ASK Publishers

ISSN: 3049-7159

Research Article

Journal of Business and Econometrics Studies

Economic Resilience: Evidence for African Economies Application of a Panel Var Model

Nerhum Laurindo Adriano Sandambi

MSc. Universidade Lusíada de Angola, Luanda, Angola

***Corresponding author**
Nerhum Laurindo Adriano Sandambi, MSc, Universidade Lusíada de Angola, Luanda, Angola.

Received: May 25, 2024; **Accepted:** June 08, 2024; **Published:** June 13, 2024

ABSTRACT
A panel VAR model was applied to analyse the economic resilience of 54 African countries from 1990-2022. Realising how exogenous shocks influence countries' ability to respond from the outset is naturally the aim of the study. Thus, the results suggest that there is a significant presence of economies based on international market expectations, which are significantly explained by the presence of exogenous shocks. On the other hand, the Impulse Response Functions help to explain the fact that 90% of African countries have economies controlled by international market expectations, which, in the presence of exogenous international market shocks, end up determining the path and behaviour of economies in the medium term. On the other hand, the results show that countries such as Botswana, South Africa, Namibia and Ghana have a greater capacity to respond in a context of uncertainty, and there are strong reasons to suggest that these countries are able to control their economies, unlike, for example, the results for Angola in a context of uncertainty, Democratic Congo and Brazzaville, Equatorial Guinea and Sierra Leone, the evidence nevertheless shows that in a context of uncertainty, exogenous shocks control and determine the economic path in the long term. These results also suggest that these economies should be characterised as economies without control by the authorities. Thus, as exogenous shocks increase, there are significant increases in the destructive capacity of these economies.

Keywords: Panel Var Model, Exogenous Shocks, Resilience and International Markets

Jel Classification: c01; c21; c23; c33; F10.

Introduction

The African continent in general, and particularly its countries, seem to be continually asleep. By and large, the African economy has been the one with the least significant indicators, and the development strategies that a large number of African governments have implemented from the outset are not economically relevant, nor can they guarantee prosperity for their countries.

There seems to be a continuous dependence on natural resources, and this dependence triggers a vicious circle for governments. The evidence shows, however, that dependence is correlated on the one hand with the levels of production capacity that these countries have, most of which is dependent on absolute advantages, and these advantages usually alter the very dynamics of the economic structure. The continued dependence of African governments shows, on the one hand, the very capacity of economies to transform, for example, times of crisis into times of economic expansion, so there still seems to be a dependence on endogenous and exogenous factors.

However, exogenous shocks are factors that intercept economies, and these interceptions occur in different possible ways:
Firstly, as exogenous shocks occur in international markets, they affect the internal structures of economies and affect the government's ability to respond. Secondly, exogenous shocks end up being correlated with endogenous shocks in the following ways: they can occur through changes in prices, and they can also occur through countries' levels of internal production. Thus, the ability to respond to these shocks will also depend on how effectively the government can combine the effects of these shocks in prosperity and in times of economic expansion.

As a generalisation of endogenous shocks, we suggest analysing the political interference that takes place in most developing countries, especially those in sub-Saharan Africa. We have thus analysed a group of sub-Saharan African countries that have, for example, high standards of political interference and external interference. These interferences can naturally be quantified in civil conflicts, external interferences through multilateral organisations for example, while internal interferences are

Citation: Nerhum Laurindo Adriano Sandambi. Economic Resilience: Evidence for African Economies Application of a Panel Var Model. J Bus Econo Stud. 2024. 1(3): 1-9. DOI: doi.org/10.61440/JBES.2024.v1.30

usually quantified in social upheavals that are driven by the levels of external interferences and shocks in international markets.

However, the aim of this study is to show how governments tend to have the capacity to respond to the different shocks that generally exist and that significantly affect the economies being analysed, and how this capacity to respond naturally translates into levels of resilience that economies tend to have. On the other hand, the ability of governments to become resilient will depend on internal macroeconomic conditions, which have a lot to do with the economic structure itself, for example, which generally has a significant influence on government decisions.

Models applied to economic resilience are significantly used to describe the capacity of a large part of economies to become resilient, especially in a context of uncertainty, some of these models are significantly analysed in [1].

On the other hand, political decisions tend to influence countries' capacity and levels of economic resilience, especially if these policies are sufficiently capable of guaranteeing a macroeconomic structural balance, as analysed in, while address economic resilience in a regional context [2,3]. Thus, the economic pattern allows a large proportion of developing countries to show hybrid behaviour, where most exogenous shocks end up determining their ability to recover. Some economies naturally have the capacity to respond in the short term, while others show a significantly slow recovery, and this approach is strongly defended in [4].

The main objectives of the study are naturally to analyse in a meaningful way and understand the capacity of African countries to respond in a context of uncertainty when exogenous shocks are quantified. Thus, a panel VAR model is applied to analyse the determinants of economic resilience in African countries, which will also allow us to understand, for example, how shocks determine the production levels of the economies under analysis.

