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Effects of Exogenous Shocks on Africa's Participation in World Trade: Empirical Evidence From the Franc Zone

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Abstract

This study examines the influence of external disturbances - such as world energy and oil costs, key interest rates and the money supply of major economic powers (Federal Reserve Bank (FED), People's Bank of China) on the engagement of French-speaking countries in world trade. We developed a composite index of external shocks using principal component analysis (PCA), with the aim of reflecting the shared dynamics of these variables. A Panel VAR (PVAR) model was estimated based on quarterly data from 2000 to 2018. The data show that these disruptions have a significant and time-varying impact on franc zone trade, underlining strong external dependence. The study recommends a better alignment of economic policies, dynamic cyclical surveillance and a policy of diversifying trading partners in order to consolidate the resilience of Franc zone economies to international disruptions.

Keywords: Exogenous Shocks, International Trade, ACP, PVAR

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1. Introduction

The integration of economies into globalization is largely based on international trade (Krugman & Obstfeld, 2009). It illustrates not only the specialization decisions of nations, but also their ability to adjust to external dynamics. In an environment characterized by growing global interdependence, the economies of the Franc zone - comprising mainly the nations of UEMOA and CEMAC - are finding it difficult to integrate seamlessly into world trade. Although they account for almost 14% of Africa's population, their contribution to global exports has not exceeded 0.5% in 2022 (WTO, 2023), compared with 4% for South-East Asia and over 2% for South Africa alone.

The explanation for this trade exclusion lies partly in internal factors (infrastructure deficiency, basic specialization, institutional instability), but it is also intensified by frequent external shocks. Indeed, variations in the cost of oil, interest rate hikes by the Federal Reserve (Fed) and the People's Bank of China (PBoC), as well as global supply chain imbalances resulting from the Covid-19 pandemic and the conflict in Ukraine, have considerably influenced trading partners' terms of trade, monetary competitiveness and external demand (Baldwin, 2022; IMF, 2023; OECD, 2023).

It is in this context that this article raises the crucial question: what is the impact of exogenous shocks on the trade participation of Franc zone economies in the globalization process? Specifically, we examine the influence of shocks such as variations in energy prices, oil prices and the monetary policy of the world's leading central banks, such as the FED and the PBoC, on the dynamics of exports of goods and services in Franc zone countries.

To answer this question, this article adopts an empirical approach based on a Vector Autoregressive Panel Model (PVAR), preceded by the elaboration of a global index of exogenous shocks through Principal Component Analysis (PCA). This framework makes it possible to model the dynamic interactions between external shocks and business results. The relevance of this method is supported by the research of Canova & Ciccarelli (2013) and Holtz-Eakin et al. (1988), who advocate the use of PVAR for macroeconomic panels where temporal interdependencies are pronounced and endogeneity pervasive.

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The article in question is structured in six distinct parts. The first provides an overview of international trade in the Franc zone, via a stylized comparative study. The second examines the controversies, both theoretical and empirical, concerning the impact of external shocks on trade. The third section focuses on the construction of the exogenous shocks index using Principal Component Analysis (PCA). The fourth section explains the choice of the PVAR method, putting it into perspective in relation to other options, while presenting the initial robustness tests. The fifth section presents the empirical results and their analysis. Finally, the sixth section discusses the political and economic consequences before coming to the conclusion.

International trade between Franc zone countries remains marked by limited diversification, significant dependence on raw materials and marginal integration into global movements. This situation is all the more worrying as these economies, despite belonging to a stable monetary zone, have been unable to capitalize on this stability to maintain sustainable trade competitiveness (World Bank, 2022).

According to the WTO (2023), in 2022, the Franc zone accounted for just 0.48% of world exports of goods and services, compared with 4.1% for ASEAN, 1.6% for the nations of Southern Africa and almost 14% for the European Union. Over 75% of the region's exports are made up of primary products (hydrocarbons, cocoa, cotton, gold), highlighting its high sensitivity to fluctuations in world prices (UNCTAD, 2023). In addition, a large proportion of trade transactions are with the European Union, notably France, reflecting the limited diversification of trading partners (Direction des Statistiques du Commerce International, 2022).

Despite the existence of UEMOA and CEMAC, trade within the same region is still in its infancy: less than 15% of transactions take place between member countries, compared with 60% for the European Union or 30% for MERCOSUR (AfDB, 2021). This finding can be attributed in part to obstacles linked to infrastructure, non-tariff barriers and the low complementarity of productive structures (UNCTAD, 2020).

