

27th Annual Conference Online

May

June

2021



TESTING THE EXTERNAL SHOCK NARRATIVE OF THE CONFLICT ON TRANSITION TOWARDS KNOWLEDGE ECONOMY IN SYRIA

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Testing the external shock narrative of the conflict on transition towards knowledge economy in Syria

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Abstract

In the existing literature, several narratives explain the failure of low-income countries in catching-up with developed countries, or at least in achieving concrete steps in the way of transitioning towards an economy more dependent on knowledge and innovation. Among these narratives is the theory of external shocks, which suggests that the underdevelopment of low-income countries is due to external shocks of various kinds: economic or political ones.

In this study, we examine the literature of the external shocks to explain and analyze the impact of the conflict in Syria on the transition process towards a knowledge-based economy before and during the conflict. This study endeavors to analyze the real causes that hindered and are hindering the Syrian economy from transitioning towards a knowledge-based economy, and thus suggest policies that pave the way for a successful reconstruction process, and at the same step forward towards building Syrian new economy.

To achieve these objectives, we apply the Documentary Research Method (DSM) to analyse the existing literature of the external shock theory and studies that investigated the transition process towards a knowledge-based economy in low-income countries. We also apply the Structural Vector Autoregression (SVAR) to measure the impact of the internal and external shocks on some innovation and knowledge creation-related variables.

Our results indicate that, in the long run, external shocks do not provide a comprehensive explanation of the failure in building a knowledge-based economy in Syria. On the other hand, internal shocks, whether the shock of liberal policies or the internal conflict, provide better insights.

The results also show that the internal shocks in general, and the shock of liberal policies, are largely responsible for Syria's failure to transitioning to a knowledge-based economy, and for the outbreak and development of the conflict.

In light of these results, we have proposed a set of economic policies for the reconstruction of Syria based on a non-classical approach that orient the reconstruction process towards building a knowledge-based economy and raising the pace of convergence with other countries in the region whether in terms of digitization or changing the sectoral structure of the economy.

Keywords: External shocks, Internal shocks, Knowledge-based economy, conflict, SVAR, Economic reconstruction, Syrian Economy.

Introduction

Small economies are characterized by their vulnerability to political and economic events in their neighboring and in major global countries. This is termed in the economic literature as external shocks. Several studies have analyzed the role and impact of external shocks on the performance of macroeconomic indicators (Hsing, 2012; James & Lawler, 2010; Maćkowiak, 2007). The more open the economy, the more vulnerable it is to external shocks (Raghavan & Athanasopoulos, 2019).

Another strand of literature has examined the impact of internal shocks (Rasaki & Malikane, 2015), both in terms of shifts in adopted economic policies (Gerlach-Kristen, 2006) and in response to internal conflicts and civil wars and the shock they pose to economic and social indicators (D'Souza & Jolliffe, 2013; Fenske & Kala, 2017; Hull & Imai, 2013).

For Arab countries in general, they can be classified into two broad groups; rich countries that are resource-abundant (Oil and Gas) such as Algeria and Gulf Cooperation Council (GCC) countries, and poor countries that depend mainly on agriculture and tourism as well as remittances from relatives working in oil rich countries as the main source of income of the remaining Arab countries (Jamshidi, 2014).

Syria, a member of the second group, has economic structure that is susceptible to external shocks due to its relatively small manufacturing sector and overdependence on agricultural and tourism sectors. The current state of Syria can be summarized by its move from the 48th place in the fragile states index in 2010 to the 4th place in 2020.

The Syrian economy has witnessed several events in the period prior and post 2011. In this study, we are interested in investigating the impact of two shocks:

one before 2011 and one after, in addition to the external Arab spring shock as external shock.

This study endeavours to test the narrative of external shock on the transition process towards knowledge-based economy in countries experiencing political and social instability, Syria in our case. We consider that analysing the impact of external and internal shocks on the knowledge-based economy in Syria is crucial to identify the sources of transition system failure.

To this end, we will examine the impact of the internal liberal policy shock since 2005 on knowledge-based economy indicators, as well as examine the impact of internal shock of conflict in 2011. We will then test the impact of the external shock of Arab revolutions in 2010 on the transition to knowledge-based economy in Syria.

This study contributes to the existing literature by expanding the boundaries of external shocks studies beyond the macroeconomy. It explores a new domain of external shock narrative in the context of knowledge-based economy building.

This study is structured as follows. First, we revise the literature of external shocks studies in different economic and social domains. Second, we illustrate the data and methodology used in this study. Third, we present and discuss the results of this study. Finally, we conclude.

Literature review

Prior literature focuses on the impact of different types of external shocks on developing economies' indicators. Those external shocks include interest rate and term of trade shocks (Calvo et al., 2006; Muhanji & Ojah, 2011), exchange rate shocks (J. P. Allegret & Benkhodja, 2015), the U.S. monetary shock (Hirakata et al., 2011), the international financial crises (The Asian crisis and the subprime crisis) (Josifidis et al., 2014), oil prices shocks (Cross & Nguyen, 2017; Ong &

Sato, 2018), the real GDP growth in the U.S. and Japan (Morita, 2014), and financial shocks (e.g., the volatility of the MSCI World Index) (J.-P. Allegret et al., 2012).

Political instability is defined as the propensity of a government collapse and state failure (Mommsen, 1989). Such collapse may be due to internal competition between certain government stakeholders or from other conflicts (Alesina et al., 1996). It ranges from certain violence incidents to social unrest and to the extreme of civil war.

Political instability disrupts the economic system and undermines the economic growth. Many articles relate political instability to loose institutional capacity, weak economic growth, and lower investment inflows (Alesina et al., 1996; Bano et al., 2019; Feng, 1997).

Several channels are suggested in the literature to describe how political instability would affect a country's innovation and technological activities and consequently impairs its transition process to knowledge-based economy. First, trust and certainty are crucial for triple helix model to flourish in the economy. Political instability creates an atmosphere of mistrust between essential units of innovation and both formal and informal institutions which undermines innovation (Allard et al., 2012; Amankwah-Amoah, 2016; Leydesdorff, L. L. y Meyer, 2003). Second, the uncertainty caused by political instability discourages both local and foreign investors from making investment (Bano et al., 2019; Feng, 1997). Globerman and Shapiro (2003) argue that political instability reduces FDI inflows and human capital development, which consequently impair innovation rates and investment (Allard et al., 2012). Third, the migration of skillful persons due to political instability is another source of impairment of transition process to knowledge-based economy (Amankwah-Amoah, 2016). The brain drain of trained professionals, academics and scientists (also called innovation migration by Cuhls, 2007) will impair innovation activities and surely slow down the

transition towards knowledge-based economy. In addition, entrepreneurs will escape instable countries because they will not be able to run businesses in them (Brück et al., 2011; Koh, 2007). Fourth, the shift in resources from R&D investments to unproductive costs and military expenditures in politically instable countries would hinder their efforts in transition to knowledge economies.

Interestingly, the narrative of external shocks in the literature in general and in Arab countries studies in particular is dominant (Abdel-Latif, 2019; Hossain, 2016; Kim & Hammoudeh, 2013). This dominance makes the validity of this narrative questionable.