Data and Methodology

Data

A number of databases are used, mostly from international organisations and other multilateral organisations, such as the United Nations (UN), IMF, COMESA, World Bank, World Trade Organisation and Brueguel. However, the analysis covers the time horizon 1990-2022. The data is measured in dollars at constant prices based on 2010.

We used panel data, so some characteristics not observed in the data were significantly captured by applying fixed effects and random effects on the one hand. Panel data is naturally relevant for analysing longitudinal studies, for example.

Some variables do not have observations at the outset, but we use the arithmetic mean, i.e. from the first to the last year naturally. Table 1 describes the variables and their sources.

Table 1: Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
ΔlnProd	1,423	.0005471	.0753781	-.7028904	.9998837
ΔlnO_P	1,727	.0422566	.2601002	-.6065295	.5411572
ΔlnD_P	252	-.0132197	.4498878	-1.974.314	2.284.191
ΔlnG_P	1,349	.0442854	.1288471	-.1688986	.3060851
Δlnreer	1,624	-.0048624	.1474855	-192.539	.7838626
ΔlnX	1,087	.037348	.2245203	-3.314.402	.9249916

Notes: The table shows the descriptive statistics used in the model.

Table 2: Description of Variables

Variables	Description	Type	Source
φ	It represents the dependent variable, but seeks to measure the capacity of economies to respond in periods of economic recession and when negative shocks significantly affect the economy.	Dependent	
O_Price	Oil prices on the international market	Independent	
D_Price	Diamond prices per carat on international markets	Independent	
G_Price	Gold prices on the international market	Independent	
Prod_	It represents the country's productive capacity, both in the short and long term, and is naturally measured by real GDP.	Independent	

Source: Own elaboration

Methodology

The panel VAR model approach is used, as it was naturally introduced into econometric literature in [5]. Intuitively, panel VAR models seek to analyse the behaviour of a variable from the outset, taking into account the effects that one variable has on the other variable; on the other hand, panel VAR models make it possible, for example, to analyse different shocks in international markets using Impulse Response Functions.

Algebraically, the model obeys the following specification:

$$y_t = \alpha_0 + \sum_{l=1}^{m} \alpha_l y_{t-1} + \sum_{l=1}^{m} \delta_l x_{t-1} + u_t \quad (1)$$

Where:

α and δ's, are the linear projection coefficients of on the constant and past values of , represents the lags, is the error term. The lags in the model must be equal for the main drawback of these models is that they require many observations for the dependent and independent variables. Many authors use them to analyse the effects of explanatory variables on the dependent variable, analyses the transmission mechanism of European monetary policy, explore the usefulness of government spending in the eurozone, explore the impacts of exchange rate shocks on government spending [6-8]. study the effects of regional expenditure and revenue shocks on price differentials for 47 US states and 9 EU countries [9]. Particularly studies the effects of shocks on eurozone countries, shows some techniques for estimating panel VAR models, using fixed effects and the group average estimator [10,11]. Relevant studies using a panel VAR approach [12-23].

However, we propose analysing the following panel VAR model:

$$ln\varphi_{it} = \alpha_0 + \sum_{l=1}^{m} \alpha_{l,j}\, ln\varphi_{it} + \sum_{l=1}^{m} \delta_l X_{t-1} + f_i + f_{it} + u_t \quad (2)$$

$ln\varphi_{it}$ However, the dependent variable is the ability of economies to respond to recessions; $\delta_l X_{t-1}$ Vector with the explanatory variables in the model, specified as follows:

X_t [lnEx, lnEd, lnO_Price, lnD_Price, lnExt_Infl, lnExt_Dep, lnProd_] (3)

i, represents the countries in the sample being analysed, where: i=1,.....40
lnEx, are the exogenous shocks;
lnEd, represent the endogenous shocks;
lnO_Price, represents the price of oil on the international market in dollars;
lnExt_Infl, represents the price of diamonds per carat on the international market in dollars;
lnExt_Dep, These can, of course, be quantified in terms of the influence of certain international organisations that end up influencing the level of the economies' ability to respond;
lnExt_Dep, This represents external dependence, so they are significantly quantifiable in terms of the economy's dependence on a given commodity;
*lnProd_* However, it represents the economy's production levels and can be quantified in the countries' real GDP.

Unit Root Tests
This approach uses the unit root tests proposed by [24]. The test consists of performing separate Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) regressions for each cross-section. The other step is to estimate the ratio of long-term to short-term standard deviations. Other tests used significantly with panel data are analysed in is an appropriate test in studies with a sample size of N and T to infinity, in line with the tests proposed in [25-27].

Cointegration Tests
The relationships between the variables in the model are significantly analysed using co-integration tests, initially proposed in The fundamental premise of the tests has to do precisely with the stationarity between the variables in the model, i.e. stationarity is reached when the variables are integrated and a long-term relationship between the variables is verified [28].