As for individual performance, marked inequalities persist: Côte d'Ivoire and Cameroon dominate with over 50% of total Franc zone exports. By contrast, nations such as the Central African Republic and Niger are struggling to create significant trade flows. This unbalanced integration is exacerbated by a deficit in local value added, given that exported goods are frequently unprocessed or poorly refined.

2. Literature Review and Research Model

2.1 Theoretical Foundations

Since Ricardo (1817), the doctrine of international trade has been based on the concept of comparative advantage, enriched by the factor endowment model of Heckscher-Ohlin (1933). In this context, variations in productivity and the relative availability of factors of production are at the root of international trade.

However, in an increasingly interconnected world, exogenous shocks - disturbances originating outside the economy concerned (e.g. variations in world tariffs, international financial policies, geopolitical instabilities) - are taking on growing importance in defining trade flows.

According to neoclassical models, economies react quickly and efficiently to disturbances thanks to perfect factor mobility and flexible prices. However, these ideal conditions are rarely present, especially in structurally constrained economies such as those of the Franc zone (Rodrik, 2011). The latter suffer from institutional rigidities, low productive diversification and high dependence on natural resources, all of which hamper their capacity to adjust.

In contrast, Keynesian models in an open economy context, such as those by Dornbusch (1980) or Obstfeld & Rogoff (2001), take into account gradual adjustments in prices and exchange rates. They demonstrate that the monetary policy of major economies (such as the USA, the ECB or China) has an impact on international interest rates, liquidity conditions, real exchange rates and, consequently, on the external competitiveness of peripheral economies. From this point of view, efficient markets encourage recovery towards equilibrium, and nations can benefit from the opportunities generated by volatility, provided their fundamentals are robust (Frankel & Rose, 2002).

Furthermore, in the political economy of trade, Acemoglu & Robinson (2012) emphasize the importance of institutions in mitigating the impact of shocks: they argue that fragile institutions expose even countries to low-intensity shocks.

2.2 Empirical Controversy Over Exogenous Shocks and International Trade

The question of the influence of exogenous shocks on world trade remains a subject of both theoretical and empirical debate. Two major perspectives clash: that of conventional economists, who believe that shocks are temporary, and that of structural and institutional approaches, which assert that they can have a lasting impact on the trade trajectory of fragile countries.

A number of studies have explored the tangible effects of these upheavals, notably those by Baffes et al (2022) on rising energy prices and trade; revealing that escalating energy costs reduce the competitiveness of countries that are major importers, such as those in the Franc zone.

As for international economic policy, Gopinath (2020) and Di Giovanni & Levchenko (2009) illustrate how decisions taken by the FED and PBoC influence trade through global demand and the dollar exchange rate.

In the Franc zone, the severity of exchange rate systems, dependence on raw materials and the external orientation of economic policies aggravate the negative consequences of trade disruptions (IMF, 2022; ECA, 2021). For example, the increase in the Fed's key interest rates between 2022 and 2023 limited access to external financing and led to a reduction in imports in various WAEMU countries (World Bank, 2023). On the other hand, Carrère & De Melo (2015) point out that French-speaking African countries export few processed goods, making them more sensitive to global commodity cycles.

Ngouana (2020) shows that in the UEMOA, a negative oil shock leads to an average 3% drop in exports over a 6-month horizon. Similarly, Coulibaly & Gandhi (2021) observe a negative correlation between oil price volatility and trade performance in CEMAC countries.

Freund et al. (2022) note that the Franc zone's weak trade infrastructure amplifies adjustment times to shocks. Gourdon and de Vries (2022) demonstrate that regional trade remains embryonic, which limits internal cushioning mechanisms in the face of global shocks.

The controversy in the literature review can be explained by differences of opinion regarding the effects of exogenous shocks on macroeconomic variables. Authors such as Dollar & Kraay (2004) argue that openness offers the possibility of mitigating shocks through diversification. In contrast, Guillaumont (2019) argues that vulnerable economies are unleashed without protection, exacerbating imbalances.

Baldwin (2016), for his part, clarifies that the impact of shocks varies according to the position occupied in value chains, an aspect that remains marginal in the Franc zone.

2.3 Building a synthetic index of exogenous shocks using Principal Component Analysis (PCA)

2.3.1 Controversy over the construction of the disaggregated index

Assessing exogenous shocks of global origin represents an essential methodological challenge in the study of their impact on developing economies, particularly those of the Franc zone. There is still controversy as to how to establish a consolidated synthetic index that groups together various variables, such as energy costs (oil, gas), key rates and the money supply of major central banks such as the US Federal Reserve (FED) and the People's Bank of China (PBoC).

