No. 31-2018

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Do sanctions reduce the military spending in Iran?

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Abstract

This study focuses on short and long-term effects of sanctions on military spending in Iran. Utilizing the annual data from 1960 to 2017 and the auto regressive distributed lag (ARDL) model, we show that the increasing intensity of sanctions dampen the military budget of Iran. By separating unilateral sanctions (where only the United States sanctions Iran) and multilateral sanctions (where, the United States acts in conjunction with other countries to sanction Iran), we show that only the latter class of sanctions have a statistically significant and negative impact on military spending of Iran. The negative effects of the multilateral sanctions on military budget are observed in both the short and long run time horizons. The results remain robust when controlling for other determinants of military spending such as gross domestic product (GDP), oil rents, trade openness, population, quality of political institutions, military expenditure of the Middle East region, non-military spending of government and the war period with Iraq.

Keywords: sanctions; military spending; Iran; ARDL

1. Introduction

The main purpose of this study is to investigate the impact of the intensity of sanctions on military spending by controlling other economic, strategic and political determinants of military expenditures in Iran. Moreover, we examine the different impacts of unilateral and multilateral sanctions on Iran's military expenditure both in short and long run ranges.

Since Islamic Revolution of 1979 and the US embassy hostage crisis, the Iranian government was under a variety of political and economic sanctions imposed by the United States. The military and nuclear programs of Iran directed more international attention to the country's ambitions. Earlier case studies of Iran have investigated the economic effects of sanctions (or their removal) (e.g., Farzanegan and Hayo, 2018; Dizaji, 2018b; Farzanegan and Krieger, 2017; Farzanegan et al., 2016; Khabbazan and Farzanegan, 2016; Dizaji, 2014; Dizaji, 2013; and Farzanegan, 2013). Dizaji and Bergeijk (2013) have also considered the simultaneous economic and political impacts of the sanctions imposed on Iran. One of the main objectives of these imposed sanctions has been to control the military capabilities of Iran. A few studies (e.g., Farzanegan, 2011 and Dizaji, 2018a) have simulated the response of military and non-military spending of Iran to a sanction shock (or their removal) (defined through negative oil revenues for the shock of sanctions or positive trade openness for the shock of their removal). However, there is no specific study which examines the intensity of these sanctions and their impact on controlling Iran's military spending over different periods of the imposed sanctions. Therefore, our study takes the first step in the analysis of short and long run effects of (various) sanctions on military spending of Iran by distinguishing between unilateral and multilateral sanctions.

The Iranian government has a longstanding record of high budget allocation to the military. According to the SIPRI (2018) and the World Bank (2018), the average military spending in Iran, as a share of total government spending from 2008 to 2016 was 15%. This is the highest average share compared to other regions of the world such as Middle East and North Africa (12.5%), East Asia & Pacific (9%), Europe & Central Asia (5%), Latin America & Caribbean (5%), Sub-Saharan Africa (7%), and average world as a whole (9%). In terms of average military spending as a share of Gross Domestic Product (GDP) for the last decade (2008-2017), Iran's record of 2.7%, is more than the world average of 2.3%, or different regions such as East Asia & Pacific (1.6%), Sub-Sahara Africa (1.3%) and Latin America (1.3%). Iran also reaches the zenith for the size of the

labor force in the military industry; for the period of 2008-2016, the average of the armed forces personnel (% of total labor force) in Iran was 2.24% which is higher than the average in Europe & Central Asia (1.18%), Latin America (0.8%), East Asia & Pacific (0.7%), and Sub-Sahara Africa (0.4%).

The current United States administration's pressure to change the political and military behavior of Iran has raised the important question on the effectiveness of such pressures. Will banking, energy and economic embargos imposed by the United States hinder the Iranian government to expand its military ambitions? What types of sanctions may serve such purpose? To answer these questions, we examine the historical development of military spending by Iran since 1960s to date.

Iran is not experiencing the threat of sanctions for the first time. Post Islamic Revolution Iran has seen different kinds of political and economic embargos which were mostly imposed by the US government. However, there were particular periods in political life of Iran where other global powers, such as the European Union also facilitated the US sanction initiatives under the endorsement of the United Nations Security Council resolutions. The most recent example of the latter phase is documented under embargos due to Iran's nuclear activities.

After election of the populist government of Mahmoud Ahmadinejad in 2005, the military and nuclear programs of Iran gained a new dimension. In reaction to the military and nuclear ambitions of Iran, major global economic powers enforced a series of economic sanctions on Iran. The majority of these sanctions were implemented in 2012 when the US and the EU agreed to impose oil embargos against Iran. Iran's military expenditure reduced by 30 per cent between 2006 and 2015, one of the highest percentage decrease in military spending globally (SIPRI, 2018). In short, the post-2005 period, Iran was under the multilateral sanctions imposed by the US, the EU and the UN with involvement of other main economic powers. Following a series of intense negotiations and the compliance by Iran to international monitoring standards, sanctions were lifted on 16 Jan 2016. In May 2018, however, president Trump withdrew the US from the Iran Nuclear Deal. He further criticized this deal and the lifting of sanctions by declaring that "*[I]n the years since the deal was reached, Iran's military budget has grown by almost 40 percent — while its economy is doing very badly. After the sanctions were lifted, the dictatorship used its new funds to build its nuclear-capable missiles, support terrorism, and cause havoc throughout the Middle East and*

beyond.[1]" The US administration is planning to re-impose the economic sanctions on Iran in 2018. However, the difference with earlier experiences is the lack of international agreement, especially in the European Union, on supporting the US plans. There is a significant tension over re-imposing sanctions, their justifications and effectiveness between the US and the group of main European powers (e.g., Germany, France and United Kingdom) who are also backed by Russia and China. For example, in September 2018, during the annual General Debate of the United Nations General Assembly, EU foreign policy chief Federica Mogherini announced that global powers (excluding the US) are determined to "protect the freedom of their economic operators to pursue legitimate business with Iran".[2]

Figure 1 shows the historical development of military spending in Iran (in US $m., at constant 2016 prices and exchange rates). We observe that the military spending under the multilateral sanctions from 2006-2015 is consistently reducing while a similar consistent trend is not observed during the period of unilateral sanctions (1979-2005). Following the Iran Nuclear Deal and lifting of multilateral sanctions, we can observe an increasing trend in real military spending of Iran (2015-2017).

A timely question that arises is to what extent the planned sanctions of the US administration may be successful in controlling and dampening the military spending of Iran. Our regression analysis shows that only multilateral sanctions (where a sender such as the US acts in conjunction with other agents such as the EU/Russia and China to the sanction) have a significantly negative (i.e., dampening) effect on the military spending of Iran. Our results indicate that although in general, sanctions have a negative impact on Iran's military expenditure, however, unilateral sanctions such as those imposed by the United States are not able to push down the military budget of Iran significantly.