There are several studies in the Arab countries, in which the external narrative has a dominant position. Expectedly, oil price shocks significantly affect GDP and trade balances of GCC countries (Nasir et al., 2018). Moreover, financial sector development of GCC countries is subject to noticeable boom and bust closely linked to oil price fluctuations (Arezki & Nabli, 2012). In addition, the spread of ICT in Arab countries, which constitutes a pillar for knowledge-based economy, disrupts the politico-economic environment. Khondker, (2015, P.801) calls the internet technology “a double-edged sword” because it upgrades the economy in one hand and disrupts the political system in the other hand. Moreover, the implementation of neoliberalization programs suggested by the IMF, that cut-off on government subsidies on food and fuel, caused huge anger and riots (Jamshidi, 2014). Global warming and draught could also hurt economies that depends on agriculture and reduce agricultural production and livestock and could cause internal migration despite that Selby et al. (2017) refuse this hypothesis in the Syrian case.

On the other hand, in the existing literature, there many other studies that explain the failure in the economic, social and political Arab systems by internal shocks and factors. Arezki and Nabli (2012) attribute the political instability of the so-called Arab Spring to social instability caused by the failure in job creation and

economic diversification. Jamshidi (2014) argues that Arab countries suffer from poor political institutions in addition to stagnant and undiversified economies that are over-dependent on oil revenues. He adds “the health of many Arab economies was intimately tied to volatile international oil markets” (Jamshidi,2014, P.5).

It is obvious that the previous external shocks studies have been limited to the analysis and measurement of the impact of external shocks on macroeconomic indicators such as GDP (Gunasinghe et al., 2020), inflation rates (Moreira, 2012; Muhanji et al., 2013), unemployment rates (Siwach, 2018) and inequality (Gunasinghe et al., 2020; Reardon & Taylor, 1996).

However, in our opinion, the impact of external and internal shocks is not limited to macroeconomic indicators, but also to other indicators associated with the transition process towards knowledge-based economy. To the best of our knowledge, no previous study has examined or analyzed the impact of external or internal shocks on the transition process towards a knowledge-based economy. Therefore, we attempt to investigate the impact of external and internal shocks on the transition process towards knowledge-based economy.

Date and methodology

This study includes data of basic knowledge economy indicators available from 2000 to 2018 (Appendix. 1, Table. 1). In the light of scarcity of data about knowledge economy in Syria, three variables were used as a proxy for three dimensions of knowledge-based economy: (1) education index as a proxy of human capital building, (2) the number of patent applications as a proxy of innovation activities, (3) the number of trademarks as a proxy of commercialization of knowledge and innovations.

These three variables were aggregated by taking their average standardized value to produce one dependent variable representing a proxy for the knowledge economy in Syria.

The Syrian economy has witnessed a number of events in the period prior to 2011. First, the Syrian economy witnessed a quick transition from a centrally planned economy to “social” market economy. This shift included cutting on state subsidies particularly on fuel (De Châtel, 2014).

We divide shocks that disturb the Syrian economy into two groups:

- **Internal shocks:** which include (1) The internal liberal policy shock since 2005. (2) The internal shock of conflict since 2011.
- **External shock:** represents the Arab Spring in Arab countries that began in 2010.

A set of dummy variables were created to represent the internal and external shocks. According to Jarque-Bera test results shown in Table 1, all variables are normally distributed. Where, the null hypothesis of this test states that the time series are normally distributed.

In order to analyse the impact of internal and external shocks on the knowledge economy in Syria, a Structural VAR model was used.

First, the general specification of the SVAR model is as follows:

$$BY_t = \sum_{i=1}^L A_i Y_{t-i} + \varepsilon_t$$

Y_t represents the endogenous variables of study, which include in our study: Knowledge economy (KE), internal policy shock (IPSh), internal conflict shock (IC), and external conflict shock (ExC). ε_t is a vector of structural shocks that is identically distributed. L is the number of lags. A_i is a coefficient matrix, and B is the contemporaneous interaction matrix. The matrix of structural shocks

supposed to be orthogonal ($\sum \mathcal{E} = I$) and to have a unitary variance to make it possible to isolate the effects of shocks from each other.

Furthermore, the absence of effect of internal shocks on external ones can be represented as zeros in the A_i matrix.

$$A_i = \begin{bmatrix} IPSh & 1 & 0 & 0 & 0 \\ ExC & 0 & 1 & 0 & 0 \\ IC & NA & NA & 1 & 0 \\ KE & NA & NA & NA & 1 \end{bmatrix}$$

Second, we imposed a set of restrictions in the SVAR models: (1) short-run restrictions and (2) long-run restrictions. Restrictions were imposed on the relationship between variables based on the economic theory. Therefore, the short-run form of the SVAR model can be written as follows:

$$\begin{bmatrix} IPSh_t \\ ExC_t \\ IC_t \\ KE_t \end{bmatrix} = \begin{bmatrix} A_{11} & 0 & 0 & 0 \\ 0 & A_{22} & 0 & 0 \\ 0 & A_{32} & A_{33} & 0 \\ A_{41} & A_{42} & A_{43} & A_{44} \end{bmatrix} \begin{bmatrix} KE_{t-1} \\ IPSh_{t-1} \\ ExC_{t-1} \\ IC_{t-1} \end{bmatrix} + \begin{bmatrix} R_1 & 0 & 0 & 0 \\ 0 & R_2 & 0 & 0 \\ 0 & R_3 & R_4 & 0 \\ R_5 & R_6 & R_7 & R_8 \end{bmatrix} \begin{bmatrix} \mathcal{E}_t^{IPSh} \\ \mathcal{E}_t^{ExC} \\ \mathcal{E}_t^{IC} \\ \mathcal{E}_t^{KE} \end{bmatrix}$$

In the short run, the liberal policy adopted in 2005 in Syria does not show a significant effect on the internal conflict. Therefore, we imposed restriction on this relationship in the short run matrix. Also, we restricted the impact of the external conflict shock on the internal policy shock since the shift in policy happened before the Arab spring.

Regarding the long-run form of the SVAR model, we activated the impact of the internal liberal policy shock on the internal conflict and knowledge economy since 5-10 years are enough to evaluate the effect of this shock on both knowledge economy and internal conflict.

it can be written as follows:

$$\begin{bmatrix} IPSh_t \\ ExC_t \\ IC_t \\ KE_t \end{bmatrix} = \begin{bmatrix} A_{11} & 0 & 0 & 0 \\ 0 & A_{22} & 0 & 0 \\ A_{31} & A_{32} & A_{33} & 0 \\ A_{41} & A_{42} & A_{43} & A_{44} \end{bmatrix} \begin{bmatrix} KE_{t-1} \\ IPSh_{t-1} \\ ExC_{t-1} \\ IC_{t-1} \end{bmatrix} + \begin{bmatrix} R_1 & 0 & 0 & 0 \\ R_2 & R_3 & 0 & 0 \\ 0 & R_4 & R_5 & 0 \\ R_6 & R_7 & R_8 & R_9 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{IPSh} \\ \varepsilon_t^{ExC} \\ \varepsilon_t^{IC} \\ \varepsilon_t^{KE} \end{bmatrix}$$

Using Cholesky factorization of the estimated covariance matrix, we computed the R matrix. In order to perform the SVAR analysis, there is a set of assumptions that must be fulfilled.

