The relationships between political stability, military expenditures, arms imports, and oil exports: a CS-DL approach for six Gulf countries

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Abstract: We consider the relationships between military expenditures, arms imports, political stability, oil exports, gross domestic product, and greenhouse gas emissions in a panel of six oil-exporting countries of the Gulf region and annual data ranging from 2000 to 2023. Second-generation panel unit root and cointegration tests are used because of the cross-sectional dependence between our considered variables. The cross-sectional distributed lag (CS-DL) methodology is performed to estimate our long-run coefficients. Several novel results are highlighted. In the long-run, arms imports increase political stability and economic growth. While military expenditures increase oil exports, arms imports slightly reduce them. Oil exports increase military expenditures but reduce arms imports. Political stability reduces military expenditures and increases gross domestic product. These oil-exporting Gulf countries are advised to reinforce their military efforts, in particular by planning the production of high-tech weapons, to improve their oil exports and thus their gross domestic product. Economic growth combined with political stability enables them to become producing and exporting renewable energy countries through adequate energy efficiency and renewable energy strategies.

Keywords: Military expenditures; arms imports; political stability; oil exports; cross-sectional distributed lag; Gulf countries.
Jel classification: C33; H56; O53 ; Q37.

1. Introduction

One of the World's top oil-producing and exporting regions is the Gulf. It is also distinguished by significant military spending and arms imports, as well as recurring threats of political and armed confrontations. By considering a panel data analysis comprising six countries: Bahrain, Iran, Iraq, Kuwait, Oman, and Saudi Arabia, this paper helps understand the relationships between military spending, arms imports, oil exports, and political stability in this region.

The World's proven crude oil reserves located in the Organization of the Petroleum Exporting Countries (OPEC, 2024) are estimated to be 1241.33 billion barrels, representing 79.1% of the total World reserves. The Middle East proportion of the OPEC total is 67.3%, with individual proportions: Iran (16.8%), Iraq (11.7%), Kuwait (8.2%), and Saudi Arabia (21.5%). In 2023, international oil demand increased by 2.6 million barrels of oil a day (mb/d), attaining an average of 102.2 mb/d. This oil demand growth continues and concerns almost every region, with China and non-OECD (Organisation for Economic Co-operation and Development) countries leading the way.

The OPEC (2024) documents that, in 2023, the World's total crude oil exports are 43829 (in 1000 barrels per day) and the total exports for OPEC countries are 17207, meaning a proportion of 39.3%. The details for each country are Bahrain (148), Iran (1323), Iraq (3467), Kuwait (1568), Oman (919), and Saudi Arabia (6659). These countries have gained too much money from these petroleum exports (in million US $): Iran (41129), Iraq (102574), Kuwait (78061), and Saudi Arabia (248376).

According to Tian et al. (2024), World military expenditures increased in 2023 by 6.8% to reach a total of 2443 billion US$, and they represent a share of 2.3% of global gross domestic product (GDP). The increase in global military spending in 2023 can be attributed to escalating geopolitical tensions in several regions, including the Middle East. The United States, China, Russia, India, and Saudi Arabia are the five biggest spenders in 2023 and account for 61% of the world's military spending. Ukraine has the highest military spending as a share of government expenditure, followed by Saudi Arabia, which are 58% and 24%, respectively. Saudi Arabia, Iran, Kuwait, and Oman military spending in billion US$ in 2023 were 75.8, 10.3, 7.8, and 5.9, respectively, and were as a share of GDP 7.1%, 2.1%, 4.9%, and 5.4%.

George et al. (2025) highlight that during the period 2020-24, the USA, France, Russia, China, and Germany were the largest international arms exporters, with the USA's share reaching 43% of global arms exports. During this period, Ukraine, India, Qatar, Saudi Arabia, and Pakistan were the largest arms importers and received 35% of global arms imports. The Middle East share is 27% of global arms imports. Qatar, Saudi Arabia, Egypt, and Kuwait, which are located in the Middle East, are among the World’s top 10 arms importers in 2020–24. Middle East arms imports are provided mainly by the USA (52%). During the period 2020-24, the shares in % of total international arms imports of our considered countries are: Bahrain (1.1), Kuwait (2.9), and Saudi Arabia (6.8). Saudi Arabia declassified from being the World’s largest arms importer to the fourth largest because it decreased its arms imports by 41% between 2015–19 and 2020–24. The USA was its main provider in 2020–24 with a 74% share. The cyclical nature of arms procurement is the main cause for this decrease in arms imports by Saudi Arabia.

Alsayegh (2023) notes that the Gulf region has played a significant international role in recent decades due to its advantageous geographic location and abundant hydrocarbon resources. It has seen several armed conflicts and political unrest, which have disrupted energy supplies and occasionally caused global economic crises. Examples include the 1973 Arab oil embargo and the 1990 oil price shock brought on by Iraq's invasion of Kuwait. In exchange for giving these nations advanced weapons to ensure their stability and security while simultaneously ensuring their energy supply, the USA and Europe depended on fossil fuels, especially oil, supplied by these nations for many years. This partnership, which might be summed up as "oil for security", is also advantageous to Gulf economies that mostly depend on the export of fossil fuels, especially oil.