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[1] The full transcript of Trump's speech on the Iran Nuclear Deal is available at:
https://www.nytimes.com/2018/05/08/us/politics/trump-speech-iran-deal.html
[2] For more details see https://www.bbc.com/news/world-middle-east-45634448

Figure 1. Military spending in Iran (1960-2017)

Military expenditure in Iran, constant (2016) US$ million
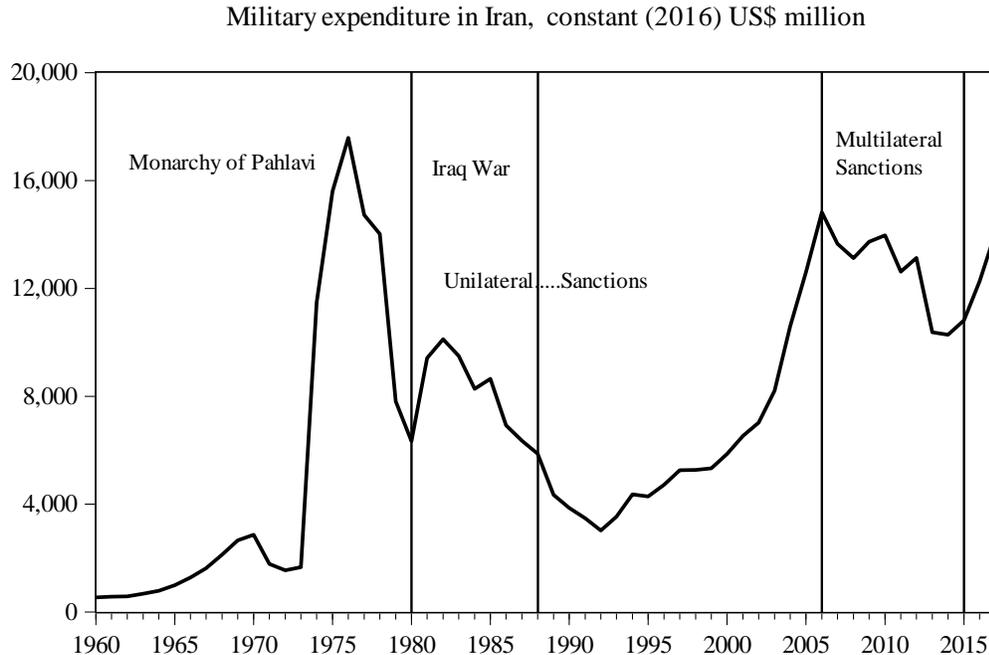
Source: SIPRI (2018)

The rest of this paper is structured as follows: Section 2 provides a review of the literature on causes and consequences of military spending. Section 3 presents the data and methodology applied. Results are then presented and discussed in Section 4 and Section 5 concludes the paper.

2. Review of literature

2.1. Economic growth related consequences of military spending

Understanding the determinants of military spending has been an important topic in literature due to significant positive and negative impacts of military on economic growth. A part of the literature shows that higher military spending positively affects economic growth (see meta-analysis of Alptekin and Levine, 2012 which finds positive effects of military expenditure on economic growth for developed countries and insignificant effects for developing countries). These studies often argue through the Keynesian hypothesis in which more military spending increases the aggregate demand in the economy. Given existence of idle economic resources, the latter increase in aggregate demand, can increase employment and national output. Using a panel of Middle Eastern and North African (MENA) countries from 1980 to 1999 period, Yildirim et al. (2005) shows a positive effect of military spending on growth. In a case study of Iran, Farzanegan (2014a)

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uses the annual data from 1959 to 2007 and simulates the response of Iran's economic growth rates to positive shocks in its military spending. He shows that this response is positive and statistically significant. The Granger causality results in Farzanegan's (2014a) study also show that there is unidirectional causality from the military spending growth rate to the economic growth rate. He concludes that any significant fall in Iranian military projects may also reduce the speed of economic growth in Iran due to major forward and backward linkages of the military complex with other sectors in the Iranian economy.

Another line of literature argues against the positive effects of military spending (see d'Agostino et al., 2017 for robust evidence on long run negative effects of military spending). They suggest that the larger size of military spending has high opportunity costs as it reduces the financial capacity of the state to invest in public goods such as education and health. Farzanegan (2011) observes such a trade-off between military and non-military spending in the case of Iran. Under-spending in critical educational and health projects because of the higher size of military spending has a significant long run negative effect on economic growth. Increasing budget deficits and external debts are other reasons for the negative effects of military spending on growth (Dunne et al., 2004). Higher military spending may also entice the state to increase the tax burden for funding their military ambitions. The latter discourage private investment and may escalate the size of shadow economy (see Chan, 1988; Lebovic and Ishaq, 1987; Mintz and Huang, 1990; Asseery, 1996).

2.2. Determinants of military spending

Following this brief review of the positive and negative effects of higher military spending, we now turn towards the related literature –which highlights the factors that are contributing to the size of military spending. Two types of models are mainly employed to explain different levels of military spending: first being the arms race model which primarily focuses on the military spending of potential enemies and/or allies to explain the military budget of a country (Richardson, 1960). The initial version of this model was based on the bilateral relationships but it proved to be less successful in explaining the changes in military spending of countries (Majeski and Jones, 1981). Later on, Rosh (1988) introduced the concept of Security Web, emphasizing that the security is a multilateral concern. According to Rosh, most threats to security are imposed by bordering countries. However, the importance of Security Web in explaining military spending of

countries reduced after the end of the cold war and collapse of Soviet Union, mainly due to the increasing importance of internal conflicts. The second type of models utilize socio-economic, political and strategic factors to explain different sizes of military spending (Dunne and Perlo-Freeman, 2003; Dunne et al., 2008; Yildirim and Sezgin, 2005; Collier and Hoeffler, 2007; Nikolaidou, 2008). Under socio-economic factors we observe variables such as population size, level of economic development (or its growth), trade, foreign aid, political development and external and internal conflicts. Studies such as Dunne and Perlo-Freeman (2003), Dunne et al. (2008) and Collier and Hoeffler (2007) show a negative effect of population on military spending. They often provide two reasons for this observation: first is that the larger populations offer a natural security in itself. Second, lager populations may increase pressures on the state to provide more education and health and thus reduce the share of military spending. However, a larger population may also lead to an increase in government spending on military and the expansion of the defense industry in order to absorb parts of the increasing working age population. The role of the military complex to provide employment for larger populations becomes more important in countries with marginalized small business sector[3].

The effect of national income on military spending is also not conclusive. When using GNP as a measure of national income, Dunne et al. (2008) found it to have a significant and negative effect on military expenditure. Increasing economic development can foster education and public awareness on the importance of other critical socio-economic and environmental concerns, requiring the state to allocate more budgets to public goods and services (Farzanegan, 2017). By contrast, Collier and Hoeffler (2007) use GDP per capita as their measure and found it to have significant and positive effect. One reason for positive correlation is that the military spending is a part of total government spending. The latter variable is positively correlated with income. The capacity of the state to borrow and to tax citizens and firms increases with economic development. In addition, existence of economic resources within a country usually creates a demand for military spending because they need to be protected against external threats. Economic development is associated with structural changes, and under specific institutional settings may add to inequalities and the risk of conflict. This situation may increase defense budgets to secure the political stability

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[3] Farzanegan (2014b) shows that marginalized small business sector is characteristic of oil-based economies.

(Maizels & Nissanke, 1986). Moreover, a larger amount of income creates financial resources for significant military projects and importing advanced armaments (McKinlay, 1989, Wang 2013).