Thus, in this approach we use the tests proposed in the test is based on Dickey Fuller (DF) and Augmented Dickey Fuler (ADF) estimated through the residuals of the fixed effects [29]. On the other hand, we used the test proposed in,These tests in particular allow for considerable heterogeneity between the individual members of the panel, including heterogeneity in both the long-run co-integrating vectors and heterogeneity in the associated dynamics of the short-run deviations between co-integrating vectors [30]. The analysis is significantly strengthened by analysing the test proposed in, which is a test based on structural dynamics, so two separate tests are used to test the alternative hypothesis that cointegration exists, while the other two tests test the alternative hypothesis that there is at least one individual that is cointegrated [31].

Granger Causality
Granger causality in the model is analysed using the test proposed in [32]. However, the test makes it possible to analyse the cause of the relationships between the variables in the models. cause i.e., if it is possible to use the information to predict .

Roots of the Complementary Matrix
The roots of the complementary matrices are used to analyse whether panel VAR models are in fact stable. Thus, a panel VAR model will be stable if the modulus of the complementary matrix is less than 1. and reinforced by analyse this in detail [33,34].

Impulse Response Functions
The Impulse Response Functions are intended to analyse the impacts that the explanatory variables have on the dependent variable. These impacts are significantly related to exogenous shocks, especially exogenous shocks in international markets. According to Impulse Response Functions are useful for studying the interactions between variables in a VAR model, they represent the reactions of variables to shocks that hit the system, where structural information is needed to specify significant shocks [35].

Variance Decomposition
Variance decomposition explains the importance of the innovations or stimuli of the series in the model propose a new approach to analyzing variance decomposition, based on Impulse Response Functions [36]. Use an approach without the orthogonalization of the shocks and invariant for the ordering of the variables in the VAR model and the decomposition of the forecast variances of the invariant order errors [37].

Criteria for Choosing the Optimum Number of Lags
To choose the optimum number of lags to include in the model, we used the Akaike Information Criterian (AIC) criteria proposed in, Bayesian Information Criterian (BIC), as seen in and Hannan-Quinn Information Criterian (QIC) analysed in [38-42].

Analysis and Discussion of Results
The unit root tests used in this analysis can of course be seen in Table 2, the test results show the statistical significance of the parameters, of course, we used the test proposed in [24]. This is an asymptotic test based on Dickey-Fuller and augmented Dickey-Fuller.

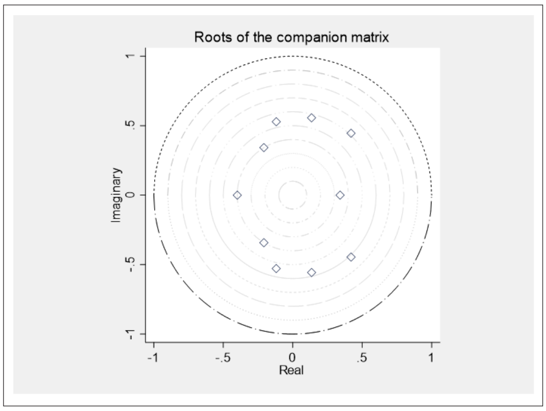

Figure 1: Unit Roots Matrix

Notes: However, the figure shows the results of estimating the complementary root matrix, so the results naturally show that the panel VAR model is stable from the outset, which allows the panel VAR model to be plausibly estimated. The complementary root matrix is naturally less than 1.

Source: Estimation results

Table 3: Panel Unit Roots Test

LLC Unit Roots							
Variable	**ΔlnProd**	**ΔlnO_P**	**ΔlnD_P**	**ΔlnG_P**	**Δlnreer**	**ΔlnX**	**Statistic (P)**
ΔlnProd t-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	26.475.226
ΔlnO_P t-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	12.085.878
ΔlnD_P t-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.823.167
ΔlnG_P t-2	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	1.585.907
Δlnreer t-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	13.313.855
ΔlnX t-2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	9.128.347

Notes: The table does, however, present the panel unit root tests, naturally using the test proposed in [24].

Source: Estimation results

The results of the panel unit root tests show that the presence of unit roots in the series analysed is relevant. On the other hand, two lags were used in the model at the outset, which allowed unit roots to be eliminated. The results therefore suggest that there are stationary series in the model.

Table 4: Kao Cointegration Test

KAO Cointegration Test		
	Statistic	**p-value**
Modified Dickey-Fuller t	-32.165	0.0006
Dickey-Fuller t	-98.566	0.0000
Augmented Dickey-Fuller t	-0.6338	0.2631
Unadjusted modified Dickey Fuller t	-81.933	0.0000
Unadjusted Dickey-Fuller t	-118.149	0.0000

Notes: The table shows the cointegration test proposed in naturally being DF and ADF based tests [29].

Source: Estimation results.

The relationships between the variables were in fact proven using the cointegration test proposed in [29]. Thus, the results suggest that there are long-term equilibrium relationships between the variables in the model, and that the existence of variables in levels, for example, is naturally proven.

However, the tests proposed in suggest that it is possible to predict the dependent variable using the information provided by the model's explanatory variables [32]. Thus, the results in Table 3 do help to explain it. On the other hand, we used, for example, the criteria for optimum choice of the number of lags to include in the models, so according to the criteria we used significantly two lags in the model, according to the results in Table 5.

