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The impact of external arms restrictions on democracy and conflict in developing countries

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Abstract

This paper examines how negative shocks to arms imports due to external arms embargoes affect the military expenditure, quality of democracy and internal and external conflicts in a sample of 48 mainly developing countries for the period of 1990–2017. An important innovation is that we include both political and conflict factors in a Panel Vector Autoregressive (PVAR) model of arms sanctions. The results show that the responses of political system and different indices of democracy including electoral, liberal, participatory, deliberative, and egalitarian democracy to decreases in arms imports (as a percentage of GDP) are positive and statistically significant, and that of military expenditures (as a percentage of GDP) is negative and significant. Furthermore, our findings show that while arms restrictions do not significantly impact on religious tensions and external conflicts, they may intensify ethnic tensions and internal conflicts in developing countries. Overall the results indicate that arms embargo weakens the military sector by creating the negative impact on military expenditure and the size of armed forces and destabilizes the government. Although this improves democratic characteristics in developing countries, it may lead to higher ethnic tensions and internal conflict. In contrast to military expenditures, the responses of education expenditures, health expenditures and GDP per capita to negative shocks in arms imports are positive. The overall results are robust to different definitions of arms shocks, and different indicators of political institutions (V-DEM democracy indices and polity2), as well as differing orderings of variables in the panel VAR system.

Keywords

Arms imports, military sector, democracy, conflict, Panel-Vector Autoregressive model.

The impact of external arms restrictions on democracy and conflict in developing countries [1]

1 Introduction

The Dutch economist, Jan Tinbergen, the first (joint) winner of the Nobel prize in economics stressed the inseparability of economic welfare and security; see Tinbergen and Fischer (1987). Thus, welfare and security go hand in hand. Excessive security, however, can become a tool in the hands of authoritarian regimes whose insecure legitimacy can lead them to exercise coercive and repressive measures on their citizenry. This can be a cause for concern for the global community who may exercise sanctions on oppressive regimes with a view to changing their behaviour. The literature on sanctions is not new; see Galtung (1967) on it, and Hufbauer et. Al (2007) on economic sanctions. This paper will be concerned with the effects of a particular type of external sanction, controls on arms imports, on democratic development on a cross section of developing countries. In doing this we will employ an untried econometric technique, panel vector autoregressive techniques (PVAR). This method is more dynamic than static panel data analysis and has advantages over other commonly used dynamic panel data techniques such as the generalised method of moments (GMM). Secondly, we utilise a new and novel data set on democracy emanating from the varieties of democracy (V-DEM) data base, which analyses many of the complex processes behind democratic development, including the distinction between the liberal and electoral aspects of democracy.

The literature on the efficacy of sanctions suggests that they are broadly a failure from the standpoint of the sender country or multilateral agency. Specifically, it is argued and demonstrated in the empirical literature that sanctions worsen repression in authoritarian regimes; Allen and Letzkian (2013), Peksen (2009). It is also suggested that sanctions worsen the democratic credentials of targeted countries, Peksen and Drury (2010). This is because sanctions result in authoritarian regimes withdrawing on themselves, becoming more nationalistic and more willing to impose hardships on segments of their population. On the other hand, it is argued, Blad (2019) for example, that the effect of sanctions on state repression is mediated by the

[1] This working paper has been written as part of the research project "Economic Sanctions and conflict Resolution" and is building on the Dizaji's research as published in ISS wp644. Sajjad Faraji Dizaji is thankful to Gerda Henkel Foundation for its financial support (Award Number AZ 05/KF/18) during preparing this research paper at Tarbiat Modares University, Tehran and the International Institute of Social Studies, the Hague. We are also grateful to Peter van Bergeijk for comments on earlier draft.
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degree of democracy already present in the targeted nation. Thus, sanctions will not cause such a repressive response in more democratic states. Other studies pointed to the positive impact of sanctions on the political situation in target countries (Dizaji 2019 a, Dizaji 2019 b). Dizaji and Bergeijk (2013) use vector autoregressive (VAR) models to investigate the impact of oil sanctions both on economic and political indices of Iran. Their empirical analysis reveals that oil sanctions impose economic costs that motivate the target country to change its political behavior positively in first 2-3 years. However, they argue that the positive political outcome of sanctions can be significant in initial phase and may turn negative in the end. Dizaji (2019 b) simulates the military and political impact of oil sanctions on a group of oil-dependent countries in the Middle East. He finds that negative oil shocks caused by sanctions may increase the military burden and induce repressive policies in the short run. However increasing financial pressures on the target country's budget may finally compel it to reduce military burden and become politically more flexible. Gershenson (2002) indicates that sanctions that create considerable damage on the target regimes may impel them to end conflict. However, sanctions with a minor impact on the target economy may be counterproductive, provoking more aggressive behavior by the target regime. Strandow (2006) discusses that arms embargoes can probably reduce the likelihood of conflict, while the threatened and imposed non-military sanctions maybe ineffective in resolving the conflict. Allen (2008) and Grauvogel et al (2014) point to the the destabilizing impact of sanctions on political situation of the target countries through triggering antigovernment protests. Dizaji and Farzanegan (2019) demonstrate that the final impact of sanctions on the military expenditures of the target depends on the relative size of the security effect and income effect caused by the sanctions. If the security impact on the target is strong, but decreases in financial resources are not substantial, then sanctions will probably increase military expenditure and vice-versa.