On the role of international trade, there is a classic view of Kant and Montesquieu that trade between nations has a pacifying characteristic. In his book, the Spirit of the Laws, Montesquieu stated "*The natural effect of commerce is to bring peace. Two nations that negotiate between themselves become reciprocally dependent, if one has an interest in buying and the other in selling. And all unions are based on mutual needs*" (cited in Howse, 2006). However, the effect of trade on conflict and military spending is not conclusive as well. If economic globalization leads to higher income inequality (as suggested by Nobel Laureate Eric Maskin[4]) and provides new rent-seeking opportunities for corporate, political and military elites, then we may experience an increasing risk of conflict. The latter situation may justify the allocation of a larger share of government budget and national income to military forces. Dizaji (2018a) shows that in the case of Iran, the response of military spending to a positive trade shock is positive and statistically significant.

Collier and Hoeffler (2007) also investigate the effect of foreign aid on military spending. While, the effect of aid is conditional to the quality of institutions in the recipient economy (Kono and Montinola, 2012), nonetheless, they show that the direct effect of aid on military spending is significant and, on average, 11.4% of development aid leaks into defense budgets.

In addition, the role of political institutions in military spending is investigated in the literature. There is stronger evidence on the negative correlation between quality of democratic institutions and military spending (Dunne and Perlo-Freeman, 2003; Dunne et al., 2008; Nordhaus et al., 2012). Dizaji et al. (2016) show the relevance of political institutions in the allocation of government spending between military and non-military purposes. Utilizing the case study of Iran and vector autoregressive models, they show that the response of military spending to a positive shock in the quality of political institutions is negative and significant. Other dimensions of institutions such as control of corruption are also shown to be important drivers of militarization of the economy. For example, Gupta et al. (2001) in a cross-country investigation from 1985 to 1998 show that corruption is significantly associated with higher military spending or higher arms

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[4] http://www.worldbank.org/en/news/feature/2014/06/23/theorist-eric-maskin-globalization-is-increasing-inequality

procurement. Capital-intensive military projects have been an interesting opportunity for corrupt deals and bribery[5].

Several studies have tried to investigate the main determinants of the demand for military spending in different countries out of which, some of them are reviewed here systematically. In a case study of Turkey, Sezgin and Yildirim (2002) use annual data from 1951 to 1998 and investigate the short run and long run drivers of military spending, employing the ARDL method. They show that in both short and long run time horizons, the effect of GDP growth rate on military spending (% of GDP) is negative and significant. This may imply that the increase of military spending in Turkey in the short run is slower than the increase in its nominator (GDP) and thus the ratio shows a declining trend. The effect of NATO's military spending on Turkey's military spending is positive and significant in the short run, indicating that Turkey, as a member of NATO, is a *follower* rather than a *free rider* (i.e., Turkey increases its military spending, instead of decreasing, if other NATO members increase their spending). The effect of trade balance (exports minus imports) on military spending of Turkey is negative, implying that Turkey is a net arms importer. In the short run, the authors show that the military spending of Greece has a positive and significant effect on Turkey's military budget. In the long run, however, this effect is insignificant, indicating more importance towards other factors such as NATO military strategy and other local concerns as main drivers of the military budget of Turkey. The authors also did not find a significant effect of non-military government spending on military spending although, they were expecting to find a negative effect due to the opportunity cost of military spending. Size of the population and the conflict dummy with Cyprus for 1974 also does not play a significant role in explanation of military spending of Turkey in their estimations.

Batchelor et al. (2002) investigate the determinants of military spending in South Africa from 1963 to 1997. They use the neo-classical model of the demand for military spending as suggested by Smith (1989, 1990) and adjusted it for the case of South Africa. They include real GDP, the share of military spending in GNP for the whole of Africa and a series of dummy variables to capture exogenous events in their ordinarily least squares regressions. One important dummy variable is the mandatory UN arms embargo against South Africa. To control the effect of this embargo, the

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[5] For more details see government defense anti-corruption initiative of Transparency International: https://government.defenceindex.org/#intro

authors use a dummy variable which equals one for the period of 1977-1993. They also use a dummy for regime changes (1994-1997); a dummy for war period with Angola (1975-1989) and a dummy variable for initial years of the Republic (1961-64). Their results show that the UN arms embargo and the regime change had a negative and statistically significant effect on military spending. In addition, they show that involvement in the Angolan War and the early years of the Republic had a positive and significant effect on military spending in South Africa. Another study which has examined the response of military spending to (lifting of) sanctions is the case study of Iran by Dizaji (2018a). His simulation shows that military spending responds positively to lifting of sanctions (which is captured by a positive shock in the international trade of Iran).

The Egyptian case also has been investigated by Abdelfattah et al. (2014). They examine the determinants of military spending for the period of 1960-2009. Among others, they employ three single-equation methods such as fully modified OLS (FMOLS), dynamic OLS (DOLS) and canonical cointegrating regression (CCR) to estimate the long run effects of the drivers of military spending. As in the case of the South Africa study, they follow the neo-classical model of the demand for military spending as suggested by Smith (1980, 1989 and 1995). The long run results show that Egypt's military spending (level) or burden (share of GDP) is significantly related to the level of GDP and Israel's level/burden of military spending.

In a recent study, Farzanegan (2017) examines the determinants of military spending in Gulf Cooperation Countries and other Middle Eastern and North African (MENA) countries. He focuses on the effects of oil rents and corruption as the major drivers of military spending in the MENA region. He finds that the effect of oil rents on military budgets depends on the extent of political corruption. A combination of higher oil rents and more corruption has a positive (increasing) effect on military spending. Earlier studies had also investigated the direct effects of resource rents and corruption (or other dimensions of governance) on (risk of) political instability, which may influence the military spending (e.g., Andersen and Aslaksen, 2013; Bjorvatn and Farzanegan, 2015).

Our study adds to this body of literature by clustering the sanctions into unilateral and multilateral ones and focusing on their short and long run impacts on the military spending of Iran. The question of the effectiveness of sanctions on controlling the military ambitions of Iran is a timely

topic given the ongoing political tensions between the US administration and Iran. In the next section, we explain our data and research design.

3. Research design

3.1. Methodology

In this study, the autoregressive distributed lag (ARDL) model, developed by Pesaran et al. (2001), is applied to establish cointegration relationships among the variables (Pesaran and Pesaran, 1997). The ARDL approach is more helpful when we want to establish cointegrating relationships in small samples, whereas the Johansen cointegration techniques usually require larger samples for the results to be valid (Ghatak and Siddiki 2001; Dizaji 2012). When the number of variables in the system is large, the vector autoregressive (VAR) models with symmetric lag length among the variables leads to small degrees of freedom, undermining a valid statistical inference. The ARDL method enables us to choose a different and optimal lag length for each variable in the model. A further advantage of the ARDL is that while in the other cointegration techniques it is necessary that all of the regressors have the same integration order; the ARDL can be used while the variables are integrated with either zero or first order (Pesaran et al., 2001). This method however is not applicable in the presence of a series with higher orders of integration. Moreover, using the ARDL method, we can estimate a single reduced form equation while with the conventional cointegration method estimations we have to work with a system of equations (Pesaran and Shin, 1995).