Table 5: Choice of Lags

Mismatches	**p-value**	**MBIC**	**MAIC**	**MQIC**
1	0.0000	45,67889	32.5678	5,5678
2*	0.0000	3,0987	78.098	6,2345
3	0.0000	98,34567	8,2345	23,89765
4	0.0000	567.890	6,87756	34,09834

Source: Estimation results

Table 6: Granger Causality Test

ΔProd	**chi2**	**df**	**Prob > chi2**
ΔlnO_P	2.876	2	0.237
ΔlnD_P	1.232	2	0.54
ΔlnG_P	4.544	2	0.103
Δlnreer	0.275	2	0.871
ΔlnX	3.809	2	0.149
ALL	16.301	10	0.091
-			

ΔlnO_P			
ΔlnProd	2.765	2	0.251
ΔlnD_P	2.983	2	0.225
ΔlnG_P	141.81	2	0.000
Δlnreer	0.276	2	0.871
ΔlnX	0.698	2	0.705
ALL	217.521	10	0.000
-			
ΔlnD_P			
ΔlnProd	0.715	2	0.699
ΔlnO_P	27.037	2	0.000
ΔlnG_P	9.114	2	0.01
Δlnreer	1.331	2	0.514
ΔlnX	1.366	2	0.505
ALL	49.11	10	0.000
-			
ΔlnG_P			
ΔlnProd	0.714	2	0.7
ΔlnO_P	28.258	2	0.000
ΔlnD_P	11.067	2	0.004
Δlnreer	0.667	2	0.717
ΔlnX	3.879	2	0.144
ALL	77.648	10	0.000
-			
Δlnreer			
ΔlnProd	18.529	2	0.000
ΔlnO_P	0.655	2	0.721
ΔlnD_P	2.526	2	0.283
ΔlnG_P	0.988	2	0.61
ΔlnX	3.363	2	0.186
ALL	51.273	10	0.000
-			
ΔlnX			
ΔlnProd	1.967	2	0.374
ΔlnO_P	2.501	2	0.286
ΔlnD_P	0.785	2	0.675
ΔlnG_P	3.814	2	0.149
Δlnreer	0.269	2	0.874
ALL	7.182	10	0.708

Source: Estimation results.

Table 7: Variance Decomposition Results

Forecast Response Variable and Forecast horizont		Impulse variable				
0	0	0	0	0	0	0
1	1	0	0	0	0	0
2	0.8533901	0.004181	0.0250903	.0014676	.0041954	.1116757
3	0.8569584	0.0109299	0.0199344	.0014849	.0037865	.1069057
4	0.7768052	0.0104876	0.0186871	.0185465	.0034197	.172054
5	0.7779735	0.0097291	0.0172907	.0322925	.0031765	.1595377
6	0.6878269	0.0118969	0.0173296	.0689259	.002791	.2112296
7	0.6707371	0.012026	0.01737	.0753423	.0025222	.2220023
8	0.6211758	0.0106363	0.0184117	.0693867	.0020615	.2783278
9	0.613048	0.0090489	0.0183149	.0579254	.0019286	.2997344
10	0.6109399	0.0083122	0.0176246	.0469005	.0019201	.3143028
D2DlnO_P						
0	0	0	0	0	0	0
1	0.0016604	0.9983397	0	0	0	0
2	0.0180627	0.9323926	0.0059527	.0263704	.0035845	.0136371
3	0.0128306	0.5627446	0.0142328	.3888144	.0024428	.0189347
4	0.0109527	0.4912934	0.0123462	.4086787	.0024627	.0742663
5	0.0533854	0.4279484	0.0298986	.3269799	.0024061	.1593816
6	0.1123734	0.3307295	0.026287	.2525013	.0022177	.2758911
7	0.2247763	0.2472114	0.0229228	.2050662	.0018831	.29814
8	0.3432362	0.1938679	0.0211343	.1585649	.0027299	.2804667
9	0.4182739	0.1687623	0.0178953	.1303066	.0037565	.2610055
10	0.4598797	0.1410567	0.0162711	.1312622	.0034574	.248073
D2DlnD_P						

