Are Investment and Saving Cointegrated Evidence From Middle East and North African Countries

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ABSTRACT

The aim of this paper is to empirically examine the relationship between saving and investment for 6 Middle East and North African Countries for the period 1980-2008. To this end, we use panel cointegration analysis and Error Correction Model techniques. The long run estimation reveals causality between investment and saving for the entire sample. The Granger causality tests confirm this result and validate the presence of bidirectional causal relationship between investment and saving. However, the short run estimation shows no causality between the two variables for the entire sample. At the individual level, saving Granger cause investment for Bahrain and Saudi Arabia only.

JEL: C32, E21, E22

KEYWORDS: Investment, Saving, Cointegration, Causality.

INTRODUCTION

In the late of the nineties, the MENA region has started to benefit from the positive consequences of the SAPs and reforms. In fact, several MENA countries have seen their role in the global economy as investors and trade partners improved and they become a major player in the global capital markets with their powerful sovereign funds and exchange reserves. This performance has lead to massive job creation and a global dynamism of the labor market. The MENA region's geographic position and its abundant natural resources have given it enormous strategic importance. As a result, the region as a whole became a center for investment and doing business as well as a hub of foreign direct investment (FDI). According to United Nations Conference on Trade and Development (UNICTAD, 2010), the FDI flows into all MENA countries have increased from an annual average of US $ 3.6 billion during the 1980s and US $ 3.7 billion during the 1990s to US $ 79.5 billion in 2007 and US $ 94.9 billion in 2008. Investment in the region increased considerably and the overall economic growth of the region became based to some extent on the level of investment activities. The optimism about the MENA economy has been on an ascent in recent years. This has led to a resurgence of interest in the dynamic linkages among saving and investment as key determinants for economic growth in the region.

The main goal of this paper is to investigate whether investment and saving are integrated for 6 MENA countries for the period from 1980 to 2008. To this end, we used panel cointegration analysis and Error Correction Model technique. Our empirical investigation has two dimensions. The first is to examine the long-run relationship between investment to Gross Domestic Product ratio and saving to Gross Domestic Product ratio (GDP henceforth), while the second is to examine the short-run dynamic causal relationship between the variables. The basic testing procedure requires three steps. The first step is to test whether the variables contain a panel unit root to confirm the stationarity of each variable (Engle and Granger,

1987). This is done by using the Levin –Lin-Chu test, (LLC, 2002), the Im et al. test (Im, Pesaran and Shin (IPS, 2003)), the Augmented Dickey–Fuller test (F-ADF) (Maddala and Wu, 1999; Choi, 2001) and finally Breitung (2000) test. The second step is to test whether there is a long-run cointegrating relationship between the variables. This is done by the use of the Johansen-Fisher (Maddala and Wu, 1999; Kao, 1999; Pedroni, 1999, 2004) methods. Finally, the last step, if all variables are I (1) (integrated of order one) and cointegrated (Masih and Masih, 1996), short-run elasticities can be computed using the vector error correction model (VECM) method suggested by Engle and Granger (1987). In this case, an error correction mechanism exists by which changes in the dependent variables are modeled as a function of the level of the disequilibrium in the cointegrating relationship, captured by the Error Correction Term (ECT), as well as changes in the other explanatory variables to capture all short-term relations among variables.

The reminder of the paper is as follows: The next section examines the related literature and develops the scope of this research study. We then describe our data and methodology and discuss the results of our empirical tests. The final section concludes.

LITERATURE REVIEW

The relationship between saving and investment is an important macroeconomic concern because it provides a central approaching into the process of sustainable economic growth. According to the standard economic theory, economic growth is significantly depends on capital accumulation and capital accumulation stems from investment which depends in its side on domestic and foreign capital. Solow (1970) argue that the increase in the savings rate boosts steady-state output by more than its direct impact on investment because the induced rise in income raises savings, leading to a further rise in investment. Therefore, increased saving leads to higher economic growth through capital formation (Ang 2007). According to this analysis, the financial system of a country allocates saving and distribute it to investment.

Literature on the nature of investment and saving relationship could be classified in two schools. Firstly, the classical theory opines that an increase in savings will lead to a decrease in the interest rates prompting investors demand more from the available funds and therefore to an increase in investments activities. In this case, the level of saving determines the interest rate and hence the cost of investment, which in turn influences the demand for new capital.