2.3.2 Univariate or disaggregate analysis: focus on individual disturbances

A first institution supports the specific approach to individual shocks, with each variable examined individually to better identify structural impacts. According to Hamilton (2003) and Kilian (2009), it is preferable to examine oil shocks independently, according to their source (supply, speculative demand, anticipation). Similarly, Gertler and Karadi (2015) and Miranda-Agrippino and Ricco (2021) extract monetary policy shocks using identification methods based on external surprises in policy rates.

Limitations: this method fails to capture the interaction effects between shocks, or the concomitance of global conditions influencing nations.

2.3.3 Aggregate or multivariate measurement: towards composite indices

On the contrary, an approach increasingly present in the literature aims to summarize the information contained in various global variables. Researchers such as Auerbach and Gorodnichenko (2012), Habib et al. (2021) or Lane &

Milesi-Ferretti (2018) use dimensionality reduction methods, such as Principal Component Analysis (PCA), to construct aggregate shock indices that encompass the oil price, the FED rate, monetary aggregates and other indicators.

This method helps to minimize information repetition, capture a shared trend and reduce the difficulties of multicollinearity in empirical models. It is particularly beneficial for understanding the overall impact of the international situation on less diversified economies.

Criticisms: this approach is mainly criticized for the subjectivity of variable selection and the sensitivity of the index to the observation period and normalization. In addition, the economic explanation of the principal components may be unclear (Stock & Watson, 2002).

2.3.4 The challenge of endogeneity and anticipated responses

Finally, several researchers (Ramey, 2011; Rodrik, 2011; Caldara & Herbst, 2019) point out that these so-called "exogenous" variables may in fact be influenced by predictable dynamics, thereby diminishing the causal validity of shocks. The use of narrative techniques or external tools to rectify these biases is recommended.

To sum up, the literature faces a dilemma between a disaggregated approach, economically explicit but fragmented, and an aggregated approach, synthetic but based on statistics, with trade-offs to be made in terms of interpretability, robustness and exhaustiveness. This work favors the construction of a composite index using PCA, in line with the approach of Habib et al. (2021), with the aim of capturing the overall structural effect of global conditions on the trade engagement of Franc zone economies.

3. Research Method and Materials

3.1 Justification of the PCA method

Given the diversity of external shock factors, whether monetary, energy, trade or geopolitical, a study on a single level would be simplistic. To address this disparity, recent studies (Romer & Romer, 2010; Ahmed et al., 2017; IMF, 2022) advocate the development of aggregate indices based on highly correlated variables. Principal Component Analysis (PCA) offers the possibility of reducing the complexity of these perturbations while preserving the essence of the original data. This approach is robust in bringing together impacts of various kinds, while avoiding the subjective distortions associated with manual weighting.

When analyzing the effects of exogenous shocks on trade participation, it is essential to integrate the multiple transmission channels of global disturbances. These shocks are multidimensional: they can be monetary, energy or geopolitical, and are often interconnected. Following the approach of Kose et al. (2020) and Aizenman et al. (2021), an aggregate measure can better capture global systemic shocks. Principal Component Analysis (PCA) has emerged as an effective tool for constructing an unbiased synthetic index, reducing dimensionality while retaining maximum information.

3.2 Selected variables and data sources

Our independent variable is the Indicechocs index of exogenous global factor shocks. The measurement of exogenous shocks of global origin is a crucial methodological issue in the analysis of their transmission to developing economies, particularly those in the Franc zone. Controversy persists as to how to construct an aggregate synthetic index grouping together heterogeneous variables such as energy prices, oil prices, key rates and the monetary supply of major central banks such as the US Federal Reserve (FED) and the People's Bank of China (PBoC).

The aggregate measurement of global exogenous shocks remains highly controversial in the literature, as it relies on multiple aspects and dimensions, as Hamilton (2003) and Kilian (2009) point out, arguing for an autonomous reading of oil shocks, depending on their origin (supply, speculative demand, anticipation). Similarly, Gertler & Karadi (2015) and Miranda-Agrippino & Ricco (2021) isolate monetary policy shocks via identification strategies based on exogenous surprises in key rates. The limitation of this approach is that it does not capture the interaction effects between shocks, nor the simultaneity of global conditions affecting countries.