According to Akkas and Altiparmak (2021), the Gulf Cooperation Council (GCC) countries' military and security reliance on the United States is still largely intact, but the United States' reliance on the GCC region's natural resources has declined, turning this relationship into a unilateral reliance with GCC countries’ natural resources mainly directed to Asian countries. There are two main causes for this relationship shift: *i)* The USA (under the Democratic administration) and Europe are promoting the switch to renewable energy; *ii)* The shale revolution in the USA in the early 2010s, which turned the country into a net oil exporter. Furthermore, tensions with the USA in particular would rise as a result of China's Belt and Road Initiative (BRI), which would expand its footprint in this area. For this reason, Gulf oil exporters can resume their current precautionary approach, which aims to "protect economic interests and strengthen national security."

Evaluating the relationships between oil exports, arms imports, military expenditures, and political stability is worth considering for these Gulf region countries. This region is expected to have an important geopolitical role for the upcoming decades, making understanding the connections between our considered variables very interesting. The main contributions of our paper are: *i)* No econometric study has been reported on the relationships between oil exports, arms imports, military expenditures, and political stability, and our research will try to remedy this; *ii)* We will employ Chudik et al. (2016)'s cross-sectional distributed lag (CS-DL) panel technique, which has not been fully utilized in the literature despite the intriguing outcomes it can yield when the time dimension is short. We will consider a panel study about six important countries of the Gulf region and annual data between 2000 and 2023. The United Arab Emirates and Qatar have been excluded because of an important number of missing data about military expenditures. Considered variables are arms imports, military expenditures, political stability, oil exports, gross domestic product, and greenhouse gas emissions. First, we use descriptive statistics and demonstrate the existence of cross-sectional dependence between variables. Then second-generation panel unit-root and cointegration tests are performed. The long-run coefficients are then estimated using the cross-sectional distributed lag approach.

Our paper is structured as follows. Section 2 is a review of the literature, Section 3 concerns the econometric techniques used, and Section 4 is a discussion of the econometric outputs. Section 5 is a conclusion with policy advice.

2. Review of the literature

Several studies have been concerned with the empirical analysis of military expenditures and the trade of oil or arms. Others by political stability or geopolitical risk. Our literature review is divided into two subsections.

2.1. Military expenditures, and trade of arms or oil

There is a rich literature dealing with the relationship of military expenditures, arms imports or exports, oil imports or exports with other interesting variables like GDP, renewable energy consumption, and carbon emissions (Snider, 1984; Aminu and Abu Bakar, 2016; Bove et al., 2018; Vézina, 2021; Khan et al., 2021; Ben Youssef, 2023a; Adedeji et al., 2024). Yakovlev (2007) examines a balanced panel of 28 nations between 1965 and 2000 and demonstrates that while military spending and net arms exports, when considered independently, hinder economic growth, military spending has a less detrimental effect on economic growth when a nation is a net arms exporter.

Bakirtas and Akpolat (2020) consider seven OPEC countries (Algeria, Ecuador, Iran, Kuwait, Nigeria, Saudi Arabia, and Venezuela) and show the presence of panel Granger causality running from crude oil prices and military expenditures to crude oil exports, from military expenditures and crude oil exports to crude oil prices, and from crude oil prices and crude oil exports to military expenditures. Dizaji (2022) considers a panel of Middle Eastern countries to show that the responses of military expenditures and non-military ones, as a percentage of GDP, to negative oil shocks become statistically significant and negative after three to four years. In the long-run, oil export reductions decrease military expenditures and improve democracy indices. Aziz and Waheed (2023) show that military expenditures and oil exports have a long-run significant and positive relationship with economic growth, and the increase in oil prices reduces carbon emissions in Saudi Arabia.

Using annual data about China from 1989 to 2016, Ben Youssef (2023b) employs the autoregressive distributed lag (ARDL) and the non-linear ARDL approaches to demonstrate that oil imports have an asymmetric and non-linear impact on military spending over the long and short terms and that the use of renewable energy lowers oil imports. A balanced panel of 25 of the World's leading arms importers from 2000 to 2021 is examined by Chary (2024), who concludes that military spending and arms imports have a short-term negative effect on per capita GDP. Raifu (2024) investigates the asymmetric effects of oil price, oil supply, and oil demand shocks on military spending in Nigeria. Positive (negative) oil prices and demand shocks positively (negatively) impact military spending. However, military spending is reduced by a positive oil supply shock.

2.2. Political stability and geopolitical risk

Several papers consider the interaction of geopolitical risk or political stability with other interesting variables as the price of oil, arms imports, renewable energy, and carbon emissions (Noguera-Santaella, 2016; Alsagr and van Hemmen, 2021; Syed et al., 2022; Kirikkaleli and Osmanlı, 2023; He and Mei, 2024; Fagbemi and Fajingbesi, 2024; Han et al., 2024; Nazir et al., 2024).

The Middle East has been experiencing a geopolitical dilemma in recent years, according to Fukutomi (2024), because the United States can get oil elsewhere, yet the Middle East is necessary for the United States to export its armaments. Dizaji and Murshed (2024) use panel vector autoregressive methods to examine a sample of 48 developing nations with annual data from 1990 to 2017. They discovered that reducing weaponry imports benefits democracy, the political system, and spending on healthcare and education. The impact on military spending is adverse, though, and these cuts to weaponry imports may exacerbate ethnic tensions and internal strife. Using annual data from 2001 to 2020, Aldabagh et al. (2025) examine a panel of OPEC nations and demonstrate that political stability boosts economic growth.