Secondly, the Keynesian and post Keynesian theorists argue that an increase in the investment leads to an increase in the output and income which, in turn, will increase savings. Savings and investment are considered to be crucial variables in ensuring price stability and promoting employment opportunities and thereby contributing to economic growth.

Numerous studies have attempted to investigate the theoretical and empirical relationship between investment and saving by adopting both approaches to test whether saving causes investment or investment causes saving. In reality, the debate was initiated by the pioneering work of Feldstein and Horioka in 1980. In their seminal paper, the authors modeled domestic investment on domestic saving for a panel of 16 OECD countries during the period 1960-1974 in order to evaluate how mobile capital was among them. Feldstein and Horioka found a high degree of correlation between domestic savings and investment that suggested the existence of restricted capital mobility. The Feldstein and Horioka finding has long been supposed as a puzzle and represents a challenge to the supporters of the perfect capital markets mobility. Feldstein and Horioka (1980) consider that if capital is perfectly mobile, investment should go where it yields the highest real returns, whilst consumption should depend only on the permanent value of income, not on contemporaneous investment decisions. This means that In the presence of

perfect capital mobility investors care only about the rate of return on their investments and not about which country they invest in.

Following the work of Feldstein and Horioka (1980), several studies have emerged to analyze the relationship between saving and investment in different countries. Some papers have investigated the causality between saving and investment for a single country case study (De Vita and Abott (2001), Narayan (2005), Seshaiah and Sriyval (2005), Chinn and Ito (2007) Ang (2008, 2009)) while some others have analyzed the relationship of the two macroeconomic variables for a group of countries (Frankel *et al* (1986), Coakley, Hasan and Smith (1999), Corbin (2001), Sinha (2002), Sinha and Sinha (2004)). Moreover these studies have been done by the use of different methodologies and techniques (Vector Error Correction Model, Vector Auto Regressive, Auto Regressive Distributed Lag, Panel, Auto Regressive Fractionally Integrated Moving Average models etc).

By looking at the available literature, there is no article to the best of our knowledge that examines the causal relationship between investment and saving in MENA countries despite the importance of the region and its weight in the global economy. Therefore, this paper is an effort to enrich the available literature by revisiting the savings and investment relationship including the period of recent global crisis for 6 MENA countries named Tunisia, Bahrain, Iran, Saudi Arabia, Kuwait and Oman. The lack of data for the others countries forced us to use a panel of 6 countries only for the period from 1980 to 2008. In the next section we will describe our data and methodology.

DATA AND METHODOLOGY

The study uses annual data of investment to GDP and savings to GDP ratios for 6 MENA countries during the period of 1980 to 2008. Data is obtained from the World Bank Development Indicators (WDI) and ratios are calculated using the current dollar. Table 2 and Table 3 summarize the main statistics associated with investment and saving as part of GDP for our sample. They show that the mean share of investment in the GDP ranges from 18.21% for Kuwait and 28% for Jordan. Bahrain has the most variation in investment and Oman is the least variation with 10.19 and 3.93 respectively.

Regarding the share of saving in the GDP, the average is between 21.99 for Tunisia and 37.64 for Bahrain. Kuwait has the highest variation in saving and Tunisia the lowest one with 23.47 and 1.45 respectively.

Table 2: Statistical summary of Investment to GDP ratio in 6 MENA countries

	INV_BHR	INV_IRN	INV_KWT	INV_OMN	INV_SAU	INV_TUN
Mean	25.1267	30.4119	18.2115	20.5548	21.1098	26.3822
Median	24.4166	32.6937	17.1268	18.8999	19.7906	25.0137
Maxi	46.1272	46.2682	41.8557	32.1120	34.1915	35.8992
Mini	7.90520	17.3252	10.6655	11.9345	15.0687	20.7098
Std. Dev.	10.19040	6.538798	5.682950	3.931047	6.254518	4.034637
Observations	29	29	29	29	29	29

This table summarizes the statistical results of investment to GDP ratios for 6 MENA countries during the period 1980-2008.