In contrast, a growing body of literature seeks to synthesize the information contained in several global variables. Authors such as Auerbach and Gorodnichenko (2012), Habib et al. (2021), or Lane & Milesi-Ferretti (2018) mobilize dimensionality reduction techniques, such as Principal Component Analysis (PCA), to construct global shock indices integrating oil prices, FED rates, monetary aggregates and other indicators.

This approach reduces informational redundancy, captures common dynamics and alleviates problems of multicollinearity in empirical models. It is particularly useful for capturing the overall effect of international economic conditions on less diversified economies.

Finally, several authors (Ramey, 2011; Rodrik, 2011; Caldara & Herbst, 2019) point out that these so-called "exogenous" variables may in fact respond to anticipated dynamics, thus reducing the causal validity of shocks. Narrative methods or the use of external instruments are then advocated to correct these biases.

Indeed, the literature contrasts a disaggregated approach, economically explicit but fragmented, with an aggregated approach, synthetic but statistical, with compromises between interpretability, robustness and completeness. This work opts for the construction of a composite index via PCA, following the approach of Habib et al. (2021), in order to capture the overall structural impact of the global conjuncture on the trade participation of Franc zone economies. Consequently, standardized PCA is recommended by Baccini (2021), especially as the variables used in our analysis come from a variety of fields and therefore present a heterogeneity of measurement units.

Table 1. Eigenvalues of principal component analysis

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	4.24087	3.26757	0.7068	0.7068
Factor 2	0.97331	0.46838	0.1622	0.8690
Factor 3	0.50492	0.28853	0.0842	0.9532
Factor 4	0.21639	0.17936	0.0361	0.9892
Factor 5	0.03703	0.00955	0.0062	0.9954
Factor 6	0.02748		0.0046	1.0000
Cronbach's alpha				0.7484
Kaiser-Meyer-Olkin (KMO) specificity test			0.7657	
Bartlett (Chi2)				1.1e+04***

Source: Author

* * *p< 0,01. The null hypothesis of Bartlett's test suggests that the variables (exogenous shock variables) are uncorrelated.

By performing a principal component analysis (PCA) on the six exogenous shock indicators, it became possible to construct an index measuring global external shocks, known as the "index shocks". The results are presented in Table 1, showing that the Bartlett Test (Chi2 ≈ 11,000, highly significant) for homogeneity of correlations is highly significant, rejecting the hypothesis of an identity matrix. In other words, correlations between variables are significant, justifying PCA. In addition, the values obtained from the Kaiser-Meyer-Olkin (KMO) tests measure the suitability of the sample for factorial analysis. A value > 0.7 is considered good (between 0.7 and 0.8 = "average to good" and Cronbach's alpha = 0.7484 indicates good internal consistency of the variables analyzed. An alpha ≥ 0.7 is generally considered acceptable, meaning that the variables are sufficiently correlated to justify synthesis into one or more factors. Thus, an alpha > 0.7; a KMO > 0.7 and the highly significant Bartlett test, statistically and econometrically support the validity of a synthetic index.

The eigenvalues in Table 1 are based on Kaiser's rule: only factors with an eigenvalue > 1 are retained. Here, only factor 1 meets this condition above 1. Factor 1 explains 70.68% of the total variance. This is more than enough to summarize the information of the 6 variables in a synthetic index of exogenous shocks. This confirms the high unidimensionality of the data.

Table 2. Principal component loadings for exploratory component analysis with oblique rotate

Variable	Factor1	Factor2	Factor3	Uniqueness
matprem	0.9143	0.3545	0.0376	matprem
omchine	0.8801	-0.4193	0.0746	0.0440
omusa	0.9565	-0.1851	0.1184	0.0368
txddollar	-0.8185	0.2485	0.1654	0.2410
txdyuan	-0.3602	-0.2812	-0.2185	0.7435
priceenergy	0.8914	0.3636	-0.1088	0.0614

Table 2 shows the coefficients of the loading matrix, indicating the degree of correlation between each variable and the extracted factors. The more strongly a variable is loaded on a factor (value close to ±1), the more it contributes to that factor, and the "uniqueness" values indicate the proportion of variance of each variable not explained by the factors. The lower the value, the better the variable is explained by the common factors. Factor 1 clearly stands out as the main factor, grouping together the most relevant variables for constructing a synthetic index of exogenous shocks linked to prices and global liquidity.

We will use these loadings for weighted aggregation or to validate the use of the composite index.