Overall, the ARDL method involves two steps. First, we examine the existence of the long-run relationship among our dependent and explanatory variables by comparing the calculated F-statistics with the critical values tabulated by Pesaran et al. (2001). We reject the null hypothesis of no cointegration among the variables if the calculated F-statistic is greater than the upper bound. However, if the computed F-statistic is smaller than the lower bound, then we cannot reject the null hypothesis of no cointegration. Finally, the result is not decisive if it is between the lower and the upper bounds. Thereafter the long-run coefficients of the ARDL model should be estimated. The order of the distributed lag function in ARDL method is important. Pesaran and Smith (1998) suggest using the Schwarz-Bayes Criterion (SBC) as it avoids the large number of lags compared to other model specification criteria.

3.2. Data

We apply an ARDL approach to the evolution of military spending in Iran over the period of 1960-2017 using strategic and socio-economic determinants while focusing on the effect of sanctions. Data has been collected from the World Bank's World Development Indicators (WDI) online database (World Bank, 2018). The logarithms of level of the non-dummy variables have been used.[6] For investigating the long-run relation between our variables, we will estimate the following equation (*L* represents the Logarithm):

$$Lmx = \alpha_0 + \alpha_1 L\,pop + \alpha_2 LGDP + \alpha_3 Lnmx + \alpha_4 Ltr + \alpha_5 Lrmx + \alpha_6 poli + \alpha_7 sanc + \alpha_8 war + \varepsilon_i$$

(1)

Where:

Lmx is the logarithm of Iran's military expenditure (constant 2010 US$). We take military expenditures (% of GDP) from the World Bank[7] and then multiply it by Iran's real GDP to get Iran's real military expenditure. Empirical studies on military spending have sometimes used the measures of the defense burden (defined as the ratio of defense spending to GDP) as their dependent variable. However, Sandler and Hartley (1995) argue that military expenditure rather than measures of the defense burden is a more appropriate dependent variable if we aim to estimate the demand function of military spending. Therefore, in our main analysis, we will use the aggregate form of military expenditure as our dependent variable. As for robustness checks, we will also use the military expenditures to GDP ratio.

Lpop is the logarithmic form of population which represents the public good nature of defense. It captures the potential effects of country scale. As we discussed in the literature review, the exact impact of population on defense spending is not clear.

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6 - The regression coefficient on a logarithmic variable can be interpreted as an elasticity, that is, as the rate of the percentage change in the dependent variable for each one percent change in the independent variable.

7 - The World Bank reports the military expenditures (% of GDP) data from the Stockholm International Peace Research Institute (SIPRI). The SIPRI database is the most up-to-date database on global military spending refreshed annually which are derived from the NATO definition. The reported military spending is not including civil defense and current expenditures for previous military activities, such as for veterans' benefits, demobilization, conversion, and destruction of weapons.

Lgdp is the logarithm of GDP (constant 2010 US$). We have also controlled for GDP as a proxy for the scale of an economy. The review of literature in the earlier section shows that the impact of national income on defense budget is inconclusive.

Lnmx is the logarithm of non-military government expenditures (constant 2010 US$) representing the opportunity cost of defense. The non-defense government variable was constructed by deducting the military expenditure figures from the general government expenditure figures. The sign for this variable is expected to be negative.

Ltr is the logged total trade (imports plus exports) representing the concept of incorporation of the country into the world economy. As we discussed in the literature review, higher trade openness may increase the opportunity costs of involvement in conflicts, reducing the necessity of investing in the military complex. Economic globalization can, however, increase internal tensions if it leads to more income inequality and marginalization of parts of the population. Under the latter situation, risk of conflict increases after a wave of globalization and thus directs more finances towards military and security forces.

Lrgmx is the logged value of averaged Middle Eastern countries military expenditures (excluding Iran). According to the concept of Security Web which we discussed in the second section, countries may adjust their military budget taking into account the spending behavior of their regional neighbors. The defense spending can be shared unequally among regional neighbors because some countries may act as free riders while other large and wealthy neighbors spend more on regional security and conflicts. If Iran is a free-rider in the Middle East region, the coefficient of *Lrgmx* will be negative; on the other hand, if Iran's defense planners adopt a follower mode of response, the coefficient will be positive.

poli is used as the index of political institutions. It is widely found that democratic countries spend less on the military than autocratic countries (Lebovic, 2001; Fordham and Walker, 2005; Dizaji et al, 2016). This is because the political survival of democratic leaders does not depend on the support of military groups, and that political checks and balances in democratic regimes restrict the extreme allocation of financial sources to the military sector. On the other hand, the autocracies rely significantly on the support of military forces to survive politically. As a result, non-democratic regimes tend to allocate a higher level of economic sources to the military forces to attract their support. To control for this potential effect of regime type, we use the Polity IV

database (Marshall et al., 2017) which describes combinations of the autocratic and democratic characteristics of the institutions of government. This index has a range of −10 (full autocracy) to 10 (full democracy).

war is an external war dummy variable, controlling for Iran-Iraq war (1980-1988). The sign for this variable is expected to be positive.

Sanc is a dummy variable capturing the intensity of sanctions. This variable is coded as an ordinal variable (0-3), which includes the categories of no sanctions (0), limited sanctions (1), moderate sanctions (2), and extensive sanctions (3). Instead of using a mere dummy variable for economic sanctions, the four-category ordinal measure better captures the impact of the sanctions. Specifically, because extensive sanctions place comprehensive economic and financial pressures on the target economy, they should have a greater substantial impact than limited or moderate sanctions (see Caruso, 2003, and Dizaji, 2018b).

The first round of US sanctions against Iran began in 1979, as bilateral relations were hurt sharply following the Islamic revolution and the hostage crisis at the US embassy in Tehran on November 4, 1979. Since then, the U.S. has imposed sanctions against Iran for different reasons[8], such as settling the expropriation claims, renouncing mass destruction, controlling nuclear activities etc. Before 2006, the major sanctions on Iran were unilaterally imposed by the US and they were relatively weaker compared with the next rounds of multilateral sanctions issued by the US, the EU and the UN. The US steadily applied broader sanctions and pushed for international action since 2006. Moreover, the UN Security Council imposed sanctions on Iran's trade in nuclear-related issues and froze the assets of individuals and companies in December 2006; however, until the end of 2011, these sanctions were not very successful in controlling Iran's nuclear activities and asymmetric warfare capabilities, although they restricted many aspects of Iran's military build-up. Iran had the time and options available to alleviate the impacts of those sanctions. It was only at the end of 2011 and beginning of 2012 that the US and other world powers imposed strong and extensive sanctions on Iran's oil exports, trade and banking system (Gordesman et al., 2014, and Dizaji 2018b). In November 2013, Iran and the P5+1 group (five permanent members of the UN Security Council; namely China, France, Russia, the United Kingdom, and the United States; plus

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[8] The first kinds of these post-revolution sanctions were the order of President Carter to freeze Iranian assets in US banks on November 14, 1979.

Germany) reached an agreement under the so called "Joint Comprehensive Plan of Action (JCPA)". In July 2015, Iran agreed to limit its nuclear activities in return for lifting many of the most punishing sanctions (for a detailed timeline and terms of sanctions imposed on Iran by the US and other global powers see Samore, 2015). The implementation of JCPA took place on 16 January 2016 in which the multilateral sanctions on Iran were lifted while the unilateral sanctions of the US on Iran continued.