For developing countries, there is also a related question of the effect of military expenditure on their development. Military expenditure may provide security, but does it promote or hamper economic growth. Deger and Sen (1990) argue that military expenditure could crowd out more productive education and health expenditure, which not only enhance welfare but also promote growth. These may out-weigh any positive externalities of military expenditure on growth, such as backward linkages of the arms industry towards other sectors and technical spin-offs to civilian sectors. The survey of military expenditure and growth in developing countries by Dunne and Tian (2013) suggests that there is a consensus in the literature on the negative effects of military expenditure on growth in developing countries. In a study on Pakistan, Murshed and Saleh (2013) find that military expenditure can have a truly negative effect on human capital accumulation, which has adverse effects on the development of manufacturing capacity, but also via promoting external indebtedness, which creates the burden of debt servicing. In a cross-sectional analysis Yakovlev (2007) finds that the negative effects of military expenditure on growth diminish somewhat if the nation is an arms exporter. Smith and Tasiran (2005) look at the arms trade, finding that in cross-sectional analysis

the demand for arms imports declines at some point of inflexion as military expenditure increases.

Then there is the question of military expenditure and the development of state capacity. In the developing world state capacity is important to the overall development process, as private markets cannot be relied on to deliver important public goods such as health and education. Political sociologists, such as Charles Tilly (1992), have pointed out the role of war in state building, asserting that in the historical European context the need for ever more complex military establishments necessitated enhanced state capacity, including fiscal capacity, leading to the state's increased ability to provide a growing array of public goods, as well its role in economic management. Hostility towards external enemies may cement state capacity, and assist in nation building, as it can form the basis for fiscal and legal institutions. This may, however, not apply to internal conflict, which tends to undermine institutions, and the provision of public goods. The last quarter of the 20th century witnessed growth and development failure in many parts of the developing world (especially in Africa), along with a decline in state capacity in many developing countries, and several of these nations have also experienced civil war, which also further reduces state capacity. Other developing countries are characterized by factionalism, with governments, even democratically elected ones, serving particular group interests. These societies have little interest in providing common interest public goods to the citizenry as a whole, but instead concentrate on using the state's resources to reward their own faction via political patronage. In short, it is important to look at the impact of external sanctions in the form of arms imports on state capacity in the form of government expenditure, as well as the military, education and health expenditure components.

The rest of the paper is organized as follows: the next section describes our research design and data sources, followed by our results before presenting brief conclusions.

2 Research design

2.1 Data description

We apply a panel of annual data for 48 developing countries that covers the period from 1990 to 2017. The list of countries is mentioned in Appendix. To examine the dynamic interrelations among arms imports, political conditions, and the military spending, the following variables are used:

- Military variables: arms imports to GDP ratio (*armimp*), military expenditures to GDP ratio (*milex*) and the ratio of armed forces personnel to total labor force (*armforc*).
- Political variables: military in politics index (*militpolit*), government stability index (*govsrabil*), polity 2 index (*polity*), Varieties of democracy indices.
- Conflict variables: Internal conflict (*intconflict*), external conflict (*exconflict*), ethnic tensions (ethnic) and religious tensions (religious) indices.
- Other control variables for robustness analysis: GDP per capita (*gdpperc*), the ratio of general government total expenditures to GDP (*govex*), the ratio of government expenditure on education to GDP (*eduex*), the ratio of domestic general government health expenditure to GDP (*healthex*).