Table 3. Variabels and weight (from Factor 1 loadings)

Variable	Loading on F1	Normalized weight (%)
matprem	0.9143	18.5 %
omchine	0.8801	17.8 %
omusa	0.9565	19.3 %
txddollar	-0.8185	16.5 %
priceenergy	0.8914	18.0 %
txdyuan	-0.3602	7.3 %
Total	4.921	100

Figure 1 below shows the evolution of the eigenvalues resulting from the construction of the exogenous shocks index using principal component analysis (PCA).

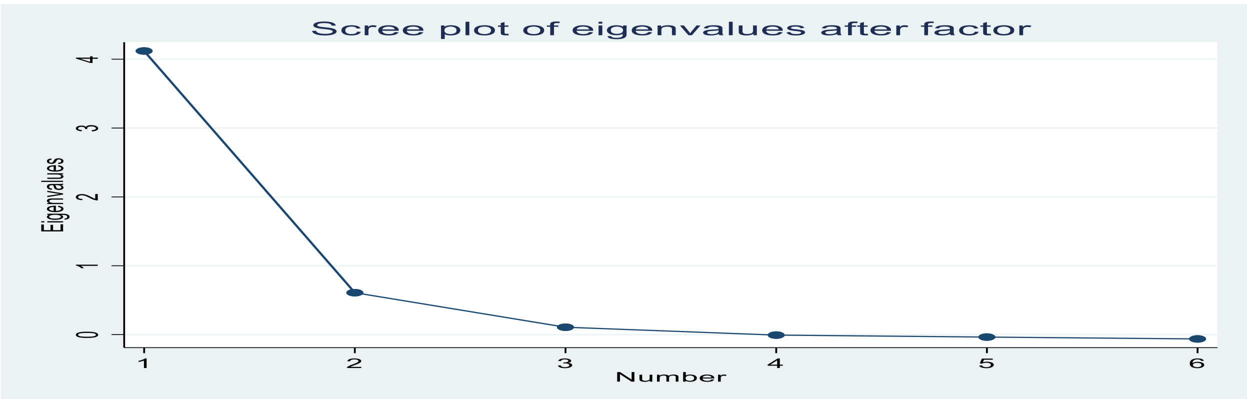

Figure 1. Evolution of eigenvalues of index variables

3.3 Dependent and control variables

Our dependent variable refers to the trade openness ratio of (exports + imports / GDP), justified by Frankel & Romer (1999) and used by Rodrik (1998) as a standard indicator of trade integration.

An overvalued exchange rate reduces the competitiveness of local products on international markets, making exports more expensive and imports cheaper. Edwards (1988) demonstrates that real devaluations stimulate exports, especially in economies with high price elasticity. This is taken further by the work of Guillaumont (2019), who shows that the fixed exchange rate regime reduces adjustment margins in the face of external shocks in the Franc zone.

Real GDP is a proxy for a country's level of production and export capacity. Sustained GDP growth reflects a broader productive base, favorable to export expansion. These analyses are taken a step further by Frankel & Romer (1999), who show that income level influences trade volume, and Calderón et al. (2007), who highlight a bidirectional relationship between growth and trade: more open countries tend to grow faster, and vice versa.

Price instability has a negative impact on foreign trade. High inflation undermines price competitiveness and creates uncertainty for investors and exporters. Justified by the work of Barro (1995), who shows empirically that inflation is negatively correlated with growth and trade performance, and supported by that of Rodrik (2008), who points out that poorly controlled inflation is often symptomatic of poor economic governance.

3.4 PVAR specification and pre-testing

Given this complexity, the PVAR (Panel Vector Autoregression) model has emerged as a robust tool for modeling these dynamic interactions (Love & Zicchino, 2006; Abrigo & Love, 2016). It captures the reciprocal effects between shocks and trade variables in a multivariate framework, without imposing a priori causal relationships. This model is particularly suited to contexts where countries share common shocks (e.g. oil prices, global monetary policy), but react differently according to their structural characteristics (Bruno & Shin, 2015).

Model specification

The PVAR model is specified as follow:

$Y\_it = A_1 Y\_\{i,t-1\} + ... + ApY\_\{i,t-p\} + \mu_i + \lambda_t + \varepsilon_{it}$

where Y_it is a vector of endogenous variables (trade, GDP, shock index), A_1...Ap are the coefficient matrices, μ_i the fixed effects, λ_t the common time effects, and ε_{it} the error term.