4. Results

4.1. Unit root test

The computed F-statistics provided by Pesaran et al. (2001) for testing the existence of long run relationships among the variables are based on the assumption that the variables are I(0) or I(1). Therefore, we apply the unit root tests to ensure that the variables are not integrated with higher orders. We use the ADF (Dickey and Fuller, 1981) and Phillips–Perron (Phillips and Perron, 1988) tests in order to establish the order of integration of the variables. As illustrated in Table 1, *Lmx*, *Lpop* and *Lrgmx* are stationary in their level at ten percent confidence level[9] while other variables are integrated with order one, i.e. I(1).

Table 1. ADF and Phillips-Perron unit root tests

Variable	ADF		Phillips-Perron	
	Level	1st diff	Level	1st diff
Lmx	-2.94**	-	-2.59*	-
Lpop	-2.58*	-	-2.75*	-
LGDP	-2.04	-4.73***	-2.30	-4.75***
Lrgmx	-2.69*	-	-2.81*	-
Lnmx	-2.04	-8.75***	-1.69	-11.37***
Ltr	-2.14	-4.79***	-1.98	-4.83***
poli	-2.20	-7.68***	-2.20	-7.72***

***: Null hypothesis rejection at 1% (critical value=-3.55)
**: Null hypothesis rejection at 5% (critical value=-2.91)
*: Null hypothesis rejection at 10% (critical value=-2.58)

4.2. Bounds Tests for Cointegration and ARDL model

We will apply the ARDL approach to test the existence of long-run and short-run relationships. The ARDL is useful because it allows us to describe the existence of an equilibrium/relationship

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9 - According to the ADF test, *Lmx* is stationary in its level also at five percent confidence level.

in terms of long-run and short-run dynamics without losing long-run information. The maximum order of the lags in our ARDL model is one year. The error correction version of our ARDL model in the absence of dummy variables is given by:

$$DLmx_t = a_0 + b_1 DLmx_{t-1} + b_2 DLpop_{t-1} + b_3 DLgdp_{t-1} + b_4 DLrmx_{t-1} + b_5 DLnmx_{t-1} \\ + b_6 DLtr_{t-1} + b_7 Dpoli_{t-1} + \delta_1 Lmx_{t-1} + \delta_2 Lpop_{t-1} + \delta_3 Lgdp_{t-1} \\ + \delta_4 Lrmx_{t-1} + \delta_5 Lndf_{t-1} + \delta_6 Ltr_{t-1} + \delta_7 poli_{t-1} + u_t$$

$$(2)$$

Following the procedure introduced in Pesaran and Pesaran (1997), we first estimate an OLS regression for the first differences part of equation (2) and then test for the joint significance of the parameters of the lagged level variables when added to the first regression. The first part of the equation with $b_1, \dots, b_7$ represents the short-run dynamics of the model whereas the parameters $\delta_1, \dots, \delta_7$ represent the long-run relationship. The null hypothesis that will be tested is the 'non-existence of the long-run relationship' defined by

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0 \tag{3}$$

Table 2 reports the results of the calculated F-statistics when each variable is considered as a dependent variable (normalized) in the ARDL-OLS regressions.

The calculated F-statistics are higher than the upper bound critical values when the regressions are normalized on *Lmx*, *Lpop*, *Lnmx* and *poli*. Thus, the null hypotheses of no cointegration are rejected, implying long-run cointegration relationships amongst the variables. In other words, there are "long-run forcing" variables regarding the level of the Iranian military expenditure.

Table 2. Results from Bounds Tests

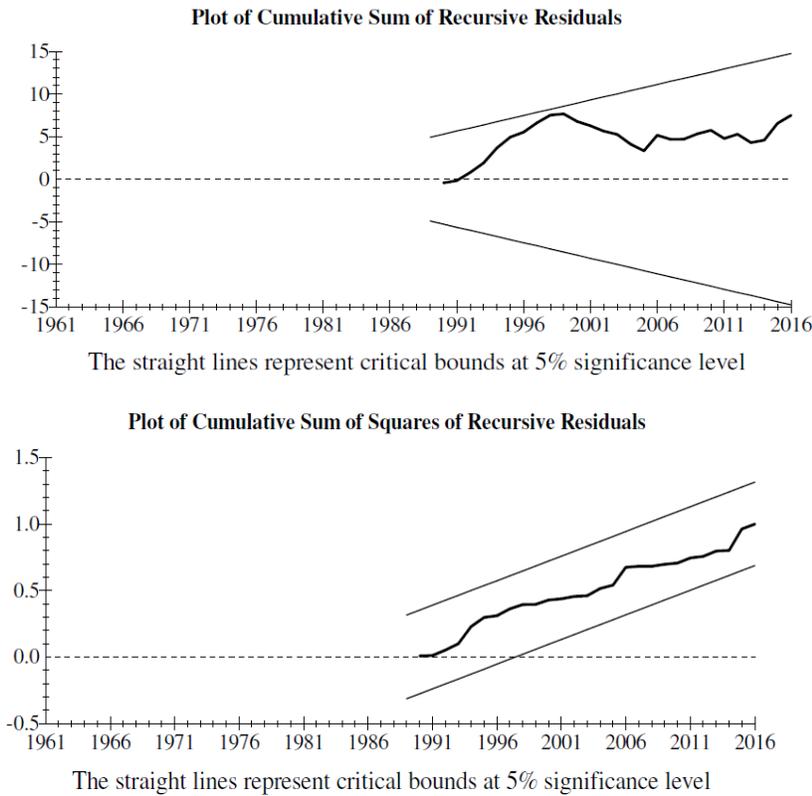| Dependent variable/…	F-statistic	Prob.	Existence of long-run relationship
F(Lmx/Lpop,Lgdp,Lrgmx,Lnmx,Ltr,poli)	5.61	0.00	Accepted
F(Lpop/Lmx,Lgdp,Lrgmx,Lnmx,Ltr,poli)	5.78	0.00	Accepted
F(Lgdp/Lpop,Lmx,Lrgmx,Lnmx,Ltr,poli)	3.18	0.00	-
F(Lrgmx/Lpop,Lgdp,Lmx,Lnmx,Ltr,poli)	2.66	0.02	-
F(Lnmx/Lpop,Lgdp,Lrgmx,Lmx,Ltr,poli)	3.86	0.00	Accepted
F(Ltr/Lpop,Lgdp,Lrgmx,Lnmx,Lmx,poli)	2.65	0.02	-
F(poli/Lpop,Lgdp,Lrgmx,Lnmx,Ltr,Lmx)	12.48	0.00	Accepted
Lower bound of critical value at 5% level: 2.47		Upper bound of critical value at 5% level: 3.64	

The results of estimated optimal ARDL model are shown in Table 3. The optimal number of lags for each of the variables is shown as ARDL (1,1,0,0,1,1,0) according to the Schwarz–Bayesian criterion. Based on the various diagnostic tests, this model was satisfactory. There was absence of significant autocorrelation or heteroscedasticity based on various test results, which are also reported in Table 3. The error term was normally distributed based on the Jarque–Bera test thus making the standard t and F tests of the estimated equation theoretically valid. The explanatory power of the model is quite stable given the high values of the R^2, adjusted R^2 and F value.