Ulussever et al. (2023) use quantile-based methodologies and monthly data from 2000/1 to 2021/12 about five GCC nations to demonstrate that the price of crude oil, the political risk index, and geopolitical risk have mixed effects on the degradation of the environment. The fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), and feasible generalized least squares (FGLS) methods are used by Al-Zubairi et al. (2024) to study a panel of Arab nations with annual data from 2000 to 2020. They conclude that there is a positive correlation between political stability and carbon emissions, which is moderated by the relationship between political stability and financial development.

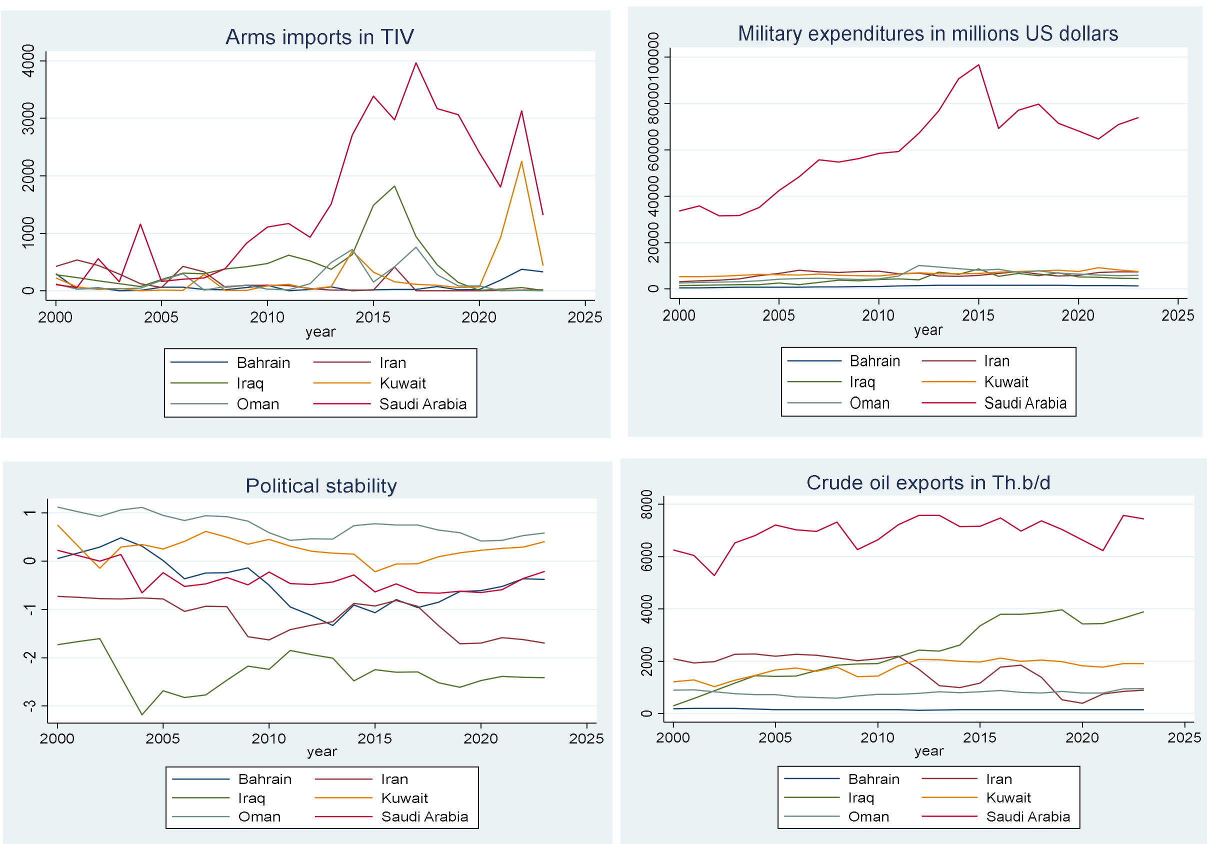
Using a two-state Markov regime-switching model, Dutta and Dutta (2022) demonstrate that a rise in the geopolitical risk (GPR) index raises (decreases) the probability of being in the low (high) volatility regime of renewable energy exchange-traded funds (ETFs). The ARDL model and yearly data for Egypt, Tunisia, and Turkey from 1990 to 2020 are used by Matallah et al. (2023). Their main conclusion is that, both in the short and long term, geopolitical risks have a significant influence on increasing the usage of renewable energy in these oil-importing nations. By considering a panel of 10 emerging countries, Kalai et al. (2025) conclude that geopolitical issues have pushed these countries to diversify their sources of energy and increase their renewable energy investments to reinforce their energy security.