To check cross-sectional dependence before selecting a regression technique, Pesaran (2015). A test of weak cross-sectional dependence is used. This test is favored because the null hypothesis of weak dependence is more acceptable than that of independence, which could prove too restrictive for large panels (Pesaran, 2015). Typically, cross-dependence is due to the influence of certain unidentified common characteristics that are shared by all countries, such as globalization, and exert an effect on each of them, potentially in different ways. To remedy this cross-dependence, the second-generation unit root test is implemented, with the null hypothesis that all series are non-stationary (Pesaran, 2007).

The second generation of panel unit root tests removes the stringent condition of the first generation, which required cross-sectional units to be independent of each other, thus allowing cross-sectional dependence. To estimate equation (1), we use the fixed-effects approach.

Driscoll and Kraay (1998) The main use of standard error correction is to address any possible dependence between panels due to joint economic movements resulting from shocks between various economies.

The analysis also uses the GMM-based panel VAR technique developed by Abrigo and Amour (2016), rectifying potential origins of endogeneity in the model. Impulse response analysis (IRF) and forecast error variance decomposition (FEVD) are the two structuring elements of the panel VAR model. IRF keeps all other shocks to a minimum, and illustrates the response of one parameter to a shock affecting another parameter within a system (Amour and Zicchino, 2006). Confidence intervals are generated using Monte-Carlo simulations provided to IRF.

Table 4. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
shock index std	1395	0	1	-1.503	1.603
trade	1457	3.967	.542	2,225	5,055
GDP	1458	6.996	3.244	-3.913	11.022
FDI	1427	18.377	2.045	9,903	22,209
CPI	981	.958	.959	-3.207	3.927
Tx change	639	4.114	1.176	-3.273	4.696

4. Results and Discussion

4.1 Preliminary tests

The results begin with the effective cross-section dependence test (Table 5) of the unit roots.

Table 5. Pesaran (2015) low cross-sectional dependence test.

Variable	CD-test	P-value	corr	Abs (corr)
index_cho~d	87.55	0.000	1.000	1.000
trade	4.27	0.000	0.050	0.404
GDP	3.63	0.000	0.045	0.419
Exchange rate	14.58	0.000	0.366	0.452

FDI	29.82	0.000	0.334	0.396
CPI	20.31	0.000	0.237	0.378

The results show that all the variables in the model exhibit a characteristic cross-sectional dependency. The shock index in particular shows a very strong dependency between the entities (countries or regions) in the panel. This means that the shocks captured by your index are highly correlated between countries, which is due to global shocks (e.g. oil, US/China rates...). This dependency justifies the use of the PVAR (Panel VAR) and the dependency-robust method of Driscoll & Kraay.

Furthermore, the unit root test (Table 6 below) shows that the shock index, GDP and exchange rate variables are non-stationary, which means that they must be differentiated before being included in the PVAR.

Table 6. Unit root test

Variable	Trend	No Trend	Decision
index_cho~d	1.000	1.000	J(1)
trade	0.000	0.001	J(1)
Tx exchange	0.077	0.003	J(1)
GDP	0.846	0.999	J(1)
FDI	0.000	0.000	J(1)
CPI	0.000	0.000	J(1)

4.2 Basic results: Driscoll and Kraay (1998)

This section presents and discusses the results first through Driscoll and Kraay (1998). Table 8 presents the regression results through Driscoll and Kraay (1998) regression methodology.

Table 7. Driscoll and Kraay (1998) test

Variable	Driscoll-Kraay Random effects Trade	Fixed effects Trade
index_cho~d	-0.0654**	0.0326***
	(0.095)	(0.003)
Tx change	-0.013	0.0051
	(0.767)	(0.645)
GDP	-0.0936***	0.0028
	(0.021)	(0.855)
FDI	3.87e-10***	-4.41e-11***
	(0.01)	(0.016)
CPI	0.038,	0.0317***
	(0.478)	(0.025)

Estimates using robust Driscoll-Kraay standard errors on the fixed-effects (FE) and random-effects (RE) models reveal distinct impacts of exogenous shocks on the international trade of Franc zone countries, based on empirical results. In the fixed-effects model, the standardized index of exogenous shocks has a notable positive impact on trade (coefficient = 0.0325, $p < 0.01$), suggesting that some countries exploit these shocks as opportunities, notably through the export of raw materials, consistent with studies by Baffes and al. (2022) and Diop and al. (2023). On the other hand, in the random-effects model, this effect turns out to be negative and slightly significant (coefficient = -0.0654, $p \approx 0.095$), indicating cross-country heterogeneity in trade responses to global shocks. Net foreign direct investment (FDI) flows also show a disparity: a notable negative impact in the FE model ($p = 0.016$) versus a strongly positive impact in the RE model ($p < 0.001$), highlighting contrasting dynamics depending on whether we examine intra- or inter-individual variation (Carrère & de Melo, 2015). In the fixed-effects model, inflation (CPI) is the only significant variable, while other variables such as GDP and the real exchange rate show a significance that varies according to the model. These results underline the importance of switching to a dynamic PVAR-type model, to better capture the endogenous interactions and delayed impacts of shocks.