Table 3. Results of estimated optimal ARDL model for equation 1

ARDL (1,1,0,0,1,1,0) based on Schwarz Bayesian Criterion Dependent Variable: Lmx			
Regressor	**coefficient**	**t-values**	**prob.**
Lmx(-1)	0.38	4.55	0.00
Lpop	63.54	5.84	0.00
Lpop(-1)	-61.47	-5.76	0.00
Lgdp	-0.22	-0.87	0.38
Lnmx	-0.42	-8.82	0.00
Ltr	0.14	0.94	0.34
Ltr(-1)	0.78	5.27	0.00
Lrgmx	0.01	0.07	0.94
Lrgmx(-1)	-0.35	-2.64	0.01
poli	-0.01	-1.77	0.08
Intercept	0.73	0.27	0.78
war	0.05	0.38	0.70
Sanc	-0.2	-3.92	0.00
Significance level of autocorrelation test based on Lagrange multiplier (LM) test			0.13
Ramsey's RESET test based on Lagrange multiplier (LM) test			0.32
Significance level of Jarque-Bera test of normality of the error term			0.17
Significance level of the LM heteroscedasticity test			0.06
R^2=0.96	Adjusted R^2=0.95		F-stat=91.03 (prob.=0.00)

Figure 2 plots the cumulative sum of the equation errors (CUSUM) and CUSUM of squares statistics. The results indicate that the estimated coefficients are stable during the investigated period because the plots of the two statistics are confined within the 5% critical bounds.

Figure 2. Plots of CUSUM and CUSUMQ statistics for coefficients Stability Tests

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

4.3. Results of estimated long-run and error correction equations

The estimated long-run relationships derived from the optimal ARDL model are reported in Table 4. The results show that coefficients for all of the variables except for GDP and war dummy are significant.

Population has a significant and positive impact on Iran's military expenditure. A 1% increase in population leads to an approximately 3.35% increase in Iran's military spending in the long run, all things being equal. The non-military expenditures variable has a negative sign and is significant. With regards to the impact of international trade (sum of export and imports), it is highly significant and has a positive impact on military expenditure. A 1% increase in trade leads to a 1.5% increase in military spending. This is in line with Dizaji (2018a), indicating that economic sanctions on Iran's trade flows may reduce Iran's ability to expand its military spending. Moreover, Iran's military spending has been negatively influenced by the military spending of other Middle Eastern countries. The estimated coefficient entails that 10 percent increase in the

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average of Middle Eastern countries military spending leads to 5.5 percent decrease in Iran's real military expenditure, in the long term. As far as the Middle Eastern countries variable is concerned, it appears that Iran is not a 'follower' of the regional military policies but behaves as a 'free-rider' in the region on a long-run time horizon. Our hypothesis regarding the negative impacts of sanctions on the level of Iran's military spending is confirmed. An increase in the intensity of sanctions is associated with a higher decline in military spending.

The war dummy has influenced military spending in the expected positive direction. However, it does not show a statistically significant impact. Whereas the political index variable has a negative and statistically significant effect, confirming the idea that the higher the level of democracy the lower the amount of government's spending on military.

Table 4. Results of estimated long-run relationship.
Derived from the optimal ARDL model for equation 1

	Regressor	**coefficient**	**t-values**	**prob.**
Dependent variable	**Lmx**			
	Lpop	3.35	5.92	0.00
	Lgdp	-0.35	-0.84	0.40
	Lnmx	-0.69	-5.73	0.00
	Ltr	1.5	5.88	0.00
	Lrgmx	-0.55	-2.86	0.00
	poli	-0.02	-1.78	0.08
	Intercept	1.18	0.26	0.79
	war	0.08	0.37	0.70
	Sanc	-0.33	-3.69	0.00

The estimated error correction model selected using SBC is given in Table 5. Unlike the long-run, in the short- run, trade and average of the Middle East military spending do not influence Iran's military spending significantly. The sanctions dummy is highly significant in short run as well and maintains its negative impact on military spending. The political variable is significant at the 10% level and has a minor impact on military spending compared to the other variables. Changes in population show a positive impact on the military spending in the short run. The 'crowding-out' effect of military spending (captured by the negative coefficient of the non-military government expenditures) applies to the cases of both long and short run, indicating that increases in other non-defense government expenditure (such as health, education and social issues) decrease the available economic resources for defense expenditures.

The error correction term indicates the speed of the equilibrium restoring adjustment in the dynamic model. The ECM coefficient shows how quickly/slowly variables return to equilibrium and should have a statistically significant coefficient with a negative sign. Bannerjee et al (1998) holds that a highly significant error correction term is further proof of the existence of a stable long-term relationship. The larger the error correction coefficient (in absolute value) the faster will be the economy's return to its equilibrium, after an exogenous shock. The error correction coefficient, estimated at -0.61 is statistically significant, has a correct sign and suggests a relatively high speed of convergence to equilibrium (indicating that deviation from the long-term military spending path is corrected by 61 percent over the following year).

Table 5. Error Correction Representation for equation 1

ARDL (1,1,0,0,1,1,0) based on Schwarz Bayesian Criterion			
Dependent Variable: dLmx			
Variables	**coefficients**	**t-values**	**prob.**
dLpop	63.54	5.84	0.00
dLgdp	-0.22	-0.87	0.38
dLnmx	-0.42	-8.82	0.00
dLtr	0.14	0.94	0.34
dLrgmx	0.01	0.07	0.94
dpoli	-0.01	-1.77	0.08
d(intercept)	0.7	0.27	0.78
dwar	0.05	0.38	0.7
dsanc	-0.2	-3.92	0.00
ecm(-1)	-0.61	-7.35	0.00
R^2=0.82		Adjusted R^2=0.77	
Akaike Info. Criterion=23.48		Schwarz Bayesian Criterion= 10.32	
DW-statistic=1.63		F-stat=21.65 (prob.=0.00)	

4.4. The impacts of unilateral and multilateral sanctions on military spending

Another way to look at sanctions is to note the number of states involved. In most cases, sanctions are imposed by only one sender country against the target country. However, sanctions can be both unilateral and multilateral. In the first case, sanctions are imposed by one sender country whereas, in the second case, they are enacted by more than one country. It is generally argued that multilateral sanctions, due to the cooperative and coercive behavior of players, are more likely to succeed compared to unilateral ones (Caruso 2003, and Dizaji 2018b).

To estimate the impacts of different types of sanctions on Iran's military spending, we employ the following model in which the log of military expenditure is regressed on log GDP, log population, log trade, log non-defense expenditures, log of region's average military spending, democracy index, war and sanctions dummies. This categorization leads us to understand how unilateral U.S. sanctions, which are not supported by international community, could influence Iran's military spending.

$$Lmx = \alpha + \beta_1 Lpop + \beta_2 Lgdp + \beta_3 Lnmx + \beta_4 Ltr + \beta_5 Lrgmx + \beta_6 poli + \beta_7 war + \beta_8 sancuni + \beta_9 sancmul + \varepsilon_i \qquad (4)$$

Where:

Sancuni is a dummy variable for capturing the impact of unilateral U.S. sanctions. It takes the value of 1 if sanctions are unilaterally imposed (periods of 1979-2005 and 2016-2017) and zero otherwise.

Sancmul is a dummy variable for capturing the impact of multilateral sanctions. It takes the value of 1 if sanctions are multilaterally imposed (period of 2006-2015) and zero otherwise.