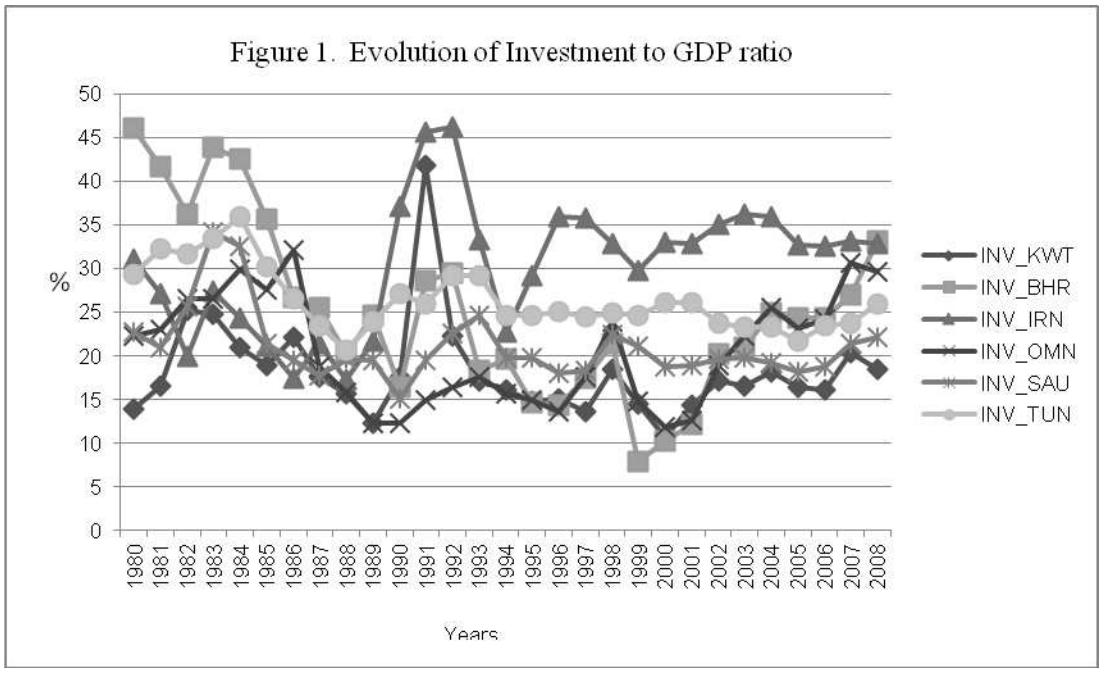
Table 3: Statistical summary table saving to GDP ratio in 6 MENA countries

	S_BHR	S_IRN	S_KWT	S_OMN	S_SAU	S_TUN
Mean	37.64154	30.46770	28.55216	35.25602	32.40446	21.99159
Median	38.04324	34.57683	28.19933	38.12902	31.50645	21.92512

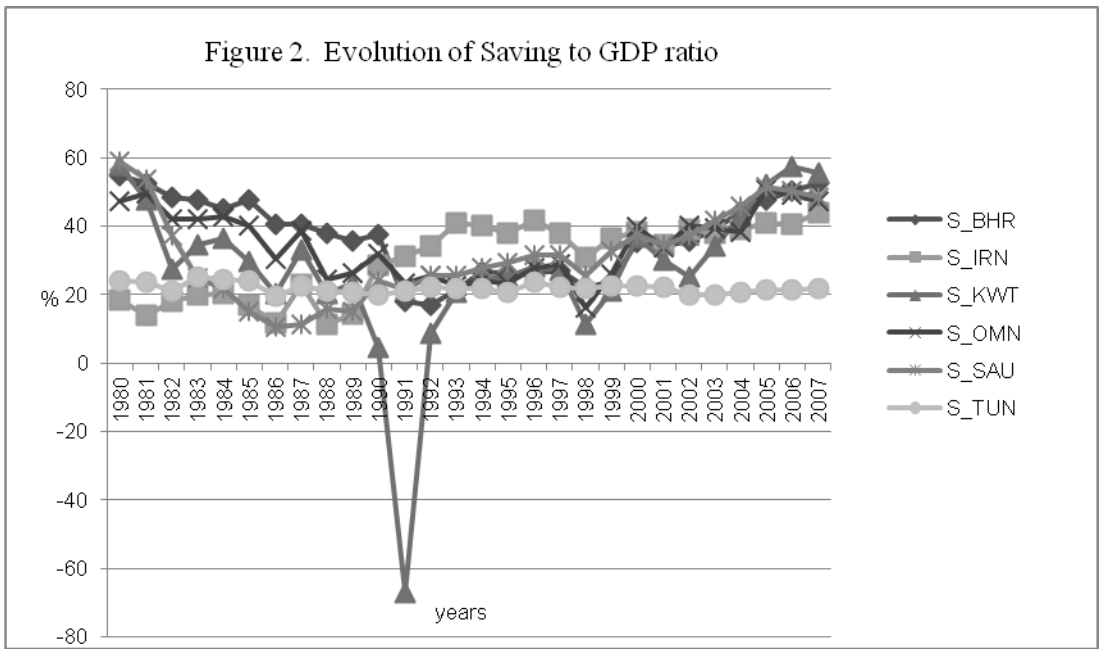
Maximum	55.76414	43.79970	58.87325	50.98763	59.00675	25.14070
Minimum	17.05665	11.44737	-66.95316	16.22515	10.37621	19.48076
Std. Dev.	11.63448	10.85054	23.47082	10.09640	13.62130	1.457835
Observations	29	29	29	29	29	29