First, stationarity test. All variables should be stationary at the first difference.

Table 2 shows the results of the unit root test for all studied variables.

Table 2. Unit root test results

Variable	Augmented Dickey-Fuller test		Phillips-Perron test	
	Level I(0)	1 st diff I(1)	Level I(0)	1 st diff I(1)
Knowledge Economy (KE)	-0.76	-2.23**	-0.069	-10.55***
Internal Policy Shock (IPSh)	-1.69	-4.12***	-1.68	-4.12***
Internal Conflict Shock (IC)	-0.79	-4.12***	-0.79	-4.12***
External Conflict Shock (ExC)	-1.60	-3.87**	-1.67	-3.87**

***, **, * represent significance at the 1, 5, and 10% level of significance, respectively.

As shown in table 2, according to the Augmented Dickey-Fuller test and the Phillips-Perron test, all variables are stationary at the first difference I(1).

Second, optimal lags selection. Various criteria were used to choose the optimal lags of the model as shown in table 3.

Table 3. Lags selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-33.76614	-	0.001000	4.4430	4.639	4.462563
1	4.416954	53.905*	7.90e-05	1.833	2.81355*	1.930738
2	25.49529	19.83843	6.53e-05*	1.2358*	3.000300	1.4112*

* indicates lag order selected by the criterion.

The result in table 3 shows that the second lag is the optimal lag according to FPE, AIC, SC, and HQ.

Third, we test the stability of the model by conducting the inverse roots of AR Characteristic Polynomial. The results shown in figure 1 indicate the stability of the model and the reliability of the coefficients.

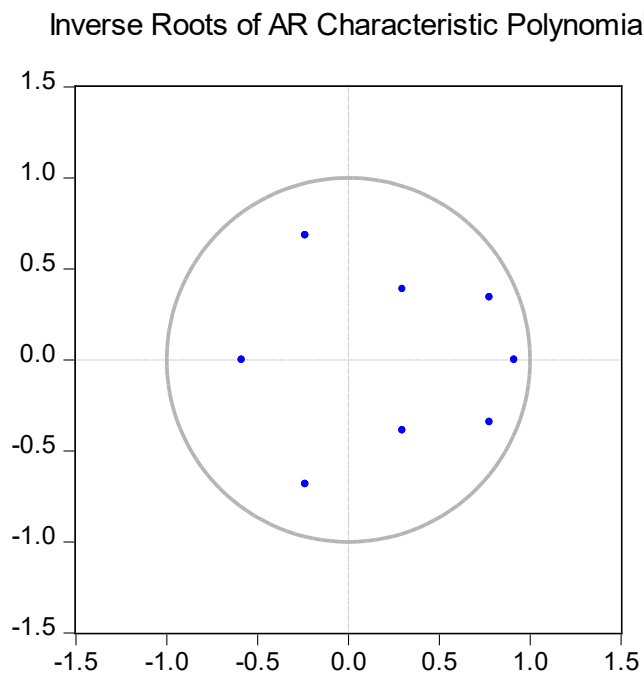


Figure 1. Inverse roots of AR Characteristic Polynomial

Fourth, we test the VAR Residual Serial Correlation. The results of the VAR Residual Serial Correlation LM Tests shown in table 4 indicate that the residuals of the model are not serially correlated.

Table 4. VAR Residual Serial Correlation LM Tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	9.944859	16	0.8695	0.354190	(16, 3.7)	0.9367
2	21.01003	16	0.1781	1.415724	(16, 3.7)	0.4110
3	19.84227	16	0.2274	1.245377	(16, 3.7)	0.4675

Fifth, normality test of the residuals. Since all shocks' variables are dummy variables and logically distributed, the normality test of the residuals is not necessary in this case.

After checking all requirements of SVAR, we build our model for both short and long run.

Table 5 shows the results of the short run SVAR model.

Table 5. SVAR Short-run results

Model: $e = Su$ where $E[uu'] = I$				
S =				
	C(1)	0	0	0
	0	C(3)	0	0
	0	C(4)	C(6)	0
	C(2)	C(5)	C(7)	C(8)
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)[IPSh→IPSh]	0.288196	0.049425	5.830951	0.0000
C(2) [IPSh→KE]	-0.075473	0.040508	-1.863157	0.0624
C(3) [ExC→ExC]	0.387596	0.066472	5.830951	0.0000
C(4) [ExC→IC]	0.043483	0.049303	0.881972	0.3778
C(5) [ExC→KE]	-0.201397	0.066133	-3.045347	0.0023
C(6) [IC→IC]	0.200941	0.034461	5.830951	0.0000
C(7) [IC→KE]	-0.171402	0.048146	-3.560059	0.0004
C(8)	0.156080	0.026767	5.830951	0.0000
Log likelihood	-0.369147			
LR test for over-identification:				
Chi-square(2)	0.472387		Probability	0.7896
Estimated S matrix:				
	0.288196	0.000000	0.000000	0.000000
	0.000000	0.387596	0.000000	0.000000
	0.000000	0.043483	0.200941	0.000000
	-0.075473	-0.201397	-0.171402	0.156080
Estimated F matrix:				
	1.361521	0.123974	0.576629	0.134268
	0.170665	0.328405	-0.299719	0.129299
	1.358668	1.147391	1.567583	0.128916
	-0.429388	-0.982441	-0.935800	0.063376

The results in table 5 shows that there is a significant negative relationship between the internal and external shocks and the knowledge economy variable. The results also show that there is a positive relationship between the external

shock and the internal conflict shock indicating that the external shock in the Arab countries participated in accelerating the conflict in Syria in the short run.

To identify the impact path of shocks on the knowledge economy in the short run, we analysed the impulse response of the knowledge economy to all shocks. The results are shown in Figures 2, 3, and 4.