4.3 VAR panel robustness analyses

However, the disparities between fixed and random effects, combined with possible endogeneity between macroeconomic variables (such as trade, money supply, policy rates, FDI, etc.), highlight the constraints of static models. Indeed, these models lack the capacity to capture dynamic feedbacks, or to explicitly differentiate the direction of causality.

In this respect, a PVAR (Panel Vector Autoregression) type model appears to be a more suitable method. PVAR has the advantage of making all the variables in the system endogenous, and of representing their dynamic interactions over time, while taking into account the diversity between countries. It also offers the possibility of examining the reactions of endogenous variables to exogenous shocks identified through impulse response functions (IRF), while enabling their magnitude to be measured through forecast error variance decomposition (FEVD).

Table 8. PVAR results

VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
index_cho~d	0.0947**	-0.309***	473.7***	-2,494***	-0.0996***	0.770***
	(0.0373)	(0.0373)	(0.0373)	(0.0373)	(0.0373)	(0.0373)
trade	-0.0100	0.301***	-243.3***	-189.0***	0.00136	0.0941***
	(0.0239)	(0.0239)	(0.0239)	(0.0239)	(0.0239)	(0.0239)
IDE	1.00e-05	-0.000223***	0.182***	0.0241***	-3.88e-06	-2.71e-05
	(2.30e-05)	(2.30e-05)	(2.30e-05)	(2.30e-05)	(2.30e-05)	(2.30e-05)
GDP	-3.38e-06	-7.08e-06*	0.0111***	0.112***	2.40e-06	-5.66e-05***
	(4.01e-06)	(4.01e-06)	(4.01e-06)	(4.01e-06)	(4.01e-06)	(4.01e-06)
CPI	-0.0945	-0.0102	-116.8***	3,675***	0.209	-0.840***
	(0.156)	(0.156)	(0.156)	(0.156)	(0.156)	(0.156)
TCR	0.0120	0.0271**	-4.620***	-423.2***	-0.0127	0.162***
	(0.0122)	(0.0122)	(0.0122)	(0.0122)	(0.0122)	(0.0122)
Observations	413	413	413	413	413	413

The results in Table 8 above highlight the complex interactions between exogenous shocks and the key macroeconomic variables of Franc zone nations. In line with the study by Corsetti et al (2013) and Kose & Terrones (2015), exogenous shocks, as measured by the index, have a notable negative impact on international trade, revealing significant external vulnerability. These shocks, at the same time, boost FDI flows and drive up the real exchange rate, a phenomenon that could be attributed to investors' response to fluctuations in the global environment (Blanchard et al., 2016).

On the other hand, international trade displays positive autoregressive dynamics, however its unfavorable impact on foreign direct investment and gross domestic product indicates a potential unsuccessful or commodity-driven specialization (Rodrik, 2008).

As for FDI, it has an expected positive effect on economic growth (GDP), confirming its driving role in developing economies (Borensztein et al., 1998), although it has no stabilizing effect on prices or trade in the short term.

Finally, most variables are significantly affected by inflation and the real exchange rate. The concrete valuation of the exchange rate encourages trade and foreign direct investment, but is detrimental to GDP, in line with the results of Edwards (1989).