3. Econometric methodology

3.1. Data and descriptive statistics

We consider six oil-exporting countries of the Gulf region, which are Bahrain, Iran, Iraq, Kuwait, Oman, and Saudi Arabia. Some countries, like Qatar and the United Arab Emirates, have not been included in the panel because of important missing data about military expenditures. Annual data between 2000 and 2023 are exploited, giving us a total of 144 observations for each variable. Six variables are considered: *i)* Crude oil exports (OE) are expressed in thousands of barrels per day (Th.b/d); *ii)* Political stability and absence of violence/terrorism (PS): evaluates the possibility that violent or unconstitutional means, such as terrorism and politically motivated violence, could topple or destabilize a government. The range of this index is roughly between -2.5 and 2.5; *iii)* The trend-indicator value (TIV), a widely used metric to quantify the volume of international transfers of significant conventional weapons, is used to measure arms imports (AI); *iv)* Military expenditures (ME) are in millions US dollars (US $m) at constant 2022 prices and exchange rates; *v)* Total greenhouse gas (GHG) emissions excluding land use change, land use, and forestry (LULUCF) are in metric tons of carbon dioxide equivalent (Mt CO2e). Due to their greater uncertainty, greenhouse gases resulting from LULUCF are not included; *vi)* Gross domestic products (GDP, Y) are expressed in constant 2015 US$.

All data used are obtained from the World Bank (2025) World Development Indicators, except those about military expenditures and arms imports, which are obtained from Stockholm International Peace Research Institute (SIPRI, 2025). For each variable, we should have 144 observations. However, for all variables, only 22 observations are missing: a total of 4, 6, 8, and 4 observations are missing for the variables ME, PS, AI, and OE, respectively. This is fixed by using the average of two accessible observations in cases when one is absent. We use the linear adjustment produced by these two accessible observations when there are multiple consecutive missing observations between two available ones. Stata 17 is the program used for all calculations. Before the econometric calculations, we transformed all of our variables, except the PS variable, logarithmically. These modified variables are denoted by lai, lme, lghg, loe, and ly.



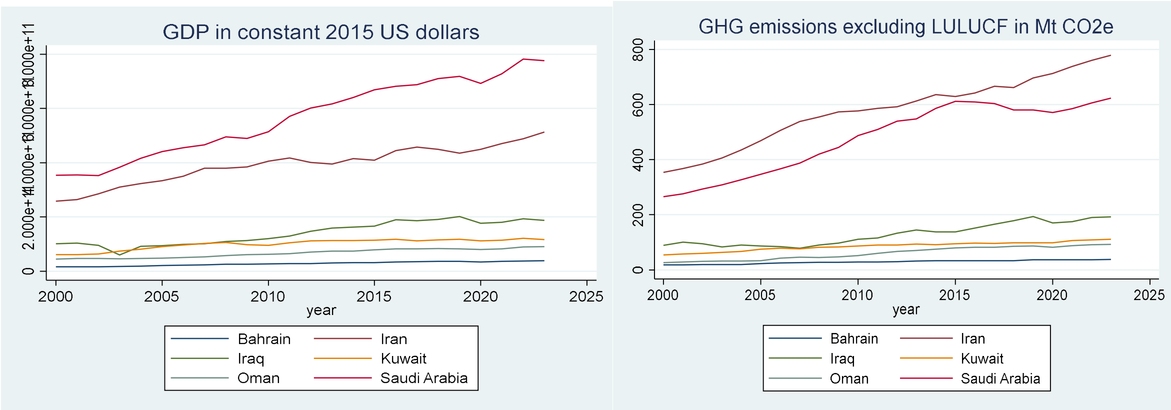


Fig. 1. Considered variables plots

The plots of our variables in Fig. 1 show that the majority are not stationary. In Table 1, some descriptive statistics are presented. Arms imports show some pics due to their cyclical nature, and Saudi Arabia appears largely as the biggest importer. Arms imports attained their minimum level of 1 TIV in 2003 and 2004 by Bahrain and their maximum level of 3968 TIV in 2017 by Saudi Arabia. Military expenditures highlight a significantly high level for Saudi Arabia compared to the other countries. The minimum level of ME was realized by Bahrain in 2000 with 514.205 US $m, and the maximum level reached by Saudi Arabia in 2015 with 96710.110 US $m. Political stability appears to be the highest in Oman, followed by Kuwait, and is the lowest in Iraq, with a minimum level of -3.18 realized in 2004 and the maximum level of 1.121 realized by Oman in 2000. Crude oil exports were nearly stable for all countries except Iraq, which experienced a recovery after the Gulf War, and Iran registered a notable decline. The minimum of oil exports is 130 Th.b/d and was realized by Bahrain in 2012, and the maximum level of 7580 Th.b/d has been reached by Saudi Arabia in 2022. All considered countries have had a consistent increase in their GDP during this period, with a net important increase for Saudi Arabia and Iran. Bahrain has registered the lowest GDP of 16.2 billion constant 2015 US$ in 2000, and Saudi Arabia has experienced the highest level of 782 billion in 2022. Iran is the biggest polluter, followed by Saudi Arabia. These two countries have increased their pollution substantially during the considered period. A minimum level of GHG emissions of 17.771 Mt CO2e was registered by Bahrain in 2000, and a maximum level of 778.802 realized by Iran in 2023.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
ps	144	-0.555	1.049	-3.180	1.121
oe	144	2264.792	2280.364	130	7580
ai	144	431.955	766.888	1	3968
me	144	14072.57	22215.4	514.205	96710.11
ghg	144	226.802	230.029	17.771	778.802
y	144	2.16e+11	2.08e+11	1.62e+10	7.82e+11

3.2. Tests of cross-sectional dependence

Finding any potential cross-sectional dependence (CD) between the variables we are considering is the first step in our empirical investigation. First-generation panel unit root tests are no longer valid when there is a CD between the variables because estimates may become biased and inconsistent. We have to employ second-generation unit root tests in this situation.