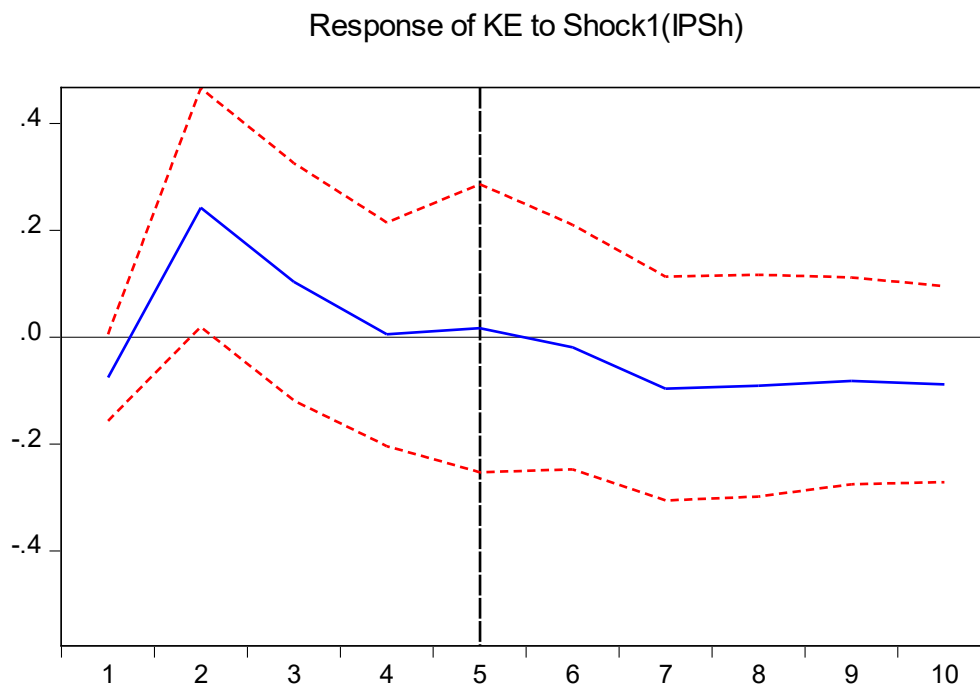


Figure 2. Short-run restricted impulse response of knowledge economy to internal policy shock.

Figure 2 shows that the internal liberal policy shock in Syria contributed to an increase in the knowledge economy in the first two years, but it quickly reverted to a negative, especially in the fifth year of adoption of policies (i.e. 2010). This negative impact of liberal policies on the knowledge economy is due to the absence of a national economic strategy aiming at transforming the Syrian economy towards a knowledge-based economy. This is confirmed by the absence of a national strategy for science, technology, and innovation until late 2019.

As to the impact of the external conflict shock in the Arab countries on the knowledge economy, the results in Figure 3 show that the knowledge economy

was affected by the external shock after two years of conflict in the Arab countries (2012), where we note a significant decline after the second year.

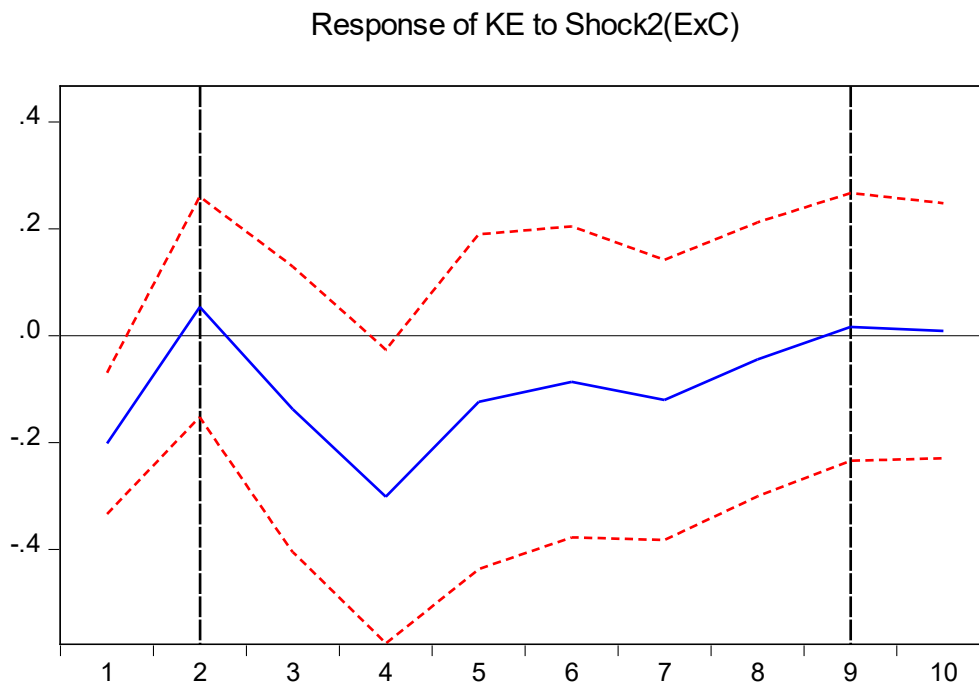


Figure 3. Short-run restricted impulse response of knowledge economy to external conflict shock.

It should be noted that after the fifth year of external conflict in the Arab countries (2015), where the situation in those countries has begun to stabilize and the political instability in them has decreased, the impact of the external shock has significantly disappeared in the ninth year.

Regarding the impact of the internal conflict on the knowledge economy, the internal conflict has had a direct impact on the knowledge economy only at the beginning of the third year of conflict as shown in figure 4.



Figure 4. Short-run restricted impulse response of knowledge economy to internal conflict shock.

In sum, the accumulative impact of internal and external shocks on the knowledge economy was negative at the first two years, except the internal liberal policy shock that have positively influenced the first two years to revert in the following years as figures 5, 6 and 7 illustrate.

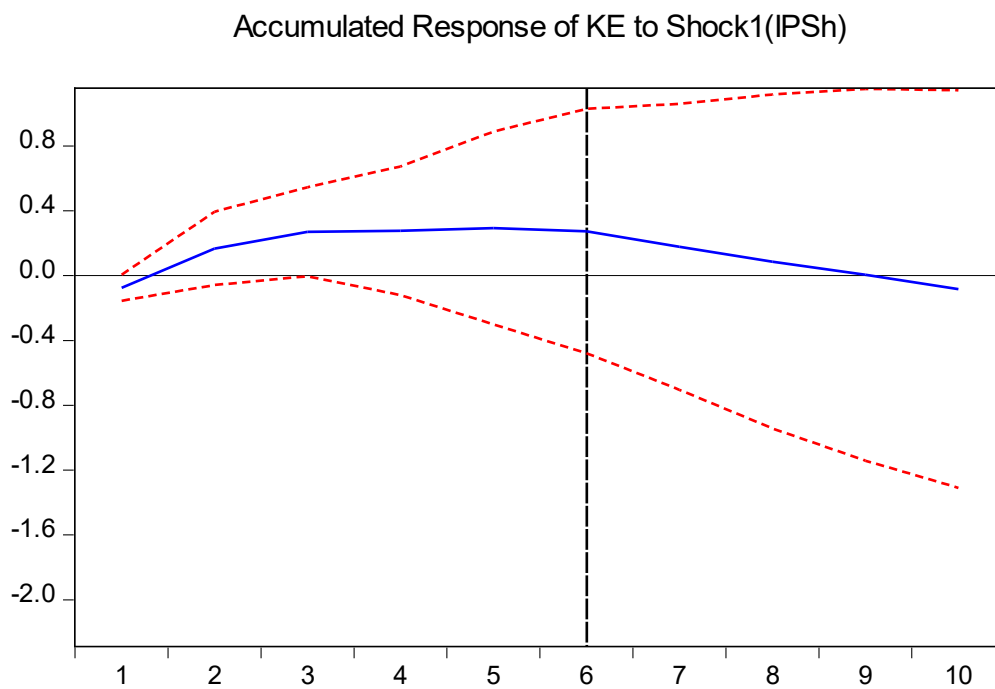


Figure 5. Short-run accumulated impulse response of knowledge economy to internal policy shock.