0	0	0	0	0	0	0
1	0.000823	0.0012633	0.9979137	0	0	0
2	0.015132	0.0054173	0.9318188	.0219745	.0030155	.022642
3	0.0240784	0.0830497	0.7830151	.0510257	.0179179	.0409132
4	0.0989894	0.0779373	0.7196282	.047769	.0178817	.0377945
5	0.1047304	0.0726274	0.6668	.0920705	.0279022	.0358695
6	0.1023952	0.0702646	0.6450793	.1183458	.0270209	.0368941
7	0.1035685	0.0837846	0.5949633	.1390887	.0268893	.0517057
8	0.1108747	0.0792869	0.5474601	.1402538	.0247585	.0973659
9	0.1457485	0.0702198	0.486798	.1244205	.0219559	.1508572
10	0.2129907	0.0601575	0.4165799	.1068836	.0190757	.1843126
D2DlnG_P						
0	0	0	0	0	0	0
1	0.0085277	0.0525072	0.0126526	.9263125	0	0
2	0.0082432	0.1040481	0.0066424	.8441858	.0011896	.035691
3	0.0177905	0.1490456	0.0122605	.6473981	.0010996	.1724057
4	0.0798875	0.113872	0.0166347	.4567301	.0007603	.3321154
5	0.1995308	0.0719001	0.0215157	.2947694	.0005606	.4117234
6	0.3363671	0.0551736	0.0194298	.2050409	.0014996	.3824889
7	0.4370256	0.055133	0.0162952	.1487339	.002774	.3400382
8	0.5067623	0.0498827	0.0145283	.1212442	.0032294	.304353
9	0.5270559	0.040064	0.0132845	.1325731	.0029457	.2840769
10	0.5108835	0.0318765	0.0128575	.1587254	.002327	.2833301
D2Dlnreer						
0	0	0	0	0	0	0
1	0.0133214	0.042796	0.0079575	.0146105	.9213147	0
2	0.1332496	0.0335731	0.0095131	.0271044	.7475749	.0489849
3	0.1331702	0.0312907	0.0085144	.0234281	.6643015	.1392951
4	0.2289209	0.0267238	0.0124097	.0201001	.5741452	.1377004
5	0.2676959	0.0237739	0.0170859	.0251251	.4993272	.1669921
6	0.3185997	0.0219332	0.0161868	.0289601	.4369086	.1774116
7	0.3533928	0.018276	0.0154601	.03927	.3639359	.2096651
8	0.3892869	0.0149786	0.0148584	.0495907	.2983913	.2328941
9	0.4164112	0.0118195	0.0152156	.0559093	.2345698	.2660746
10	0.4454965	0.0091111	0.0158566	.0563894	.1807783	.2923681
D2DlnX						
0	0	0	0	0	0	0
1	0.3814024	0.0259685	0.0012014	.0223561	.0005407	.5685309
2	0.4168421	0.0260164	0.0087443	.0201348	.0055834	.5226791
3	0.543613	0.0188239	0.0143803	.0115471	.0044396	.4071961
4	0.565562	0.0209457	0.0144336	.0112989	.0044422	.3833176
5	0.6027432	0.0180636	0.0124249	.0257859	.0034986	.3374839
6	0.5813849	0.0134261	0.0127329	.0572157	.0028472	.3323931
7	0.5620775	0.0103671	0.0129468	.0827638	.002201	.3296439
8	0.5342051	0.0081973	0.0142271	.088967	.0016581	.3527455
9	0.5298866	0.0059672	0.0153826	.0792682	.0013176	.3681778
10	0.5350204	0.0042254	0.015946	.0653589	.001223	.3782264

Notes: The table shows the results of the Variance decomposition.
Source: Estimation results.

Table 8: Results of the Panel VAR Model

Variable	ΔlnProd	ΔlnO_P	ΔlnD_P	ΔlnG_P	Δlnreer	ΔlnX
ΔlnProd	(-0.373) (-1.72)	(-0.602) (-1.47)	(-0.948) (-0.77)	0.102 (0.44)	(-0.149) (-1.04)	0.293 (0.44)
ΔlnProd	0.460 (0.93)	(-0.694) (-0.91)	(-0.912) (-0.47)	0.333 (0.71)	0.120 (0.41)	0.993 (0.90)
ΔlnO_P	(-0.0662) (-1.37)	(-0.475)*** (-4.51)	(-0.220) (-1.17)	(-0.297)*** (-4.63)	0.0235 (0.49)	(-0.243) (-1.57)
ΔlnO_P	(-0.00852 (-0.23)	(-0.431)*** (-5.24)	(-0.609)*** (-5.12)	(-0.244)*** (-5.10)	0.0261 (0.77)	(-0.0927) (-0.94)
ΔlnD_P	0.0390 (1.06)	(-0.0863) (-1.52)	(-0.135) (-1.23)	(-0.0205) (-0.54)	0.0120 (0.53)	0.0443 (0.61)
ΔlnD_P	0.00739 (0.53)	0.0103 (0.22)	(-0.308)** (-2.77)	(-0.102)** (-3.28)	0.0303 (1.53)	0.0339 (0.74)
ΔlnG_P	0.0828 (1.04)	0.390* (2.03)	0.532* (2.18)	0.931*** (12.80)	0.0443 (0.65)	0.336 (1.61)
ΔlnG_P	(-0.114) (-1.04)	1.527*** (7.44)	0.406 (1.39)	0.120 (1.01)	(-0.0679) (-0.92)	(-0.241) (-1.25)
Δlnreer	0.0739 (0.36)	0.197 (0.44)	(-0.273) (-0.50)	0.0992 (0.49)	0.195 (1.31)	0.236 (0.35)
Δlnreer	(-0.0422) (-0.32)	(-0.0674) (-0.18)	(-0.664) (-1.13)	0.0962 (0.57)	(-0.230) (-1.73)	(-0.0531) (-0.11)
ΔlnX	0.188 (1.10)	0.170 (0.66)	0.287 (0.87)	(-0.193) (-1.21)	(-0.108) (-1.83)	0.607 (1.12)
ΔlnX	(-0.106) (-0.43)	0.0168 (0.07)	0.484 (1.17)	(-0.213) (-1.93)	(-0.0506) (-0.70)	0.411 (0.70)

Notes: The table shows the results of the panel VAR model estimation. The * p<0.05; ** p<0.01 and *** p<0.001 represent the significance levels for 5%; 10%; and 1%, respectively.