Pesaran (2015) uses the exponent of cross-sectional dependence, which was proposed by Bailey et al. (2016), to evaluate the premise that errors in a panel data model are weakly cross-sectionally dependent. He demonstrates that the null hypothesis of weak dependence is more suitable than the null hypothesis of independence in the situation of large N panels because the latter may be quite limiting. Assuming no significant asymmetries in the error distributions, the established CD test performs well for both static and dynamic panels, regardless of whether the panel contains lagged values of the dependent variable.

The cross-sectional dependence exponent α might have any value between 0 and 1. According to Pesaran (2015), α values in the [0,1/2) range correspond to varying degrees of weak cross-sectional dependence, while Bailey et al. (2016) found that α values in the (1/2, 1] range correspond to varying degrees of strong cross-sectional dependence. $\alpha = 0$ indicates the lack of cross-sectional dependence.

Table 2. Bailey et al. (2016) and Pesaran (2015) CD tests

	Test for strong CD				Test for weak CD			
Variables	Alpha	Std. Err.	[95% Conf. Interval]		CD	P-value	N_g	T
lai	0.436	0.106	0.228	0.643	-0.949	0.342	6	24
lghg	1.012	0.110	0 .796	1.227	17.762	0.000	6	24
loe	0 .666	0.116	0.439	0.892	-1.320	0.187	6	24
lme	1.012	0.066	0.882	1.141	13.798	0.000	6	24
ps	0.939	0.097	0.749	1.130	5.776	0.000	6	24
ly	1.012	0.083	0.849	1.174	17.507	0.000	6	24

0.5<=Alpha<1 signifies a strong CD. For the test of weak CD, H0: errors are weakly CD.

Table 2 demonstrates that the Alpha's Bailey et al. (2016) cross-sectional dependence exponent is greater than 0.5 for all variables except for the lai variable α is slightly lower than 0.5 (α=0.436). All variables exhibit strong cross-sectional dependence, according to this test. For variables lghg, lme, ps, and ly, the Pesaran (2015) CD test rejects the null hypothesis of weak cross-sectional dependence. We can infer from both tests that all variables under consideration exhibit strong cross-sectional dependence.

3.3. Panel second-generation stationary test

By taking into account a multifactor error structure, Pesaran et al. (2013) expand on Pesaran's (2007) cross-sectionally augmented panel unit root test (CIPS). When cross-sectional dependence caused by stationary common factors is present, this second-generation panel unit root test is still valid. The fundamental idea is to employ the information about the m unobserved factors shared by the k observed time series in addition to the series under consideration. CIPS test is computed from the average of t-ratios Augmented Dickey-Fuller (ADF, 1979) régressions. These latter are augmented by the cross-section averages of the endogenous variable and k other exogenous variables having similar common factor characteristics. For every cross-section (N) and time series (T) combination taken into consideration, Monte Carlo experiments indicate that the suggested test has strong small sample properties. As N and T increase, so does its power. Critical values for the CIPS test rely on N, T, k, and the lag order p.

We perform the CIPS second-generation panel unit root test with a constant and trend, and the results are given in Table 3. We find that lai and loe variables are stationary at level, i.e., are integrated of order 0, or are I (0). However, lghg, lme, ps, and ly are stationary after the first difference, i.e., are integrated of order 1, or are I (1). Thus, our variables have a mixed integration order I (0) or I (1).

Table 3. Second-generation CIPS unit root test

Variables	lai	lghg	dlghg	lme	dlme	loe	ps	dps	ly	dly
Maximum lag	4	4	4	4	4	4	4	4	4	4
Bglag	4	4	4	4	4	4	4	4	4	4
Pesaran-CIPS	-3.18**	-1.80	-3.88***	-2.74	-4.57***	-3.33***	-2.35	-4.04***	-1.75	-4.01***

The CIPS test is calculated with a constant and trend. To adjust for autocorrelation, Bglag is the number of lags used in the model. Statistical significance levels at 5% and 1% are denoted respectively by ** and ***. Statistical critical values at 1%: -3.3; 5%: -2.94; 10%: -2.76.

3.4. Westerlund cointegration test

Second-generation cointegration tests should be used because there is cross-sectional dependence between variables. A bias-adjusted (BA) estimator to utilize in panel régressions with cross-sectionally correlated errors has been proposed by Westerlund (2007). The commonly used ordinary least squares estimators, such as Kao and Chiang (2001), are inefficient and biased and thus inconvenient inference tools when there is cross-sectional dependence. The Westerlund (2007) test is different from Bai and Kao's (2006) second-generation fully modified (FM) cointegration test in that it assumes that the number of common factors causing the cross-sectional dependency is unknown and is calculated from the data using recently established information criteria. Monte Carlo simulations in small samples are done, and the asymptotic distributions are analyzed, revealing that the BA estimator performs well compared to current ones. More exactly, the BA estimator is as efficient as the FM estimator but is more convenient computationally.