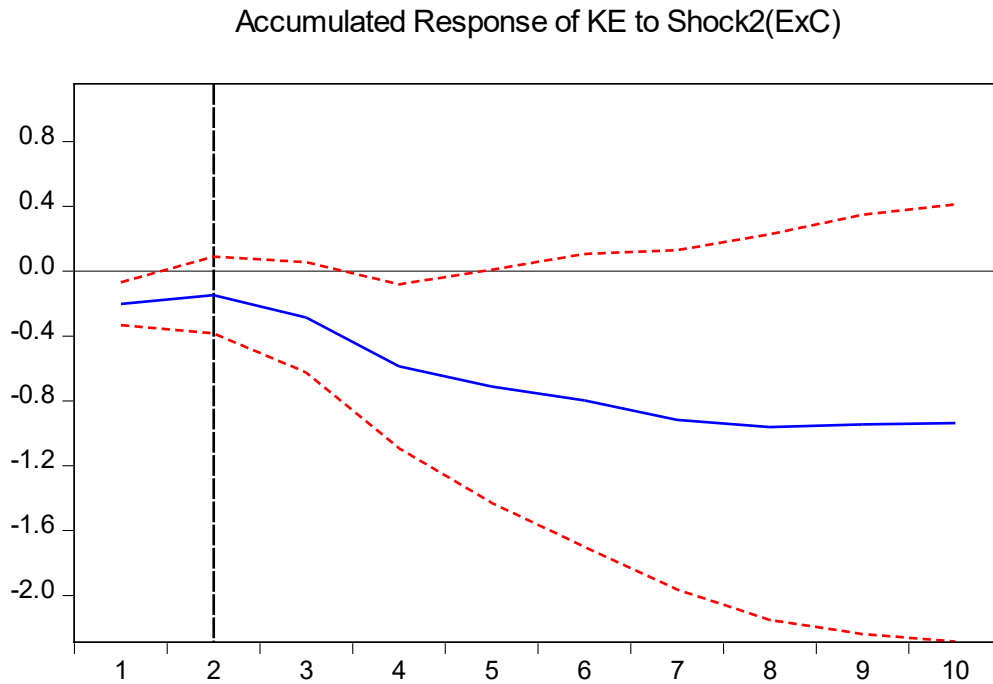


Figure 6. Short-run accumulated impulse response of knowledge economy to external conflict shock.

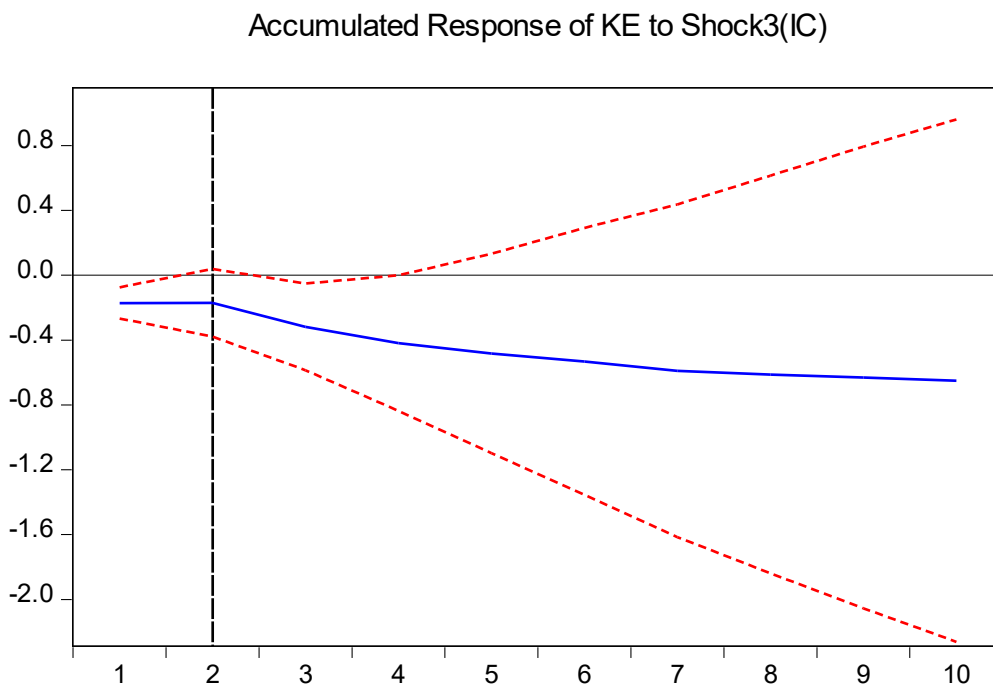


Figure 7. Short-run accumulated impulse response of knowledge economy to internal conflict shock.

The results of the short run SVAR model also showed that the external shock affected the internal conflict in the first two years, see Figure 8, and then its impact decreased over time. This is due to the way the dynamics of the conflict in Syria have evolved afterwards.

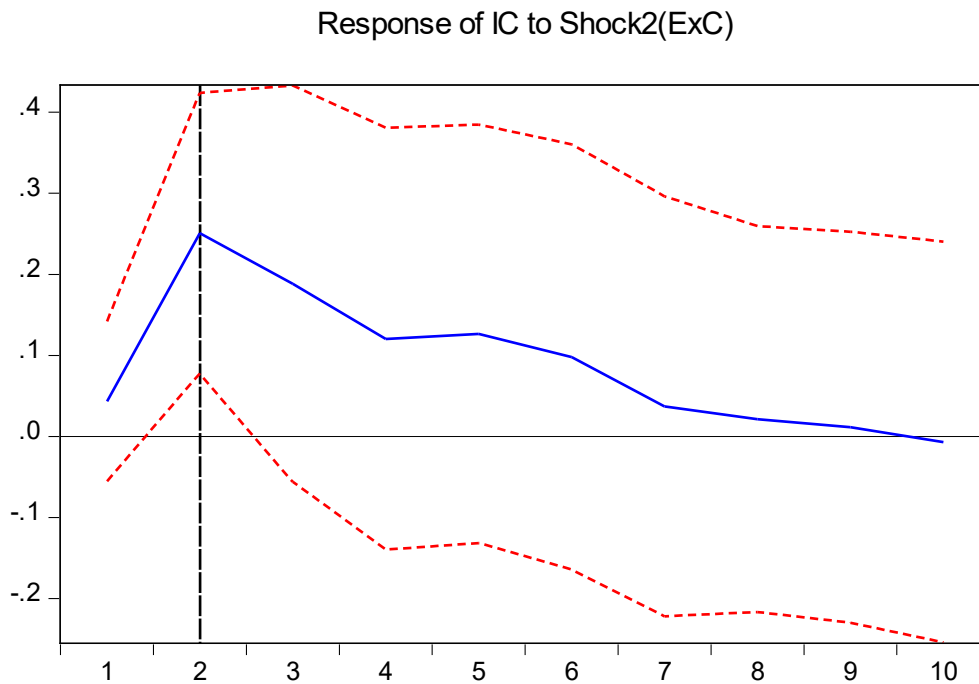


Figure 8. Short-run restricted impulse response of internal conflict to external conflict shock.