This table summarizes the statistical results of saving to GDP ratios for 6 MENA countries during the period 1980-2008.

Figure 2 and Figure 3 illustrate the trajectory of investment and saving as part of GDP in the selected countries since 1980. It is clear that the evolution of the two variables differ across the sample despite the common factors that link the different countries. This indicate that the decision of saving or investing depend of the state of the country.



This figure shows the evolution of Investment to GDP ratio is 6 MENA countries since 1980 to 2008.
Source: WDI data and authors calculations



This figure shows the evolution of saving to GDP ratio in 6 MENA countries since 1980 to 2008.
Source: WDI data and authors calculations.

From Figure 1 and Figure 2, we can see that Kuwait has two picks: the first one is in 1991 where investment reaches 41.85% of GDP and the second one is again in 1991 where saving represents -66.95% of GDP. This year is the date of the gulf war (Iraq-Kuwait) in which the government of Kuwait has increased its investment on military projects.
Our empirical investigation has two dimensions. The first is to examine the long-run relationship between investment and investment while the second is to examine the short-run dynamic causal relationship between the two variables. In the next section, we will discuss the results of the econometric model.

RESULTS

We start our empirical study by performing the panel unit root tests as proposed by Levin-Lin-Chu (LLC, 2002), Im, Pesaran and Shin (IPS, 2003), the Augmented Dickey–Fuller (F-ADF) and finally Breitung (2000). The results are displayed in Table 4. The test statistics for levels of investment and saving are statistically insignificant. When we apply the panel unit root tests to the first difference of the four variables, all four tests reject the joint null hypothesis for each variable at the 1 per cent level. Thus, from all of the tests, the panel unit roots tests indicate that each variable is integrated of order one.

Table 4: Panel unit roots and cointegration tests for MENA

	LLC		**IPS**		**F-ADF**		**Breitung**	
	level	1st diff	level	1st diff,	level	1st diff,	level	1st diff
INV/GDP	-1.378	-15.45***	-1.072	-10.765***	-0.324	-12.99***	-0.353	-6.62***
S/GDP	-0.117	-12.00***	-1.147	-13.65***	-0.137	-14.00***	1.456	-12.75***

This table shows the results of the unit root tests at the level and the first difference of the investment to GDP ratio and saving to GDP ratio using LLC, IPS, F-ADF and Breitung tests.

After checking the integration of our four variables at order one, I (1), the Pedroni, Kao and Fisher tests for balanced panel date are used.

Pedroni (1999, 2004) suggests two sets of tests for cointegration: the between and the within dimensions. The within approach includes four statistics panel v-statistic, panel r-statistic, panel PP-statistic, and panel ADF-statistic. These statistics pool the autoregressive coefficients across different countries for the unit root tests on the estimated residuals taking into account common time factors and heterogeneity across countries. The between approach includes three statistics: group r-statistic, group PP-statistic and group ADF-statistic. These statistics are based on averages of the individual autoregressive coefficients associated with the unit root tests of the residuals for each country. All seven tests are distributed asymptotically as standard normal.