Source: Estimation results

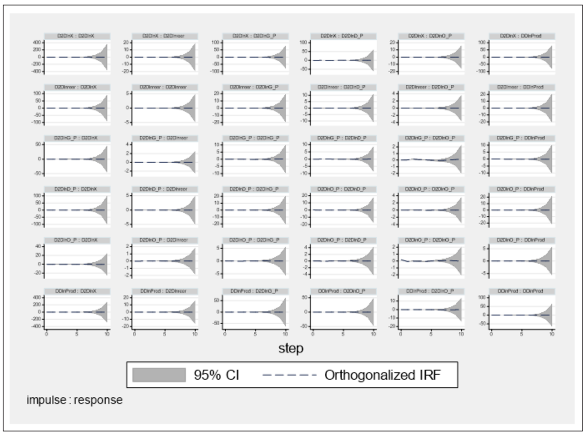

Figure 2: Impulse Response Fuctions

Source: Estimation results

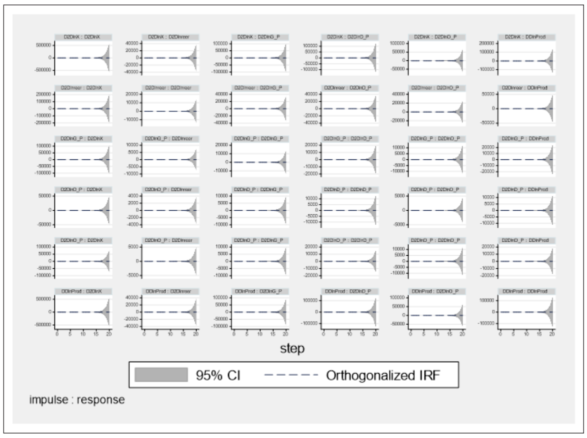

Figure 3: Impulse Response Fuctions

Source: Estimation results

Discussion of Results

We used two lags in particular: on the one hand, it allowed us to obtain stationary series at the outset, and on the other, we had an excellent long-term equilibrium relationship between the series in the model.

However, the variance decomposition shows the quantification of exogenous shocks, which both affect production through prices and end up affecting the behaviour of exports from the outset, strongly supported by the significant decreases in production levels that the selected economies show from the outset. Some quantifiable endogenous shocks via political instability in some African countries, however, help contribute to the significant decreases in the economy's production levels in general. Plausibly suggesting economic non-resilience in a context of uncertainty.

In general terms, however, the results help us to understand how economies are not able to become resilient from the outset. This non-resilience is largely associated with some of the relevant variables used in the model, such as resilience through the prices of the main exports that the selected African countries trade on the international markets.

With the Impulse Functions answered, we can see that a large number of African countries have economies that are out of their control. This approach suggests that the authorities are unable to control their economies from the outset, but this is due to a number of reasons: the first has to do with the fact that these countries do not have an economy with diversified production capacity from the outset, and the second has to do with the fact that these countries have an economy that is focussed mainly on the adoptive expectations of international markets. Thus, it is assumed from the outset that there are sufficient reasons to show that there is, for example, a lack of effective control over their economies, which makes them on the one hand non-resilient.

The Impulse Response Functions show, however, that there are significant levels of economic resilience in some of the countries selected from the sample, which from the outset do not have significant dependence on international markets and are also able to control their economies from the outset, particularly in countries such as Ghana, Botswana, South Africa and Namibia.

The exogenous shocks of the international diamond markets do help to explain the economic resilience of the countries, which in fact have an economy based on expectations of the behaviour of the international diamond markets in general.

As an example, Botswana has an economy controlled by the exogenous shocks of the diamond and adaptive expectations markets. However, in the selected sample, Botswana proved to be significantly resilient in a context of uncertainty, especially in the presence of the relevant exogenous shocks.

Strong reasons could, however, be related to the levels of Botswana's resilience, so industrial capacity, for example, helps to explain the levels of resilience, on the other hand, the levels of competitiveness of the economies explain the levels of Botswana's resilience behaviour, which from the outset are strongly supported by the levels of infrastructure that the country presents from the outset.

However, the exogenous shocks of the international gold markets do help to explain how the economy behaves in a context of uncertainty, so the results suggest that there is, for example, non-dependence on both international markets and dependence on adaptive expectations.