The data on military variables, GDP per capita, health and education expenditures are gathered from World Bank's World Development Indicators (WDI) online database (World Bank, 2019). The data on general government total expenditures are from International Monetary Fund's World Economic Outlook Database (October 2019). The Polity*2* index (*polity*) is commonly used to measure the political situation and ranges from − 10 (full autocracy) to 10 (full democracy). This indicator shows combinations of autocratic and democratic characteristics of the political system for different years (Marshall et al. 2017). For robustness analysis, we also use different indices of democracy provided by the Varieties of Democracy (V-Dem) project, version 9; these are electoral democracy (*elecdem*), liberal democracy (*liberdem*), deliberative democracy (*delibdem*), egalitarian democracy (*egalitdem*), and participatory democracy (*participdem*). All of these democracy indices are ranged between 0 and 1. Larger values present a better quality of democracy. The V-Dem democracy indices are extremely dynamic and capture the changes in politics and the quality of different components of democracy from year to year.

The required conflict data, military in politics and government stability data are collected from International Country Risk Guide (ICRG).

- *govsrabil* (Government stability index) is an evaluation both of the government's ability to stay in office, and its ability to carry out its stated program(s). It varies from 0 (very high risk) to 12 (very low risk).
- *intconflict* (Internal conflict; ranged from 0 to 12) is a measure of political violence and its actual or potential impact on governance in the country. The highest score stands for a situation that there are no armed or civil

opponents to the government and the government does not indulge in arbitrary violence, direct or indirect, against its own citizens.

- *exconflict* (external conflict measure) measures the risk to the incumbent government from foreign action, ranging from non-violent external pressure to violent external pressure. It ranges from 0 (very high risk) to 12 (very low risk).
- *militpolit* (military in politics index) ranges from 0 to 6, so that lower scores stand for a greater degree of military involvement in politics and a higher level of political risk.
- *religious* (religious tensions index) ranges from 0 (very high risk) to 6 (very low risk). Religious tensions may be due to the domination of society and/or governance by a single religious group that wants to substitute religious law for civil law and to prevent other religions from the political and/or social procedure; the desire of a single religious group to control governance; the suppression off religious freedom; the desire of a religious group to express its own identity independently and separate from other parts of the country.
- *ethnic* (ethnic tensions; ranging from 0 to 6) shows the tension within a country which is related to the nationality, racial, or language divisions. Higher scores represent the lower risks of ethnic tensions.

2.2 Methodology

Panel Vector Autoregressive (PVAR) models are applied to examine the possible interrelationships among the variables. PVAR modelling is an appropriate methodology for the purposes of our research. First, dynamic simultaneous relationships can be considered using VAR models. For example, these models display the long run variations of political system, military spending and conflict over time as affected by shocks to arms imports. Second, some interactions between the arms imports, military expenditures, political institutions and conflict variations are examined. Considering the lack of *a priori* theory related to the simultaneous relationships among arms imports, political system and conflict, the VAR approach is useful as it assumes that all variables are endogenous and does not impose any prior restrictions on structural relationships among the variables. PVAR model combines the panel-data model, with the standard VAR model (Love, Zicchino, 2006). The VAR method defines the dependent variables on the basis of the predetermined lagged variables; hence it is a reduced-form model (Filippaki, Mamatzakis 2009). This reduced form model is as following:

$$Z_{it} = \Gamma(L)Z_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

Where *i* marks the country, *t* denotes time=1,…T, Z_{it} comprises a vector of stationary variables, $\Gamma(L)$ denotes a matrix polynomial in the lag operator with $\Gamma(L) = \Gamma_1 L^1 + \Gamma_2 L^2 + \cdots + \Gamma_p L^P$, μ_i is the vector of country specific effects and ε_{it} indicates the disturbance term. Simultaneity does not cause any

problem in VAR system and OLS estimations are consistent, because only lagged values of the endogenous variables are appeared on the right-hand side of the equations. In the standard VAR models, the error terms are generally characterized by simultaneous correlations which it enables the response of the system to the variations in a particular variable be the response of all those variables that have contemporaneous correlation with it. However, this simultaneous correlation is settled by the Cholesky orthogonalization procedure. The dynamic changes of variables in reaction to shocks in a particular variable are explained by impulse response functions (IRFs). Therefore, the IRFs allow us to estimate the dynamic impacts of variations in a particular variable (for example arms imports) on the other political and conflict variables in VAR system. The IRFs enables us to consider the magnitude and statistical significance of the impulse responses to one standard deviation decrease (or increase) in arms imports (see Stock and Watson 2001).