The test results of Pedroni displayed in Table 5 reveal the rejections of the null of no cointegration for all tests at 5 % level of significance except the group rho-tests. Therefore, one may conclude that our model is in fact panel cointegrated.

The Kao test also, also displayed in Table 5 suggests panel cointegration at 1% level of significance. In addition, the Johansen Fisher test suggests the existence two cointegrating vectors at 1% of significance. Overall, there is strong statistical evidence in favor of panel cointegration among investment and saving in MENA countries which signifies that there is at least one long-run equilibrium relationship among the variables. In this case, Granger causality exists among these variables in at least one way (Engle and Granger, 1987).

Table 5: Pedroni, Kao and Johansen Ficher tests

Panel v-Statistic *Weighted Statistic*		1.478397**
Panel rho-Statistic *Weighted Statistic*		-1.824988**
Panel PP-Statistic *Weighted Statistic*		-2.013289**
Panel ADF-Statistic *Weighted Statistic*		-2.541776***
Group rho-Statistic	0.1727	
Group PP-Statistic	0.0351**	
Group ADF-Statistic	0.0082***	
Kao Test.		
ADF Test	3.834797***	

Johansen Fisher Panel Cointegration Test

Null Hypo.	Max-Eigen.	Trace
r=o	61.61 (0.0000)***	71.6 (0.0004)***
r<1	43.753 (0.0006)	43.75 (0.0006)***

*This table shows the results of the balanced Panel Cointegration tests for MENA countries using Pedroni tests. The optimal lag lengths are selected using SBC. Figures in parenthesis are probability values. Trace test and Max-eigenvalue test indicate 2 cointegrating vector at the 0.01 level. **, *** indicate significance at the 5 and 1 percent levels respectively.*

The Vector Error Correction Model (VECM) is used to correct the disequilibrium in the cointegration relationship, as well as to test for long and short-run causality among cointegrated variables. The correction of the disequilibrium is done by the mean of the Error correction term (ECT).

To test for panel causality, a panel-based VECM is specified as follows:

$$\Delta(INV/GDP)_t = \alpha_1 + \sum_{i=1}^{p} \beta_{1i} \Delta(LINV/GDP)_{t-i} + \sum_{i=1}^{q} \beta_{1i} \Delta(S/GDP)_{t-i} + \lambda_1 ECT_{t-1} + \mu_{1t} \quad (1)$$

$$\Delta(S/GDP)_t = \alpha_2 + \sum_{i=1}^{p} \beta_{2i} \Delta(S/GDP)_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta(INV/GDP)_{t-i} + \lambda_2 ECT_{t-1} + \mu_{2t} \quad (2)$$

Where ECT is expressed as follows:

$$ECT_t = (INV/GDP)_t - \beta_0 - \beta_1 S_t \quad (3)$$

Where $t=1...T$, denotes the time period

The results of the long-run equilibrium relationship are presented in Table 6. It shows that the coefficient of saving for the whole panel is 0.344, which is positive and significant at the level of 1%. This means that an increase of 1% in saving will increase investment by 0.35% for MENA.

At the individual country level, the coefficient of saving is positive and significant at the level of 1% for the entire sample except for Saudi Arabia where it's not significant. The highest coefficient is for Bahrain and the lowest if for Saudi Arabia with 0.67 and 0.016 respectively.

Table 6: Investment long-run elasticities for MENA

	BHR	KWT	OMN	SAU	TUN	IRN	Panel
Intercept	0.2688	-9.4286	-1.8726	-20.5200	34.5003	-16.2193	-13.028
Saving	-0.6694 -[4.430]***	-0.3392 [-4.9817]***	-0.5403 [-7.6657]***	-0.0163 [-0.801]	-2.7768 [-3.831]***	-0.4618 [-5.771]***	0.34447 [-2.5577]**

*This table shows the long-run equilibrium relationship when investment is the dependant variable. **, *** indicate significance at the 5 and 1 percent levels respectively.*

Table 7 illustrates the results in which DINV is the dependent variable. Given that the optimal lag length was two, the short-run results are also presented for two lags of each variable. Results show that saving act positively to investment. At the individual country level, the coefficient is negative for all countries. However, it is significant for Bahrain at the level of 10% and significant for Saudi Arabia for the level of 1%. For the rest of the countries, the coefficient of saving is not significant.