In order to determine the contribution of each shock to the interpretation of variances in the knowledge economy variable, we have conducted a Variance Decomposition analysis of the short run impact of shocks in table 6.

Table 6. Variance Decomposition of knowledge economy (Short run SVAR).

Variance Decomposition of KE					
Period	S.E.	Shock1 (IPSh)	Shock2 (ExC)	Shock3 (IC)	Shock4 (KE)
1	0.316222	5.696349	40.56219	29.37977	24.36170
2	0.402412	39.84208	26.82794	18.14322	15.18675
3	0.462423	35.18184	29.19491	24.12178	11.50146
4	0.562262	23.80621	48.47666	19.50425	8.212869
5	0.579410	22.50129	50.21728	19.54536	7.736081
6	0.589233	21.85871	50.71344	19.62603	7.801826
7	0.611822	22.75216	50.91106	19.07437	7.262417
8	0.620756	24.25101	49.96384	18.67202	7.113130

9	0.627043	25.47145	49.03397	18.37834	7.116248
10	0.633685	26.87337	48.03209	18.08553	7.009009

The results in table 6 shows that the external conflict shock has the highest explanatory power in the short run of 10 years with 48% of the variances in the knowledge economy. Whereas the internal policy shock and the internal conflict shock contribute towards explaining 26.9% and 18.1% of the variation of knowledge economy indicator respectively.

These results indicate that, in the short run, external shocks play a more important role than internal shocks in interpreting changes in the knowledge economy in Syria. This can be explained by (1) the nature of the knowledge economy indicators that respond rapidly to external changes since the innovation activities are highly correlated with external factors, and (2) the delay in activating the impact of the internal shocks.

To analyse the nature of the long run relationship between shocks and the knowledge economy, we have built a long run SVAR model after releasing the restriction of the internal policy shock's impact on the internal conflict shock since long run.

Table 7 shows the results of the long run SVAR model.

Table 7. SVAR long-run results

Model: $e = \Phi \cdot F_u$ where $E[uu'] = I$				
F =				
C(1)	0	0	0	
0	C(4)	0	0	
C(2)	C(5)	C(7)	0	
C(3)	C(6)	C(8)	C(9)	
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	1.538878	0.263917	5.830916	0.0000
C(2)	1.987727	0.472767	4.204453	0.0000
C(3)	-0.813431	0.313816	-2.592064	0.0095
C(4)	0.467392	0.080157	5.830951	0.0000
C(5)	0.065009	0.327755	0.198348	0.8428
C(6)	-0.131111	0.282001	-0.464930	0.6420
C(7)	1.349640	0.231461	5.830951	0.0000

C(8)	-1.151701	0.199740	-5.765994	0.0000
C(9)	0.122586	0.021023	5.830951	0.0000
Log likelihood	-0.144866			
LR test for over-identification:				
Chi-square(1)	0.023825		Probability	0.8773
Estimated S matrix:				
0.263320	0.050089	-0.091545	-0.042926	
-0.017754	0.256753	0.284377	-0.058854	
0.099142	-0.095084	0.153084	0.025861	
-0.133981	0.001877	-0.234385	0.163464	
Estimated F matrix:				
1.538878	0.000000	0.000000	0.000000	
0.000000	0.467392	0.000000	0.000000	
1.987727	0.065009	1.349640	0.000000	
-0.813431	-0.131111	-1.151701	0.122586	

The results in table 7 shows that there is a significant negative impact of the internal policy shock, internal conflict shock and external shock on the knowledge economy. The results also shows that the internal liberal policy shock has a positive relationship with the internal conflict. On the other hand, the results show that the external shock does not have a significant impact on the internal conflict on the long run. This can be explained by the fact that the mechanisms of the internal conflict started to revolutionize itself with internal accumulated factors due to the way in which the conflict developed overtime.

Similarly, we analysed the impulse response of the knowledge economy to all shocks the long run. The results are shown in the figures 9, 10, 11, and 12.

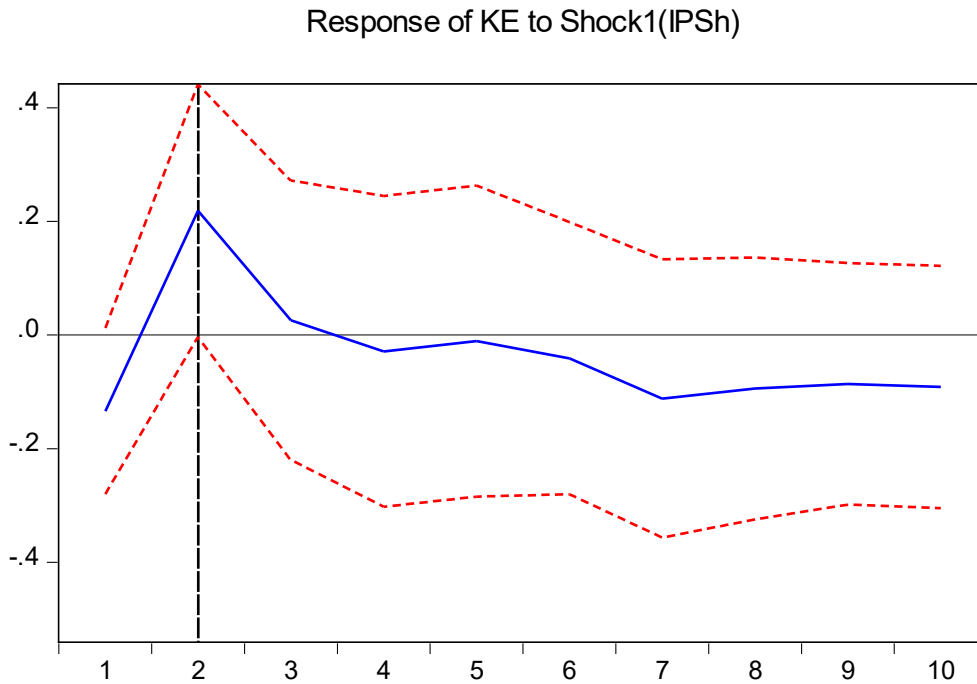


Figure 9. Long run restricted impulse response of knowledge economy to internal policy shock.

Similar to figure 2, the internal liberal policy shock in Syria increased the variances of the knowledge economy in the first two years. However, after that, it affected the knowledge economy negatively. This indicates that liberal policies, that were supposed to expand the prospects of knowledge-intensive activities that require a certain level of economic liberalism and openness, have not been properly implemented. This has adversely affected the performance of the key indicators of the knowledge economy in Syria.

Regarding the long run impact of the external shock, the results shown in figure 10 indicates that the negative impact lasted for three years before becoming non-significant in the long run.