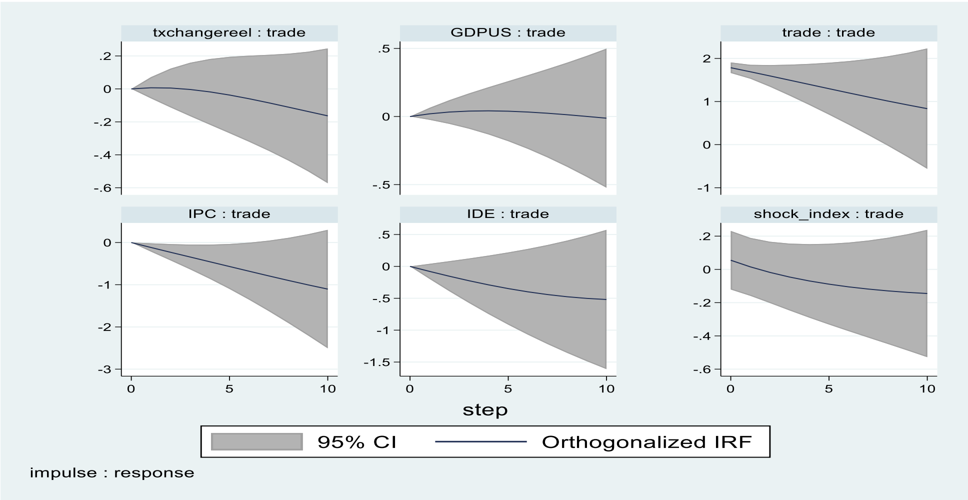

Figure 2. Impulse response function

Examination of the impulse response functions derived from the PVAR model (Figure 1 above), based on quarterly data, reveals notable and distinct impacts of macroeconomic shocks on international trade. It reveals that a rise in inflation (CPI) induces a gradual and noticeable decrease in foreign trade as early as the second quarter, peaking around the sixth quarter. This proves that higher domestic prices are detrimental to export competitiveness (Balassa, 1964; Dornbusch, 1976). In addition, foreign direct investment (FDI) has a negative impact on trade, perceptible from the first quarter and intensifying until the eighth quarter. This suggests a substitution relationship between FDI and trade transactions in certain situations (Markusen & Venables, 1999).

The appreciation of the real exchange rate (txchangereel) has a negative impact on trade from the third quarter onwards, with this effect gradually strengthening. This inverse relationship corresponds to the predictions of the Marshall-Lerner condition (Obstfeld & Rogoff, 1995).

The GDP of franc zone nations, expressed in dollars and represented by GDPUS, indicates a slightly positive but statistically insignificant influence on trade in the short term. This illustrates that although economic expansion stimulates trade, its impact is attenuated when evaluated in foreign currencies, due to exchange rate variations and valuation effects rather than the actual volume of activity (Devereux & Engel, 2003).

Finally, the index of global shocks has a negative effect on trade from the second quarter onwards, with the effect stabilizing around the sixth quarter. This receptivity to economic hazards is in line with Bloom's (2009) research, which shows that uncertainty reduces investment and international trade.

In general, the results show that economic shocks have an impact on trade, with transmission periods generally ranging from 1 to 3 quarters, and cumulative effects lasting up to 8 to 10 quarters.

5. Conclusion

In conclusion, international trade remains a crucial instrument for the growth and integration of Franc zone economies, especially in an environment characterized by strong global interdependence. The aim of this article was to analyze the influence of external shocks, in particular fluctuations in world energy and oil prices, key rates and the money supply of major central banks such as the FED and the People's Bank of China, on the trade commitment of Franc zone countries. The empirical findings, derived from a PVAR model implemented on quarterly data, demonstrate that these shocks have a notable impact on international trade, with response times depending on the variables considered. They also highlight the region's structural fragility in the face of these external disturbances.

In this context, it is vital that the decision-making authorities in the Franc area step up trade resilience measures by diversifying partners and traded products, while reinforcing structural competitiveness. It is also advisable to implement more dynamic macroeconomic surveillance, taking into account global monetary and energy trends, to anticipate the consequences of external shocks. Strategic steering of exchange rate and investment policies is essential to mitigate the destabilizing impacts of these shocks and foster stronger, more sustainable integration into global value chains.

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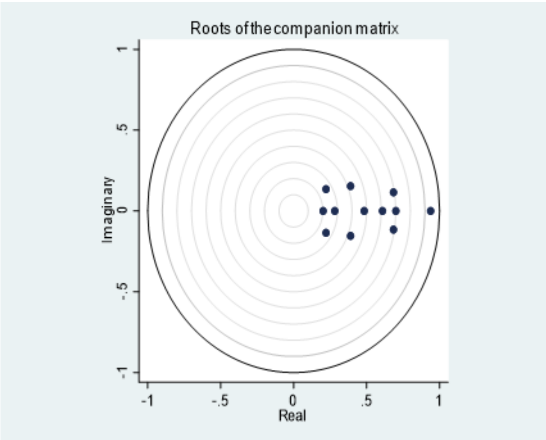
Annexes

A.1 PVAR Stability



Eigenvalue stability condition
Eigenvalue

Real	Imaginary	Modulus
1.020415	0	1.020415
.9617924	-.1208765	.9693584
.9617924	.1208765	.9693584
.962791	0	.962791
.8943117	.0499672	.8957065
.8943117	-.0499672	.8957065