It is also evident from Table 7 that the error correction term, although having the right sign, is statistically significant at the level of 1% for the panel as whole as well as for individual countries (except for Tunisia). The coefficient of the error-correction term is -0.234 for the sample, suggesting that when investment is above or below its equilibrium level, it adjusts by almost 23.4% within the first year.

Table 7: Investment short-run elasticities for MENA

	BHR	KWT	OMN	SAU	TUN	IRN	Panel
Intercept	-0.389	-0.893*	-0.019	-0.27	-0.183	0.273	0.002
Δ(INV/GDP) (-1)	-0.055	-0.2	0.270*	0.477**	0.29	0.617***	0.125
Δ(INV/GDP) (-2)	-	-	0.431***	0.299	-0.039	-	-0.101
Δ(S/GDP) (-1)	-0.399*	-0.087	-0.204	-0.458***	-0.274	-0.115	0.029
Δ(S/GDP) (-2)	-	-	0.067	-0.233*	-0.269	-	0.014
ECT(-1)	-0.584***	-0.368***	-0.888***	-1.314***	-0.234	-0.689***	-0.234***

This table shows the short term equilibrium of investment to GDP *ratio and saving o GDP ratio for 6 MENA countries. Indicate significance at the 5 and 1 percent levels respectively.*

The existence of a panel long-run cointegration relationship among saving and investment suggests that there must be Granger causality in at least one direction. Thus, the next concern is to inspect the direction of causality amongst the two variables. The results of causality tests based on the VEC model are reported in Table 8. The table has three major blocks illustrating the short-run effects, long-run effects represented by the error correction coefficients, and the joint short-run and long run effects, respectively.
The F-statistics for the short-run dynamics reveals no causality between investment and saving. This results support our findings reported in Table7 in which saving is not significant. Regarding error correction results, the coefficient is found to be significant in the saving and investment. This confirms that deviation from the long-run equilibrium is corrected by the two variables. This reveals the fact that any changes in saving that disturb long-run equilibrium are corrected by counter-balancing changes in the investment and vice versa.

Turning now to the right side of Table 8, the joint Wald F-statistics results indicate in the investment equation, error correction term and saving are jointly significant at a level of 1%. Hence, there is a granger causality running from saving to investment. This indicate whenever there is a shock, GDP would make short-run adjustments to reestablish long run equilibrium. Similarly, the joint Wald F-statistics results indicate in the saving equation, error correction term and investment are jointly significant at a level of 1%. Hence, there is a granger causality running from investment to saving.

Table 8. Results of the balanced panel causality tests

Variable	*Short run (F-stats)*		*ECT (t-stats)*	*Joint short and long run (F-stats)*	
	Δ(I/GDP)	**Δ (S/GGDP)**		**Δ (I/GDP)**	**Δ (S/GDP)**
Δ(INV/GDP)	-	0.239	-0.233***	-	8.779***
Δ (S/GDP)	1.009	-	0.210**	2.868***	-

*This table shows the result of the balanced panel causality tests based on VECM estimation. **, *** indicate significance at the 5 and 1 percent levels respectively.*

To conclude, granger causality tests shows no causality between investment and saving in the short run and confirms the presence of bidirectional causal relationship between the two variables in the long run.

CONCLUDING COMMENTS

The aim of this paper is to analyze the dynamic relationship between saving and investment in selected Middle East and North African countries using annual time series data from 1980 to 2008. Our sample contains 6 countries only because data for other countries was very limited and/or unavailable. We used a panel data analysis based on cointegration and causality analysis. The empirical findings at an individual level are mixed across countries for the short run as well as for the long run.
For the short run, there is no bidirectional relationship between the two variables for all the countries. This means that saving and investment activities are two policies taken separately by policy makers.

Empirical results reveal that saving Granger cause investment for Bahrain and Saudi Arabia only and investment Granger cause saving for Kuwait only.
Regarding the long run estimation, Kuwait appears to be the only country with bidirectional relationship between investment and saving. Results show that saving Granger cause investment for all countries except Tunisia. Furthermore, investment Granger cause saving for Tunisia and Kuwait only. These mixed results show that policy may differ from one country to another even if these countries have many common characteristics (historical, religion, language geographic, etc).

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The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of their institutions.

BIOGRAPHY

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