Thus, it is assumed from the outset that the authorities are able to control the economy, especially in the context of exogenous shocks of uncertainty that have a significant influence from the outset. On the other hand, there are significant reasons that show from the outset, for example, the sustainability of economic resilience through the production capacity that the economies present from the outset, on the other hand, they have also been significantly supported by the levels of investment that these economies in particular present.

As a result of exogenous shocks in the international oil markets, the results suggest that there is a significant influence on the levels of adaptive expectations, so the oil-producing countries, such as Angola and Equatorial Guinea, are unable to control their economies from the outset, although the approach suggests that there is a control of the international markets over the petro-dependent economies.

In general terms, the relevance of both international markets and the behaviour of certain variables helps us to understand, for example, how the authorities should be able to control their economies from the outset, especially in a context of uncertainty, where exogenous shocks can significantly affect the ability of economies to become resilient.

Resilience, however, is achieved when countries are able to respond from the outset with productive capacity and significant levels of domestic production, quantifiable in significant increases in exports.

Generally speaking, countries that can control their economies from the outset will be able to control exports from the outset, avoiding the existence of economies based on international market behaviour and the non-existence of adaptive expectations economies from the outset.

Conclusion

We did, however, analyse the productive capacity of a group of countries selected from the sample.

However, the approach suggests that economies based on adaptive expectations exist from the outset, i.e. economies that are strongly controlled by the behaviour of exogenous variables. These shocks often significantly determine the type of economy that countries have, and for economies characterised by the absence of major infrastructure, especially those that support production. This is more prevalent in the African countries selected from the sample.

The capacity for economic resilience, however, will on the one hand be associated with the levels at which the economy can become significantly robust and capable of being controlled by the authorities from the outset. The results suggest, however, that the economies that can be easily controlled by the authorities from the outset are those that have managed to guarantee, for example, significant levels of increase, both in production levels and in the existing diversified matrix of trade patterns and industry patterns, which from the outset have been strongly supported by increased levels of infrastructure.

For example, internal shocks help to significantly increase the capacity of these economies not to control, so as the quantification of the levels of exogenous shocks increases, there are significant increases in the non-control of these economies.

The approach also suggests that economies can indeed become resilient if, on the one hand, the authorities are able to control their economies directly from the outset, i.e. by taking into account the levels of productive infrastructure that these economies have at the outset. These infrastructures, however, help to consolidate, for example, a significant response capacity in the levels of economic resilience.

Thus, in the face of exogenous shocks, the greater they are from the outset, the greater the economies' capacity to respond. Thus, resilient economies will be those that from the outset have managed to guarantee significant levels of response to exogenous shocks coming from the international markets, via oil prices, where they plausibly influence and determine the economies themselves. On the other hand, exogenous shocks via gold prices on international markets have also been relevant and Impulse Response Functions contribute to this approach, especially in a context of uncertainty.

Annexes

Table 9: Correlation Matrix

	ΔlnProd	ΔlnO_P	ΔlnD_P	ΔlnG_P	Δlnreer	ΔlnX
ΔlnProd	10.000					
ΔlnO_P	0.1389	10.000				
ΔlnD_P	0.0320	0.1069	10.000			
ΔlnG_P	0.1593	0.4766	0.1613	10.000		
Δlnreer	0.0474	-0.0141	0.1668	0.0589	10.000	
ΔlnX	0.3994	0.2165	-0.0034	0.1424	-0.0859	10.000

Notes: The table shows the correlation matrix of the variables used in the model.