Table 4. Westerlund cointegration test

	Statistic	p-value
Variance ratio	-1.411	0.079

We consider included panel means and time trends. The dependent variable is ly and lai, lghg, lme, loe, and ps are the independent variables. H0: no cointegration, and Ha: all panels are cointegrated.

The results of Westerlund's (2007) test, which is performed with included panel means and time trends, are shown in Table 4. The dependent variable is ly, and the independent variables are lai, lme, loe, ps, and lghg. The alternative hypothesis, Ha, states that all panels are cointegrated, while the H0 hypothesis states that there is no cointegration. For our considered panel of six oil-exporting Gulf countries, H0 can be rejected at the 10% statistical significance risk, indicating a long-term cointegration between our variables of interest: political stability, greenhouse gas emissions, oil exports, military spending, arms imports, and gross domestic product.

3.5. CS-DL estimates

Six models will be considered in order to study the relationships between arms imports, military expenditures, political stability, crude oil exports, gross domestic product, and greenhouse gas emissions:

$$lai=f_1(lme, loe, ly) \quad (1)$$

$$lme=f_2(lai, loe, ps) \quad (2)$$

$$loe=f_3(lai, lme, ly) \quad (3)$$

$$ps=f_4(lai, lghg, loe) \quad (4)$$

$$ly=f_5(lai, lghg, lme, ps) \quad (5)$$

$$ly=f_6(lai, lghg, lme, loe) \quad (6)$$

We opt to employ the cross-sectional distributed lag methodology proposed by Chudik et al. (2016) since our variables, which are mixed integrated of orders 0 and 1, exhibit cross-sectional dependence. When the time series dimension, as in our investigation, is less than 50, this methodology is demonstrated to provide better performances than alternative panel ARDL estimates, such as the cross-sectional autoregressive distributed lag (CS-ARDL) approach established by Chudik and Pesaran (2015).

Conventional literature on panel long-run estimates, including the FMOLS approach of Pedroni (2001), the DOLS approach of Mark and Sul (2003), and the pooled mean group (PMG) approach of Pesaran et al. (1999), allow for heterogeneous short-run dynamics and lagged-dependent variables, but not cross-sectional dependence of errors.

Pesaran's (2006) common correlated effects (CCE) methodology has been used to address the issue of cross-sectionally dependent errors in panel data models that do not include lagged-dependent variables. Chudik and Pesaran (2015) extend the CCE approach to take into consideration the CS-ARDL approach to allow weakly exogenous regressors, such as lagged-dependent variables. To filter out the unobserved common factors effects, these two methods take into account ARDL specifications that are supplemented by cross-sectional averages. The requirement for a wide time dimension is the primary flaw in the CS-ARDL methodology.

Based on an ARDL representation enhanced by cross-sectional averages, the CS-DL technique proposed by Chudik et al. (2016) does not incorporate the dependent variable's lags and permits cross-sectionally dependent errors. The following are its primary benefits: *i)* When the temporal dimension is reasonably large (T<50), it provides better small sample performances than the CS-ARDL methodology; *ii)* It is resilient to serial error correlation and misspecification of dynamics, unlike the ARDL-type estimators; *iii)* Long-run coefficients are directly estimated.

We shall employ the CS-DL method because our series (T=24) is not long enough. In line with Chudik et al. (2016), we employ the auxiliary regressions listed below:

$$y_{it} = c_i + \theta_i^{'} x_{it} + \sum_{s=0}^{p-1} \beta_{is}^{'} \Delta x_{i,t-s} + \sum_{s=0}^{p_{\bar{y}}} \omega_{y,is} \overline{y_{t-s}} + \sum_{s=0}^{p_{\bar{x}}} \omega_{x,is}^{'} \overline{x_{t-s}} + \varepsilon_{it} \quad (7)$$

The individual long-run estimates are the *1xk* vector coefficients of independent variables θ_i, and the average CS-DL mean group estimator of the long-run coefficients is equal to $\overline{\hat{\theta}} = N^{-1} \sum_{i=1}^{N} \hat{\theta}_i$; Δ and ε_{it} are the first-difference operator and the residual term, respectively; the cross-section averages of the endogenous and exogenous variables are $\overline{y_t} = N^{-1}\sum_{i=1}^{N} y_{it}$, $\overline{x_t} = N^{-1}\sum_{i=1}^{N} x_{it}$; $p_{\bar{x}}$ is equal to the integer part of $T^{1/3}$, and thus equal to 2; $p_{\bar{y}}$ is equal to 0 and $p = p_{\bar{x}} = 2$.

As a result, our estimated equation comprises two lags of the cross-sectional averages of the regressors, one lag of the differenced independent variables, and the cross-sectional average of the dependent variable for models 3 and 4. Therefore, the cross-sectionally augmented distributed lag equation that we need to evaluate for these models is:

$$y_{it} = c_i + \theta_i' x_{it} + \sum_{s=0}^{1} \beta_{is}' \Delta x_{i,t-s} + \omega_{y,i} \overline{y_t} + \sum_{s=0}^{2} \omega_{x,is}' \overline{x_{t-s}} + \varepsilon_{it} \quad (8)$$

With the aforementioned lags suggested by Chudik et al. (2016) for the other models, we were unable to achieve adequate results. For this reason, we may utilize lag one for the cross-sectional averages of the regressors and lag two for the differenced independent variables. For every model, just the dependent variable's cross-sectional average is utilized. Details of the estimate are provided in Table 5. As we use the mean group estimate approach, the models' fit was evaluated using the mean group (MG) R-squared, which represents the average fit across the cross-sectional units. All of our models' R-squared (MG) values are high enough to indicate their statistical significance.