3 Empirical results

To avoid spurious regression estimations, we need to test the stationarity of the variables before estimating our panel-VAR models. Thus, we test the existence of unit roots for the variables. Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), Maddala and Wu (1999) and Choi (2001) are commonly used to test the unit roots within the context of panel data. Levin, Lin and Chu (2002) suggest a common unit root under the null hypothesis against the alternative of stationarity of all individuals, whereas the other tests suppose individual unit roots under the null hypothesis. Table 1 reports the results of panel unit root tests. We have included a constant but not a time trend (see Dickey and Fuller, 1979). The results show that all of the variables are stationary in their level according to the different unit root tests.[2] An unrestricted VAR model should be applied when the variables are stationary in their levels.

Table 1
Panel Unit Root Tests

Variables	Levin, Lin & Chu	Im, Pesaran and Shin	ADF-Fisher	PP-Fisher
armimp	-15.16**	-15.49**	436.2**	489.84**
milex	-7.84**	-6.85**	210.65**	230.26**
militpolit	-4.27**	-4.80**	151.1**	164.46**
govstabil	-7.73**	-7.68**	224.94**	190.27**
polity	-1.51*	-1.47*	98.86**	106.96**
exconflict	-4.11**	-8.07**	248.32**	200.15**
intconflict	-4.48**	-6.32**	208.62**	152.78**
ethnic	-11.34**	-7.67**	154.44**	132.46**
religious	-7.14**	-10.78**	414.79**	97.98**
armforc	-0.92	-1.57*	131.76**	129.97**
elecdem	-2.69**	-3.11**	198.83**	238.83**
liberdem	-3.60**	-1.79**	161.36**	185.89**
delibdem	-3.87**	-3.88**	176.81**	158.88**
egalitdem	-2.41**	-2.59**	167.96**	204.07**
par-ticipdem	-1.31*	-0.38	119.26**	125.85**

Note: Automatic lag length selection (Schwarz Information Criteria) is applied. According to the Levin, Lin and Chu test the null hypothesis is a unit root which assumes a common unit root process. For the other three tests, the null hypothesis is a unit root which supposes an individual unit root process.
** indicate significance at the 5%. * indicate significance at the 10%.

[2] Armed forces personnel (as percentage of total labor force) and participatory index of democracy are stationary with respect to three tests out of four unit root tests.

The ordering of the variables in VAR systems is important as different settings may lead to different results within a VAR model. As a common strategy, we put the variables with more exogenous natures first and the variables with more endogenous characteristics later in our VAR models. A sanctioned country's arms imports depend on the availability of alternative external channels from where the target country can import its required armaments, rather than relying on domestic production. Hence, arms imports shocks, to a great extent, are of an exogenous nature for the sanctioned country. We expect that significant shocks in arms imports simultaneously influence the other variables in the model. Military expenditures, political and conflict indices follow the arms imports in our Cholesky ordering. The restrictions on arms imports affect both government expenditures on defence and political conditions and this may affect internal and external conflicts in target countries. In this study, we first estimate an unrestricted panel-VAR model consisting of six variables to test the impact of negative shocks to arms imports (as percentage of GDP) on military expenditures (as percentage of GDP), political institutions and conflict indices in developing countries. The vector of endogenous variables in our first PVAR model is as following:

$$Y_t = [armimp,\ milex,\ militpolit,\ polity2,\ exconflict,\ inconflict] \quad (2)$$

3.1 Impulse response functions

The impulse response functions (IRFs) display the impact of a one-time shock to arms imports on military expenditures, political institutions and conflict indices in VAR model. If the disturbance terms ε_t are contemporaneously uncorrelated, the explanation of the estimated impulse response functions is straightforward. The ith innovation ε_{it} is explained as a shock to the ith endogenous variable Z_{it}. The confidence bands around the impulse responses enable us to assess the statistical significance of them (Runkle, 1987). We estimate 68% confidence intervals for the IRFs (see Sims and Zha 1999). In the presented IRFs in Figure 1, the middle lines illustrate the response of the variables to a one standard deviation negative shock in arms imports (as percentage of GDP). The dotted lines represent confidence bands. The impulse responses are statistically significant wherever the horizontal line lies outside of the two confidence bands. In this case we can reject the null hypothesis of "no effects arms imports" on the particular variable (Berument et al. 2010). The horizontal line in IRFs shows the time line and the vertical line shows the magnitude of responses to shocks.