We have selected one year as the maximum order of lags in the ARDL model for the period of 1960-2017. The optimal number of lags for each of the variables is shown as ARDL (1,1,0,1,1,1,0). Based on the various diagnostic tests, this model specification is satisfactory. Table 6 shows the long-run coefficients of the variables under investigation. All of the variables have maintained their previous signs. Again, the war dummy and GDP fail to show any significant impact on military spending.

Table 6. Results of estimated long-run relationship
Derived from the optimal ARDL model for equation 4

	Regressor	coefficient	t-values	prob.
Dependent variable	**Lmx**			
	Lpop	4.2	3.87	0.00
	Lgdp	-0.68	-0.99	0.32
	Lnmx	-0.69	-4.21	0.00
	Ltr	1.79	4.64	0.00
	Lrgmx	-0.87	-2.83	0.00
	poli	-0.02	-1.64	0.10
	Intercept	5.24	0.73	0.46
	War	0.49	1.20	0.23
	Sancuni	-0.88	-1.54	0.13
	Sancmul	-1.5	-2.34	0.02

Significant results are obtained for population, non-defense expenditures, trade and the average of Middle East region's military expenditures. Non-military government spending has a significant and negative coefficient, suggesting that military spending will tend towards crowding out other government expenditures.

The impact of trade is positive and significant, indicating that sanctions on trade flows may reduce Iran's military expenditures. Increases in the average of Middle East defense expenditures decreases Iran's military spending in the long run confirming our previous finding.

The hypothesis that multilateral sanctions have significant effects on military expenditure is confirmed. While the impact of unilateral sanctions on military expenditure is also negative, however, its coefficient is not statistically significant.

The results of the error correction model for equation (4) are presented in Table 7. The signs of trade and Middle Eastern countries' military spending are similar to their signs in the long run but are not statistically significant in the short run. Population has a significant and positive impact on the level of military spending both in the short and long run. The negative impact of political institutions on defense spending is although negligible, but remains significant at 10 percent both in the short and long run. The Iran-Iraq war dummy variable has a positive but insignificant impact on the military spending. The insignificant impact of unilateral sanctions and significant impact of multilateral sanctions are also confirmed in the short run.

Table 7. Error Correction Representation for equation 4

ARDL (1,1,0,1,1,1,0) based on Schwarz Bayesian Criterion			
Dependent Variable: dLmx			
Variables	**coefficients**	**t-values**	**prob.**
dLpop	48.51	3.89	0.00
dLgdp	-0.32	-1.02	0.31
dLnmx	-0.45	-8.38	0.00
dLtr	0.24	1.48	0.14
dLrgmx	-0.08	-0.63	0.53
dpoli	-0.01	-1.73	0.08
d(intercept)	2.45	0.75	0.45
dwar	0.22	1.29	0.2
dsancuni	-0.41	-1.47	0.15
dsancmul	-0.70	-2.33	0.02
ecm(-1)	-0.46	-4.38	0.00
R^2=0.83		Adjusted R^2=0.77	
Akaike Info. Criterion=23.47		Schwarz Bayesian Criterion=8.29	
DW-statistic=1.64		F-stat=20.25 (prob.=0.00)	

According to Table 8, our results do not suffer from serial correlation or heteroskedasticity. The specified model also passes the Jarque-Bera normality test, indicating that the errors are normally distributed[10].

Table 8. ARDL-VECM Model Diagnostic Tests for equation 4

LM Test Statistics		
Serial Correlation $\chi^2(1) = 2.53[0.11]$		Normality $\chi^2(2) = 0.14[0.93]$
Functional Form $\chi^2(1) = 0.24[0.62]$		Heteroscedasticity $\chi^2(1) = 3.26[0.07]$

4.5. The impacts of sanctions on the military burden

Are our results robust to using share of military spending in GDP instead of total aggregate level of military spending? Brauer (2002) argues that the empirical results depend on the specification of the military spending variable in level or as a share of GDP. Sandler and Hartley (1995) argue that using the variable in level better explains the nature of demand for military expenditure. In addition, utilizing the levels of military spending is suggested to be appropriate for testing the presence or absence of an arms race (Brauer, 2002). We, nevertheless, use the share of military spending in GDP of Iran and other Middle Eastern countries for robustness checks[11] in the following equation:

$$Lmxgdp = \alpha + \beta_1 Lpop + \beta_2 Lgdp + \beta_3 Lnmx + \beta_4 Ltr + \beta_5 Lrgmxgdp + \beta_6 poli + \beta_7 war + \beta_8 sanc + \varepsilon_i$$

(5)

Where:

Lmxgdp denotes the logarithm of the ratio of Iran's military expenditure to GDP.

Lrgmxgdp is the logarithm of the average of the Middle Eastern countries' military burdens (excluding Iran).

10- We have also applied the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of the recursive residuals (CUSUMSQ) tests to test for parameter constancy. The findings indicate that the estimated coefficients are stable. These results are available upon request.

[11] Using share of military spending in GDP is especially more common in cross-country estimations. It has a couple of advantages such as "comparability across countries, no need to deal with inflation and deflators or with exchange rate conversions into a common currency" (for a detailed discussions on this issue, see Brauer, 2002).

As an alternative specification, we also investigate the separate impacts of unilateral and multilateral sanctions on Iran's military burden through the following equation:

$$Lmxgdp = \alpha + \beta_1 Lpop + \beta_2 Lgdp + \beta_3 Lnmx + \beta_4 Ltr + \beta_5 Lrgmxgdp + \beta_6 poli + \beta_7 war + \beta_8 sancuni + \beta_9 sancmul + \varepsilon_i$$

(6)

The estimated long-run coefficients for both equations 5 and 6 are presented in Table 9. The maximum order of lags in the ARDL models is two years. The optimal number of lags for each of the variables in both models is shown as ARDL (2,1,0,1,1,0,0).[12] All of the long-run coefficients maintain their previous signs.

Since the dependent variable is the log of military burden, we expect that the impact of GDP on the military spending to GDP ratio will be negative. This is confirmed for both the models. According to Farzanegan (2017), this may also indicate that higher levels of development increase the economic perspective, employment, and investment among others. The political stability improves because of further economic development, reducing the willingness to increase the size of military forces.

Moreover, the long run impact of the population on the military burden in both specifications is positive and significant indicating that the larger population has caused the higher military burden in Iran. The Polity index does not show a significant impact on the military burden. In addition, Iran's defense burden does not depend on the Middle Eastern countries' military burden. Our expectations regarding the impacts of sanctions are supported by the estimation results. Firstly, the long run estimation from equation 5 shows that economic sanctions have negative impacts on Iran's military burden. Secondly, the more comprehensive the sanctions are the higher the contracting pressure they put on Iran's military burden. Thirdly, according to our estimations from equation 6, the unilateral sanctions have not influenced Iran's military burden significantly while the impact of multilateral sanctions are negative and statistically significant. The positive

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12 - The regression for the underlying ARDL equations fits very well and also passes the diagnostic tests against serial correlation, functional form misspecification, and non-normal errors. It failed the heteroscedasticity test at 5% in both models. However according to Shrestha and Chowdhury (2005), "since the time series constituting the ARDL equation are potentially of mixed order of integration, i.e., I(0) and I(1), it is sometimes natural to detect heteroscedasticity". In addition, when analyzing the stability of the long-run coefficients together with the short-run dynamics, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMQ), point to the in-sample stability of the both models. These results are available upon request.

coefficient of trade may also imply that increases in Iran's trade for example, due to the lifting of sanctions, increases Iran's military burden. This is in line with Dizaji's (2018 a) simulation findings. Although the external war dummy has a positive impact on Iran's military burden, it is not statistically significant.