Table 5: CS-DL long-run estimates

	Independent variables						R-squared (MG)
Model/Dependent variables	lai	lghg	lme	loe	ps	ly	
Model 1: lai [2;1]	-	-	4.067 (0.007)***	-4.544 (0.094)*	-	-3.563 (0.558)	0.70
Model 2: lme [1;1]	0.0384 (0.136)	-	-	0.310 (0.018)**	-0.132 (0.082)*	-	0.88
Model 3: loe [1;2]	-0.014 (0.000)***	-	0.284 (0.001)***	-	-	1.767 (0.016)**	0.98
Model 4: ps [1;2]	0.154 (0.027)**	1.350 (0.064)*	-	-0.154 (0.849)	-	-	0.67
Model 5: ly [1;1]	-0.005 (0.738)	0.234 (0.239)	0.132 (0.003)***	-	0.076 (0.095)*	-	0.98

Model 6: ly [1;1]	0.011 (0.087)*	0.452 (0.034)**	0.018 (0.648)	0.175 (0.000)***	-	-	0.98

Statistical significance levels at 10%, 5%, and 1% are denoted by *, **, and ***, respectively.We have indicated between brackets the lags of the differenced independent variables and their cross-sectional averages, respectively. The mean group R-squared is denoted by R-squared (MG).

4. Discussion of the results

We present in Table 5 all estimated long-run coefficients that can be regarded as elasticities, except for those related to political stability, which we did not logarithmically modify because some of its values are negative. The majority of the long-run estimated coefficients for each equation under consideration are statistically significant.

In the long-term, a 1% increase in oil exports significantly lowers imports of weapons by 4.5%. One may anticipate that increased disposal of oil earnings would allow these nations to purchase more weapons, therefore, this is an unexpected outcome. A rise in oil exports generally happens when there are no armed conflicts or political unrest in the Gulf, and thus, there is less need to purchase additional weapons. This outcome is comparable to that of a study conducted by Adedeji et al. (2024) on eleven chosen OPEC nations, which found that these countries import fewer weapons when the price of oil fluctuates. It goes in the opposite direction of Vézina (2021), showing that arms imports rise by an average of 30% after an important gas or oil discovery in developing countries. A 1% increase in military expenditures increases arms imports by 4%. This is an expected result as more budget for the defense department enables the import of more weapons. While this result is logical, no previous econometric study has been reported.

Increasing oil exports by 1% increases military expenditures by 0.3% because a proportion of oil revenues is reserved for the defense department. The Gulf countries are aware that to protect their oil exports, they must provide their defense departments with the means to guard against foreign interference and protect oil shipping lanes. Moreover, there is a high proportion of foreign workers in these countries, and the defense department should have the means to prepare to crush any rebellion. This result is similar to that of Dizaji's (2022) study on a panel of Middle Eastern countries, showing that oil export reductions decrease military expenditures in the long-run.

Political stability reduces military expenditures in these Gulf countries. Indeed, when there are no internal political or social problems, nor problems with neighboring countries, Gulf governments reduce military expenditures in favor of investments in other sectors such as infrastructure, education, health, and social aid. This constitutes a new and interesting econometric result, as no previous study has evaluated the impact of political stability or geopolitical risk on military expenditures.

A 1% increase in arms imports slightly reduces crude oil exports by 0.01%. This can be explained by the money spent on arms imports that could have been spent on improving oil export logistics or the search for and exploitation of new oil fields. However, a 1% increase in military expenditures increases oil exports by 0.28%. Military expenditures seem to have a significant impact on securing Gulf oil shipping lanes and preventing political and armed conflicts in this region. This constitutes a new and interesting result close to Bakirtas and Akpolat's (2020) study on seven OPEC countries (Algeria, Ecuador, Iran, Kuwait, Nigeria, Saudi Arabia, and Venezuela), showing the presence of panel Granger causality running from military expenditures to crude oil exports. A 1% increase in gross domestic product increases crude oil exports by 1.8%, denoting the strong correlation between GDP and oil exports in this Gulf region.

It is noteworthy that political stability improves when arms imports increase. Possession of weapons, especially advanced weapons, reduces the risk of interference by other nations in these internal affairs or of attempts at destabilization or colonialism motivated by the availability of oil resources. Moreover, it offers arms importers a degree of security and the support of their suppliers, who do not want their arms contracts to be jeopardized. Terrorist organizations will also reconsider their position. Our findings are consistent with He and Mei's (2024) study on 135 non-OECD countries, which found that US arms imports significantly reduce the risk of civil war, and with Dizaji and Murshed's (2024) study on a panel of 48 developing countries, which found that reducing arms imports can exacerbate ethnic tensions and internal conflicts.