The selected number of lags for the variables may also influence the PVAR estimations. The statistical criteria such as LR (sequential modified Likelihood Ratio test statistic), FPE (final prediction error), AIC (Akaike information criterion), SIC (Schwarz information criterion), and HQ (Hannan–Quinn information criterion) are usually employed to choose the optimal lag length in VAR specifications. We choose the lag length of 2 according to the SIC and HQ criteria as these are often more parsimonious (Pesaran and Smith, 1998). Table 2 represents the results of lag length tests.

Table 2
Panel VAR Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-6267.88	-	0.00	11.98	12.01	11.99
1	-192.05	12070.41	6.30e-08	0.45	0.64	0.52
2	72.29	522.13	4.07e-08	0.01	0.38*	0.15*
3	125.05	103.59	3.94e-08	-0.02	0.52	0.18
4	170.69	89.10*	3.87e-08*	-0.04*	0.67	0.23

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Figure 1 provides the panel impulse responses of conflict indices, the political situation and military spending as a percentage of GDP to a one standard deviation negative shock in arms imports to GDP ratio for a period of 1990–2017 among the 48 developing countries.

The ratio of arms imports to GDP is the first variable in our PVAR model, followed by military expenditures as a percentage of GDP, military in politics, polity2 index, and internal and external conflict indices. We postulate that arms imports (as a % of GDP) is the most exogenous variable in the model of arms sanctioned countries and can be used as an index to imitate the impact of arms embargo on the political situation and conflict in developing countries. Decreases in arms imports (due to arms embargo) impact military expenditure, and this may affect the military's involvement in politics, and thereafter the political behavior of the government. Both fluctuations in military spending and the political situation may affect internal and external conflicts in sanctioned developing countries.

Figure 1 reveals that the decreases in the arms imports to GDP ratio have a negative and statistically significant impact on the military expenditure to GDP ratio during the entire period. Also, the arms imports variable responds negatively to its own negative shocks due to external sanctions. The responses of the military in politics index (for the entire period) and polity2 index (after 2 years of initial shock) to the negative shocks in arms imports as a percentage of GDP are positive and statistically significant. Imposing arms restrictions will decrease government spending on the military, and this lowers the military's involvement in politics and improves the political behaviour of government. The responses of the external conflict index to decreases in arms imports as a percentage of GDP are negative but not significant, while the internal conflict index shows negative and marginally significant responses within 3-6 years after initial shocks. This indicates that military embargoes are not effective in controlling external conflict in developing countries; they may even increase the risk of internal conflicts due to a weakening defence sector.