Table 9. Results of estimated long-run relationship.
Derived from the optimal ARDL model for military burden

	Regressor	Equation 5 coefficient (prob.)	Equation 6 coefficient (prob.)
Dependent variable	**Lmxgdp**		
	Lpop	1.93 (0.00)	2.52 (0.03)
	Lgdp	-1.21 (0.02)	-1.55 (0.03)
	Lnmx	-0.50 (0.00)	-0.47 (0.00)
	Ltr	1.26 (0.00)	1.37 (0.00)
	Lrgmxgdp	-0.21 (0.32)	-0.16 (0.54)
	poli	-0.02 (0.13)	-0.02 (0.19)
	Intercept	-1.49 (0.77)	2.03 (0.79)
	War	0.17 (0.53)	0.53 (0.23)
	Sanc	-0.27 (0.01)	-
	Sancuni	-	-0.78 (0.19)
	Sancmul	-	-1.2 (0.07)

The results of the ECMs related to the equations 5 and 6 are presented in Table 10. The sign of the coefficients for each variable in the short run are almost similar to those in the long-run. The only difference is that while the positive impact of trade on military burden is significant in the long-run it becomes insignificant in the short run for both specifications.

Similarly, the population variable (dLpop) included to capture the public good aspects of military expenditure has a positive and significant effect.

The change of income (dLgdp) has a negative and significant effect on the change of the share of military expenditure from the GDP. The changes in the average of Middle Eastern countries' military burden do not influence the changes in Iran's military burden significantly in the short run, indicating that Iran has not adopted a follower response to increases in the military burden of the Middle East region.

Table 10. Error Correction Representation for the selected ARDL-Model for military burden

ARDL (2,1,0,1,1,0,0) based on Schwarz Bayesian Criterion		
Regressor	**Equation 5**	**Equation 6**
Dependent Variable: dLmxgp	**coefficient (prob)**	**coefficient (prob)**
dLmxgdp1	0.34 (0.00)	0.34 (0.00)
dLpop	35.85 (0.00)	28.82 (0.01)
dLgdp	-0.58 (0.02)	-0.69 (0.03)
dLnmx	-0.45 (0.00)	-0.45 (0.00)
dLtr	0.00 (0.99)	0.05 (0.73)
dLrgmxgdp	-0.1 (0.34)	-0.07 (0.54)
dpoli	-0.01 (0.14)	-0.00 (0.19)
d(intercept)	-0.72 (0.77)	0.9 (0.79)
dWar	0.08 (0.51)	0.23 (0.19)
dSanc	-0.13 (0.01)	-
dSancuni	-	-0.35 (0.19)
dSancmul	-	-0.53 (0.06)
ecm (-1)	**-0.48 (0.00)**	**-0. 44 (0.00)**
R^2	0.85	0.84
F-stat	22.84 (0.00)	20.32 (0.00)
DW-statistic	2.05	2.03
Schwarz Bayesian Criterion	14.18	12.25

The sanctions dummy shows a negative and significant impact on Iran's military burden in the short run as well. Moreover, in accordance with previous findings, the results show that multilateral sanctions have a negative and significant effect on Iran's military burden, but unilateral sanctions do not influence Iran's military burden significantly. The error correction coefficients estimated for both equations are highly statistically significant and have the correct sign. This reflects the joint significance of the long-run coefficients and suggests a relatively high speed of convergence to the equilibrium, once shocked. The F-statistic is significant and the Durbin–Watson statistic does not indicate any sign of serial correlation.

4.6 ARDL estimations by using oil rents

In order to check the further robustness of our results, we use the oil rents instead of national income in our model as the source of financing Iran's military expenditures. Since the first oil shock in 1973, government expenditures and economic performance in Iran have been significantly influenced by oil exports and direct government expenditures derived from oil revenues (Dizaji, 2016; Dizaji and Bergeijk, 2013; Farzanegan; 2011). Oil rents may encourage

the conflict in oil-rich countries and increase the military expenditure through several channels. Firstly, oil rents provide a direct source of revenues for the governments especially in the developing oil-rich countries, which have limited tax bases and tax collection abilities. This can affect public spending and facilitate the purchases of advanced military equipment. Secondly, the necessity of protecting oilfields from actual or potential internal and external threats motivates the governments of these countries to increase the military spending. Thirdly, a state that is highly dependent on resource rents may lead to a regime whose survival depends on the loyalty of military forces (Perlo-Freeman and Brauner, 2012).

We have estimated the following equations:

$$Lmx = \alpha + \beta_1 Lpop + \beta_2 Loil + \beta_3 Lnmx + \beta_4 Ltr + \beta_5 Lrgmx + \beta_6 poli + \beta_7 war + \beta_8 sanc + \varepsilon_i$$

(7)

$$Lmx = \alpha + \beta_1 Lpop + \beta_2 Loil + \beta_3 Lnmx + \beta_4 Ltr + \beta_5 Lrgmx + \beta_6 poli + \beta_7 war + \beta_8 sancuni + \beta_9 sancmul + \varepsilon_i$$

(8)

Loil is the logarithm of Iran's oil rents (constant 2010 US$). We take the oil rents (% of GDP) from the World Development Indicators (WDI) and then multiply it by Iran's real GDP to calculate real oil rents. Oil rents are the difference between the value of crude oil production at regional prices and total costs of production. This data is available from the period of 1970-2016.

Our estimations confirm our previous findings for both the short and long run time horizons. The results show that unlike GDP, the oil rents have a positive and significant impact on Iran's military spending. The coefficients of the sanction dummies, like before, indicate that the intensity of sanctions is important in alleviating Iran's military expenditure. Moreover, while the multilateral sanctions have significant negative impacts on military spending, the impact of US unilateral sanctions is not significant.[13]

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[13] - These results are available upon request.

5. Conclusion

We study the short and long run effects of the intensity of sanctions as well as the impact of unilateral and multilateral sanctions on the military spending of Iran. For which we employ annual data from 1960 to 2017 utilizing the auto-regressive distributed lag (ARDL) method. Using the historical data, we show that the intensity of sanctions is important in alleviating Iran's military spending. More importantly, we find that only multilateral sanctions can hinder the military ambitions of Iran significantly. These results are obtained after controlling for other determinants of military spending such as GDP, oil rents, population, trade, non-military spending, average of military spending of other countries in the Middle East, quality of democratic institutions and the Iran-Iraq war.

Our findings have important implications for the current policies of the US administration, under the presidency of Mr. Trump. By pulling out from the Joint Comprehensive Plan of Action (JCPOA) in May 2018, the US government has started to impose a variety of economic sanctions on Iran. The announced purpose is to control the military complex in Iran and addressing the regional presence of Iran among others. Our analysis, which is based on historical data, shows that the chances of success for the US sanction policy in both the short and long run is statistically insignificant.

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