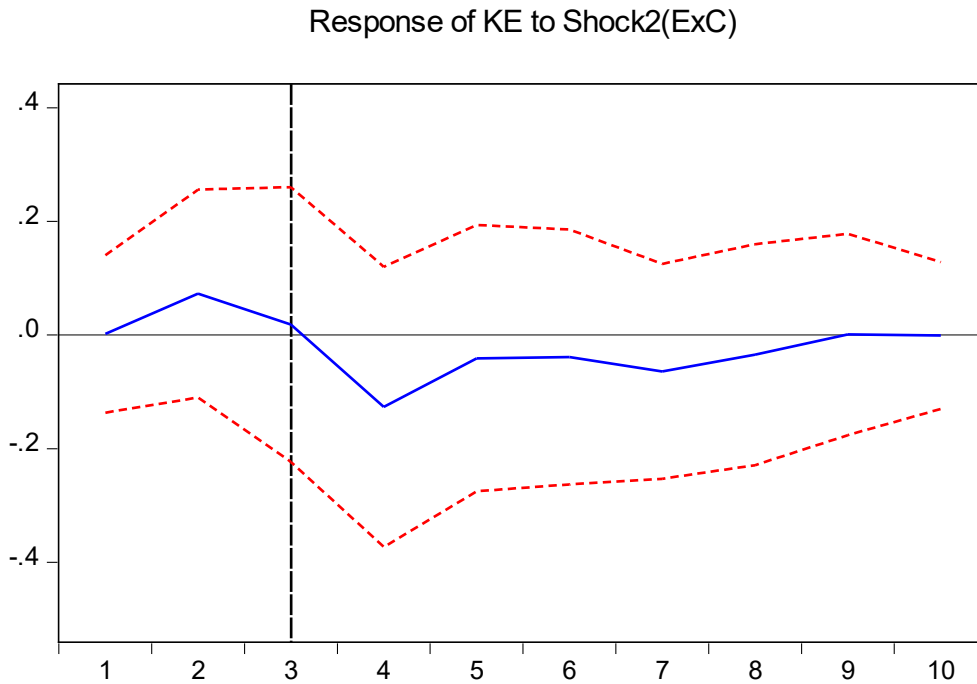


Figure 10. Long run restricted impulse response of knowledge economy to external conflict shock.

Here, it should be noted that, the decreasing long run impact of the external shock on the knowledge economy is due to increase in the impact of internal shocks on the knowledge economy compared to external shock.

Figure 11 shows the impact of the internal conflict on the knowledge economy. The results show that the internal conflict shock had a negative significant impact on the knowledge economy in the first four years. This effect lasted until the end of the ninth year of the conflict.

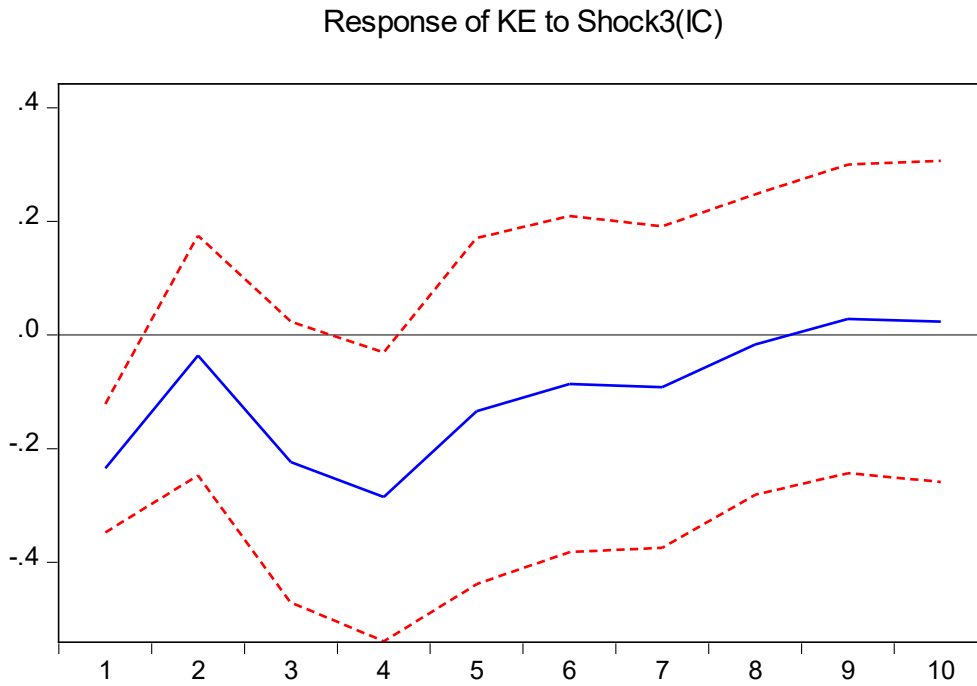


Figure 11. Long run restricted impulse response of knowledge economy to internal conflict shock.

Regarding the impact of both internal policy shock and external shock on the internal conflict in Syria, figures 12 and 13 show the long run path of this impact.

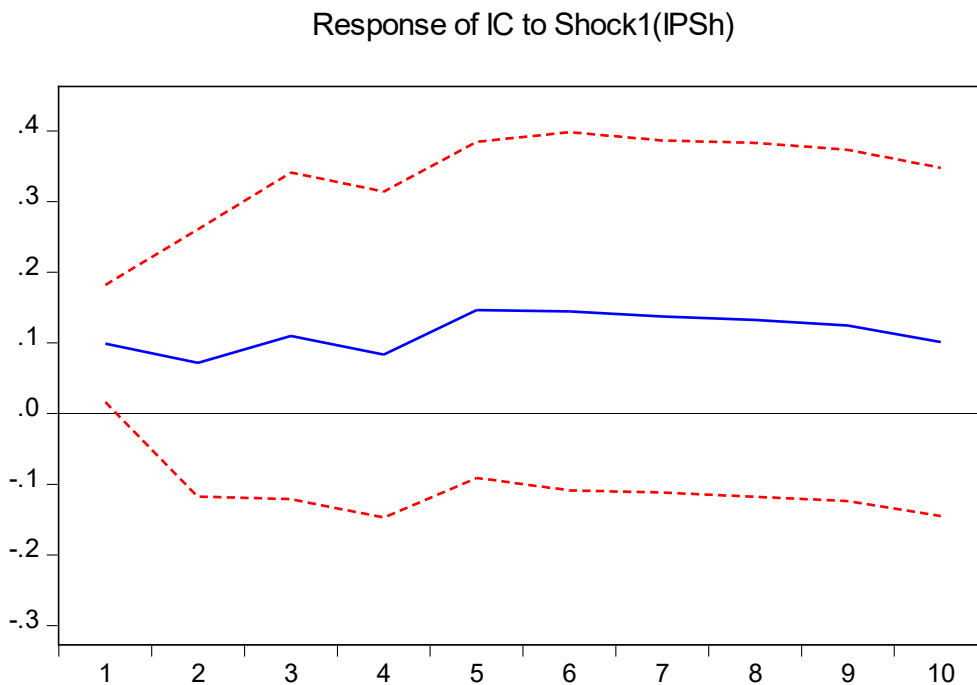


Figure 12. Long-run restricted impulse response of internal conflict to internal policy shock.

