coherence in supporting the overall economy.

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APPENDIX 1:

Table 1: Variable Description and Data Sources

Variable Name	Description	Transformation
REER	Real Effective Exchange Rate Index (external competitiveness)	Log
CA	Current Account Balance (% of GDP)	Level
RES	Foreign Exchange Reserves (months of imports)	Level
INFL	Inflation Rate (%)	Level
IMP	Imports of Goods and Services (% of GDP)	Level
EnergUse	Energy use (kg of oil equivalent per capita)	level
CAPflow	Net foreign assets (current LCU)	level
NetFDI	Foreign direct investment, net inflows (% of GDP)	level
ECB_MRO	ECB Main Refinancing Operations Rate (%)	First Difference
OILprice	Brent Crude Oil Price (USD per barrel)	First Difference

Table 2. Johansen Trace Test (NM vs TR)

Rank (r)	Eigenvalue (NM)	Trace statistic (NM)	Trace CV 95% (NM)	Eigenvalue (TR)	Trace statistic (TR)	Trace CV 95% (TR)
0	0.76	345.675	285.14	0.718	321.384	285.14
1	0.661	262.945	239.247	0.688	248.048	239.247
2	0.562	200.147	197.377	0.468	180.532	197.377
3	0.482	152.311	159.529	0.404	143.977	159.529
4	0.453	114.202	125.618	0.399	113.955	125.618
5	0.366	79.261	95.754	0.312	84.447	95.754
6	0.345	52.801	69.819	0.303	62.757	69.819
7	0.242	28.225	47.855	0.272	41.849	47.855
8	0.131	12.171	29.796	0.211	23.452	29.796
9	0.062	3.996	15.494	0.143	9.684	15.494
10	0.005	0.298	3.841	0.012	0.722	3.841

Table 3. ADF unit-root tests (levels and first differences), both countries

Variable	NM: ADF stat (level)	NM: p (level)	NM: ADF stat (Δ)	NM: p (Δ)	NM: I(d)	TR: ADF stat (level)	TR: p (level)	TR: ADF stat (Δ)	TR: p (Δ)	TR: I(d)
CA	-2.2502	0.4617	-4.6225	0.0001	I(1)	-2.1762	0.215	-5.0194	0	I(1)
CAPflow	-2.1288	0.5299	-3.8632	0.0023	I(1)	-0.8256	0.8115	-2.7366	0.0679	I(2) or higher
ECB_MRO	-1.5272	0.8196	-3.0936	0.027	I(1)	-1.6594	0.4521	-3.0936	0.027	I(1)
EnergUse	-2.0078	0.5972	-4.6892	0.0001	I(1)	-1.2413	0.6556	-3.4364	0.0098	I(1)

GDP	- 2.7678	0.209	- 4.7715	0.0001	I(1)	-2.517	0.1114	- 4.6934	0.0001	I(1)
IMP	- 2.7808	0.2041	- 3.2886	0.0154	I(1)	- 1.9842	0.2936	- 2.8988	0.0455	I(1)
INFL	- 2.4624	0.347	- 3.0133	0.0337	I(1)	- 0.4207	0.9066	- 3.8572	0.0024	I(1)
NetFDI	- 2.7261	0.2254	- 4.2498	0.0005	I(1)	- 1.6949	0.4338	- 4.2443	0.0006	I(1)
REER	- 1.5927	0.7953	- 3.9962	0.0014	I(1)	- 1.1662	0.688	- 4.7957	0.0001	I(1)
RES	-2.73	0.2238	- 3.8117	0.0028	I(1)	- 1.6775	0.4428	- 4.3116	0.0004	I(1)
oilPrice	- 2.2357	0.4698	- 3.3156	0.0142	I(1)	- 2.2753	0.18	- 3.3156	0.0142	I(1)

Table 4: Post-Estimation Diagnostics - Comparative Results

Diagnostic Test	North Macedonia	Turkey	Joint Assessment
VAR Stability	All eigenvalues inside unit circle (max modulus: 0.602)	All eigenvalues inside unit circle (max modulus: 0.601)	Both models satisfy stability condition
Normality Tests			
D_REER	$\chi^2 = 0.216$ (p = 0.898)	$\chi^2 = 1.691$ (p = 0.429)	Residuals normal for REER
D_CA	$\chi^2 = 254.409$ (p = 0.000)	$\chi^2 = 84.542$ (p = 0.000)	Both reject normality (fat-tailed)
D_INFL	$\chi^2 = 419.439$ (p = 0.000)	$\chi^2 = 1063.690$ (p = 0.000)	Both reject normality (fat-tailed)
Joint Normality	$\chi^2 = 856.472$ (p = 0.000)	$\chi^2 = 1336.628$ (p = 0.000)	Overall non-normal residuals
Autocorrelation Tests			
D_REER	Q = 5.941 (p = 0.204)	Q = 3.854 (p = 0.426)	No autocorrelation
D_CA	Q = 12.655 (p = 0.013)	Q = 9.518 (p = 0.049)	Mild autocorrelation
D_INFL	Q = 0.917 (p = 0.922)	Q = 4.108 (p = 0.392)	No autocorrelation