Increasing military expenditures by 1% increases gross domestic product by 0.13%. Indeed, military expenditures are an important proportion of the government budget and GDP for most Gulf countries, and are equal to 24% and 7.1%, respectively, for Saudi Arabia in 2023. These important military expenditures contribute to creating employment and boosting consumption. In particular, they reinforce security and political stability, prevent other countries and organizations from interfering in their internal affairs, and secure Gulf oil shipping lanes. This result is in line with those of Ben Youssef's (2023b) study on China and Aziz and Waheed's (2023) study on Saudi Arabia. However, it is in the opposite direction to the findings of Aminu and Abu Bakar's (2016) study on Nigeria and Chary's (2024) study on a panel of twenty-five of the World's top arms importers. Political stability is beneficial for gross domestic product because it enables governments to plan and implement long-run development strategies. This result follows that of Aldabagh et al.'s (2025) study on a panel of OPEC countries.

The GDP only rises by 0.01% for every 1% increase in gun imports. The consolidated military, political, and economic ties with nations that export weapons, as well as the internal and external security that these imports provide, may explain this. Our findings are different from those of Chary (2024), who looked at a balanced panel of 25 of the World's top arms importers and found that imports have a short-term negative impact on per capita GDP, and Aminu and Abu Bakar (2016), who found that imports have a long-term negative impact on GDP in their study on Nigeria. The GDP rises by 0.17% for every 1% increase in oil exports. The substantial contribution of oil exports to the GDP of the vast majority of the Gulf nations under consideration is the cause of this anticipated outcome. Indeed, OPEC (2024) estimates that in 2023, Saudi Arabia's petroleum exports accounted for 23.26% of its GDP. Our result is similar to the findings of Aziz and Waheed's (2023) study on Saudi Arabia.

5. Conclusion and policy recommendations

This study examines the relationships between our primary variables: political stability, oil exports, arms imports, and military expenditures. Six Gulf oil-exporting nations, which are Bahrain, Iran, Iraq, Kuwait, Oman, and Saudi Arabia, are taken into consideration. Qatar and the United Arab Emirates are removed from the panel because of important missing data about military expenditures. As far as we are aware, no panel research or temporal series analysis has been conducted on the nations we are considering to assess the link between our primary variables. This is because we believe there is a dearth of sufficiently long data series, particularly concerning oil exports and political stability. Our study's use of the cross-sectional distributed lag technique, proposed by Chudik et al. (2016), is another contribution. Although the literature has not utilized it enough, it can yield decent findings when the time dimension is not long enough. Because our time series are not sufficiently long, we choose to estimate our long-run coefficients using the CS-DL approach, and series cross-sectional dependence forces us to employ second-generation unit root and cointegration tests.

In the long-term, oil exports significantly lower the import of weapons. This outcome can be explained by the fact that oil exports generally increase when there are no armed conflicts or political unrest in the Gulf, which eliminates the need to purchase additional weapons. However, oil exports increase military expenditures because a proportion of oil revenues is reserved for the defense department. The Gulf nations understand that to safeguard their oil exports, they must give their defense forces the tools they need to prevent foreign meddling and secure oil shipping lanes. Furthermore, these nations have a sizable foreign labor force, and the defense department ought to be equipped to put down any uprising.

In these Gulf nations, political stability lowers military spending. In fact, Gulf governments cut back on military spending in favor of spending on infrastructure, education, health care, and social assistance when there are no internal political or social issues or issues with neighboring nations. Since no prior research has assessed the impact of political stability or geopolitical risk on military spending, this is a novel and intriguing econometric finding.

Military expenditures are beneficial for oil exports because they have a significant impact in securing Gulf oil shipping lanes and in preventing political and armed conflicts in this region. This is a new and interesting finding. In addition, importing weapons helps maintain political stability because they deter terrorist organizations, provide some protection and support from nations that supply them, and lessen the likelihood that other nations will try to destabilize or colonize.

Gross domestic product rises as military spending rises. Indeed, military spending accounts for a significant amount of the government budget and GDP in the majority of Gulf nations; in 2023, it accounted for 24% and 7.1% of Saudi Arabia's, respectively. These military spending increases consumption and creates jobs. They specifically protect Gulf oil shipping lanes, prevent other nations and groups from meddling in their domestic affairs, and strengthen political stability and security. Also, political stability is beneficial for gross domestic product because it enables governments to plan and implement long-run development strategies.

Because they strengthen military, political, and economic ties with nations that supply guns, imports of weapons have a beneficial effect on GDP. These findings are novel in the context of Gulf nations. As expected, oil exports are beneficial for gross domestic product. This is the result of oil exports' significant contribution to the GDP of the majority of the Gulf countries. In fact, according to OPEC (2024), 23.26% of Saudi Arabia's GDP comes from its petroleum exports in 2023.

Oil-exporting Gulf nations are encouraged to keep acquiring weapons, particularly more advanced ones, as these are essential to their political stability in this extremely unstable and war-torn region, according to the econometric findings above. Having enough high-tech weapons on hand serves as a deterrent and keeps wars from breaking out. These nations should think about and plan the manufacturing of their advanced weaponry, since they are a source of economic growth. Additionally, they ought to keep increasing their military budget since it protects their oil exports and spurs economic expansion. Political stability, in turn, boosts economic growth and enables these nations to design and implement energy efficiency and renewable energy initiatives. Renewable energy resources, especially solar energy, have the potential to be abundant in these nations. The Gulf nations must get ready for the global shift toward greater usage of renewable energy and devise plans to move from producing and exporting only fossil fuels to generating and exporting renewable energy as well.

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