Response of IC to Shock2(ExC)

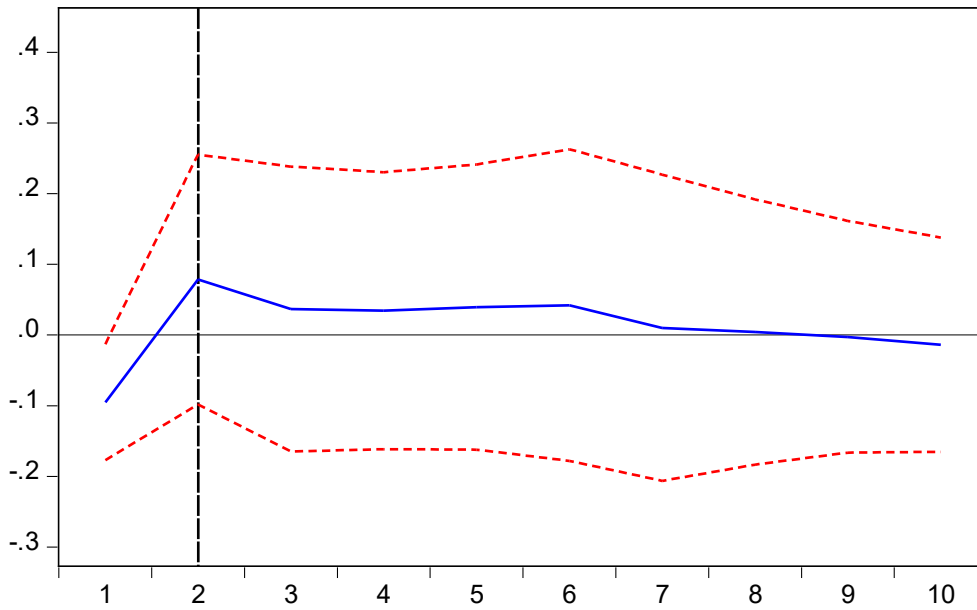


Figure 13. Long-run restricted impulse response of internal conflict to external conflict shock.

Figures 12 and 13 show that the impact of the external shock affects the internal conflict more than the internal policy shock in the long run. This can be explained by the nature of the Syrian conflict, which has taken an international dimension.

The results of the decomposition variances analysis of the long run impact of shocks on the knowledge economy are shown in table 8.

Table 8. Variance Decomposition of knowledge economy (Long run SVAR).

Variance Decomposition of KE					
Period	S.E.	Shock1 (IPSh)	Shock2 (ExC)	Shock3 (IC)	Shock4 (KE)
1	0.315612	18.02101	0.003537	55.15077	26.82469
2	0.396784	41.74704	3.369336	35.72678	19.15684
3	0.457055	31.78146	2.698714	50.89582	14.62400
4	0.557829	21.60461	6.967481	60.28810	11.13981
5	0.575275	20.34999	7.061132	62.11065	10.47822
6	0.584939	20.17524	7.268653	62.25079	10.30531
7	0.606133	22.20171	7.884247	60.26378	9.650266
8	0.614614	23.93633	7.988000	58.68866	9.387004
9	0.621489	25.33503	7.812430	57.60611	9.246433
10	0.628649	26.87965	7.635736	56.44427	9.040337

The results of the Variance Decomposition of knowledge economy show that, on the long run, the internal shocks, whether the internal policy shock or internal conflict shock, have the largest influence on knowledge economy, and contribute to explaining the variances of the knowledge economy in Syria by 56.4% and 26.9% respectively. On the other hand, the external shock explains only 7.6% of the variances of the knowledge economy.

Consequently, it can be concluded that the narrative of external shocks and their impact on the economy of knowledge in Syria are valid only in the short run. In the long run, however, the narrative of external shocks cannot provide a comprehensive explanation of the changes in the knowledge economy. Internal shocks, whether associated with political and security instability, or those associated with the poorly implemented national economic policies, are the ones that have the greatest impact on the process of building and transition towards the knowledge economy in the long term in Syria.

Based on the above results, it can be argued that building national policies for innovation, technology, and science (Alnafrah et al., 2020; Alnafrah & Mouselli, 2019), as well as achieving a political settlement together with the agreement on the identity of the national economy within the framework of a clear and comprehensive strategy, are essential steps to build a knowledge-based economy in post-conflict Syria. Moreover, all narratives that link the failure of the process of building or transition towards the knowledge economy merely to external shocks or external factors are unreliable.

Conclusion

In this study, we provided a test for the external shocks' narrative and its role in building the knowledge-based economy in Syria in both short and long run by using the SVAR models.

The results showed that knowledge-based economy in Syria is affected by external shocks in the short run, but by internal shocks in the long run, especially, those that associated with the liberal policy and their implementation.

The study also revealed that in the long run, internal conflict in Syria is more determined by internal factors than by external shocks. This is because of the way in which the dynamics of the conflict were evolved. and to the type of economic policies adopted in the conflict period, particularly those associated with cutting subsidies and marginalization of the middle class.

Regarding the limitations of the study, it can be said that including more variables in the knowledge-based economy proxies would provide more insights to the results. Thus, there is a venue for future scholars to integrate more variables that represent other dimensions of the knowledge-based economy and to study their relationship with external and internal shocks.

Finally, it can be noted that limiting the explanation of the failure in transitioning towards knowledge-based economy to external shocks alone does not reflect reality. Therefore, taking the internal shocks into account, especially in countries that suffer from political and social instability and fluctuating national policies, is a fundamental step toward understanding reality and identifying the shortcomings in the system. This step is important to orient national innovation policy towards accelerating the process of building a knowledge-based economy in a country that is struggling to put an end to the spiral of conflict.

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Appendix 1. Descriptive statistics.

	Education Index	Trademarks	Patents	KE	IPSH	IC	EXC
Mean	5.26E-11	-5.26E-11	1.05E-10	1.05E-10	0.736842	0.421053	0.263158
Median	-0.267912	-0.132984	0.311456	0.075728	1.000000	0.000000	0.000000
Maximum	1.554090	2.575776	1.753212	0.857711	1.000000	1.000000	1.000000
Minimum	-1.244656	-1.232695	-2.184719	-0.814230	0.000000	0.000000	0.000000
Std. Dev.	1.027402	1.027402	1.027402	0.503510	0.452414	0.507257	0.452414
Skewness	0.130294	0.934182	-0.738246	-0.072106	-1.075706	0.319801	1.075706
Kurtosis	1.404389	3.278947	2.766796	2.060447	2.157143	1.102273	2.157143

Jarque-Bera	2.069322	2.825138	1.768910	0.715315	4.226692	3.174947	4.226692
Probability	0.355347	0.243517	0.412939	0.699312	0.120833	0.204441	0.120833
Sum	1.00E-09	-1.00E-09	2.00E-09	2.00E-09	14.00000	8.000000	5.000000
Sum Sq. Dev.	19.00000	19.00000	19.00000	4.563399	3.684211	4.631579	3.684211
Observations	19	19	19	19	19	19	19