References

1. Gilbert S, Ayyub BM. Models for the Economics of Resilience. ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems. Part A: Civil Engineering. 2016. 2: 04016003.
2. Li CZ, Crépin AS, Folke, C. The economics of resilience. International Review of Environmental and Resource Economics. 2018. 11: 309-353.
3. Martin R. Sunley P. On the notion of regional economic resilience: conceptualisation and explanation. Journal of economic geography. 2015. 15: 1-42.
4. Hill E, Clair TS, Wial H, Wolman H, Atkins P, et al. Economic shocks and regional economic resilience. In Urban and regional policy and its effects: Building resilient regions. Brookings Institution Press. 2012. 193-274.
5. Eakin DH, Newey W, Rosen SH. Estimating Vector Autoregressions with Panel Data. Econometrica. 1988. 56: 1371-1395.
6. Ciccarelli M, Rebucci A. Has the transmission mechanism of European monetary policy changed in the run-up to EMU? European Economic Review. 2006. 737-776.
7. Marattin L, Salotti S. Has the transmission mechanism of European monetary policy changed in the run-up to EMU? The Journal of Socio-Economics. 2011. 780-795.
8. Bénétrix A, Lane P. Fiscal Shocks and the Real Exchange Rate. International Journal of Central Banking. 2018. 9: 3.
9. Canova F, Pappa E. Price Differentials in Monetary Unions: The Role of Fiscal Shocks. The Economic Journal. 2007. 713-737.
10. Jarociński M. Responses to monetary policy shocks in the east and the west of Europe: a comparison. Journal of Apllied Econometrics. 2010. 25: 833-868.
11. Rebucci A. Estimating VARs with long stationary heterogeneous panels: A comparison of the fixed effect and the mean group estimators. Economic Modelling. 2010. 1183-1198.
12. Da Silva MA. Does Inequality Benefit Growth? New Evidence Using a Panel VAR Approach. 2017.
13. Calomiris CW, Stanley DL, William RM. The Foreclosure-House Price Nexus: A Panel VAR Model for U.S. States 1981-2009. Real Estate Economics. 2013. 709-746.
14. Grossmann A, Love I, Orlov A. The dynamics of exchange rate volatilety: A panel VAR approach. Journal of International Financial Markets Institutions and Money. 2014. 1-27.
15. Berdiev A, Saunoris J. Financial development and the shadow economy: A panel VAR analysis. Economic Modelling. 2016. 197-207.
16. Rudra PP, Mak BA, Neville RN, Samadhan KB. Economic growth and the development of telecommunications infrastructure in the G-20 countries: A panel-VAR approach. Telecommunications Policy. 2014. 634-649.
17. Kim S, WhaLee J. Demographic changes, saving, and current account: An analysis based on a panel VAR model. Japan and The World Economy. 2008. 236-256.
18. Assenmacher K, Gerlach S. Monetary Policy, Asset Prices and Macroeconomic Conditions: A Panel-Var Study. National Bank of Belgium. 2010. 149.
19. Lin B, Wang Y. Inconsistency of economic growth and electricity consumption in China: A panel VAR approach. Journal of Cleaner Production. 2019. 144-156.
20. Pradhan. Determinants of Foreign Direct Investment in SAARC Countries: An Investigation Using Panel VAR Model. Information Management and Business Review. 2011. 117-126.
21. Magazzino C. CO2 emissions, economic growth, and energy use in the Middle East countries: A panel VAR approach. Energy Sources. 2016. 960-968.
22. Rezitis A, Ahammad S. The Relationship between Energy Consumption and Economic Growth in South and Southeast Asian Countries: A Panel VAR Approach and Causality Analysis. International Journal of Energy Economics and Policy (Forthcoming). 2015.
23. Trung N. The spillover effect of the US uncertainty on emerging economies: a panel VAR approach. Applied Economics Letters. 2019. 210-216.
24. Levin A, Lin CF, Chu CS. Unit roots Tests in panel data: asymptotic and finite sample properties. Journal of Econometrics. 2002. 108: 1-24.
25. Harris RD, Tzavalis E. Inference for Unit roots in dynamic panels where the time dimension is fixed. Journal of Econometrics. 1999. 201-22.
26. Im SK, Pesaran MH, Shin Y. Testing for unit roots in heterogeneous panels. Journal of Econometrics. 2003. 53-74.
27. Breitung J, Meyer W. Testing for unit roots in panel data: are wages on dzflerent bargaining. Applied Economics. 1994.
28. Engle FR, Granger CW. Co-Integration and Error Correction: Representation Estimation, And Testing. Econometrica. 1987. 55: 251-276.
29. Kao C. Spurious regression and residual based tests for cointegration in panel data. Journal of Econometrics. 1999. 1-44.
30. Pedroni P. Critical Values for Cointegration tests in Heteregeneous panels with multiple regressors. Oxford Bulletin of Economics and Statistics. Special Issue. 1999. 0305-9049.

31. Westerlund J. Testing for Error Correction in Panel Data. Oxford Bulletin of Economics and Statistics. 2007. 0305-9049.
32. Granger C. Investigating Causal relations by econometrics models and cross- spectral methods. Econometrica. 1969. 37: 3.
33. Hamilton JD. Times Series Analysis. Princeton: Princeton University Press. 1994.
34. Lutkepohl H. New Introduction to Multiple Time Series Analysis. Heidelberg: Springer. 2005.
35. Lütkepohl H. Impulse Response Function. London: Macmillan Publishers Ltd (eds) The New Palgrave Dictionary of Economics. 2018.
36. Lanne M, Nyberg H. Generalised Forecast Error Variance Decomposition for Linear and Nonlinear Multivariate Models. CREATES Research Paper 2014. 17.
37. Pesarana H, Shin Y. Generalised impulse response analysis in linear multivariate models. Economics Letters. 1978. 17-29.
38. Akaike H. Fitting Autoregressive Models for Prediction. Annals of the institute of Statistical Mathematics. 1969. 21: 243-247.
39. Schwarz G. Estimating the dimension of a model. Annals of Statistics. 1978. 6: 461-464.
40. Rissanen J. Modelling by shortest data description. Automatica. 1978. 14: 465-471.
41. Akaike H. On entropy maximisation principle. Applications of Statistics. Amsterdam: North-Holland: ed. Krishnaiah PR. 1977. 27-41
42. Hannan EJ, Quinn GB. The Determination of the Order of an Autoregression. Journal of the Royal Statistical Society. Series B (Methodological). 1979. 41: 190-195.