Figure 1

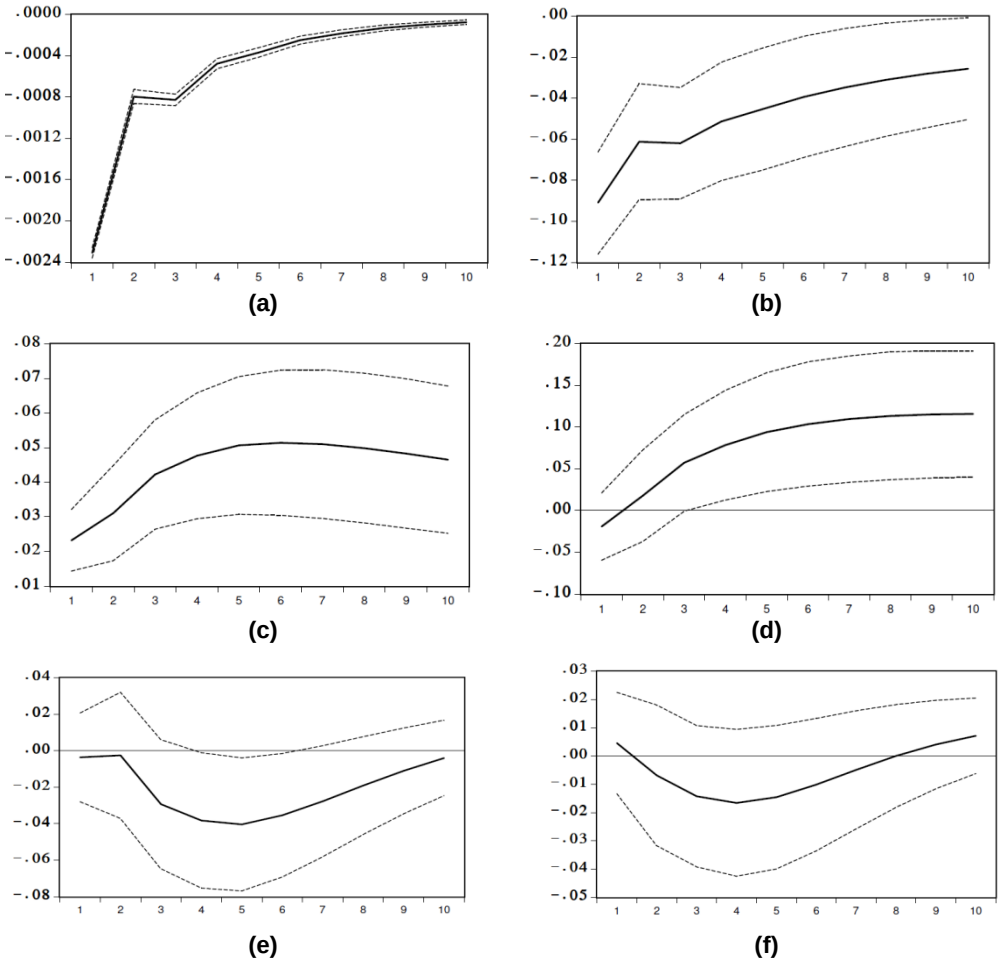


Figure 1 Impulse response functions related to a one standard deviation negative shock in arms imports as a percentage of GDP. **(a)** Response of arms imports as a percentage of GDP. **(b)** Response of military expenditures as a percentage of GDP. **(c)** Response of military in politics index. **(d)** Response of polity2 index **(e)** Response of internal conflict. **(f)** Response of external conflict. *Notes*: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

Figure 2
Inverse roots of AR characteristic polynomial

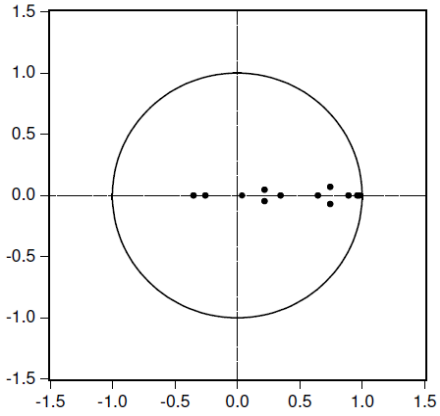
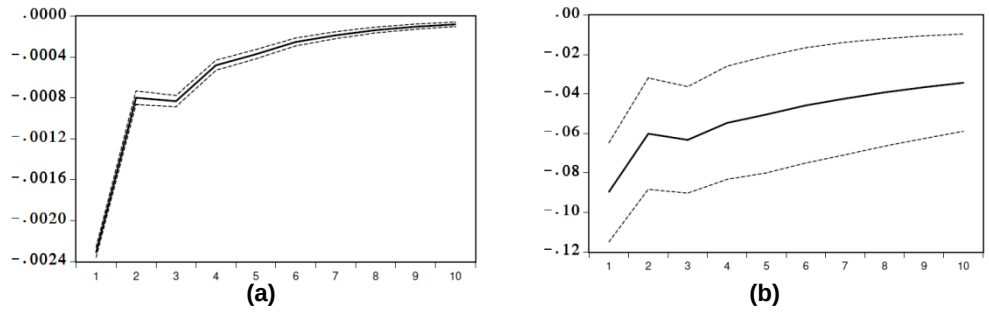


Figure 2 displays the AR graph, which represents the inverse roots of the characteristic AR polynomial (see Lütkepohl 1991). According to this figure, all roots in the PVAR model are located inside the unit circle and have modulus less than one and the PVAR model is stable.

3.2 Impacts on religious and ethnic tensions

In Figure 3 we examine the impact of arms embargo on the political situation, as well as ethnic and religious tensions in developing countries. We employed 2 lags as the optimum number of lags in our analysis. The VAR stability condition test (roots of characteristic polynomial) indicates that the VAR satisfies the stability condition.[3] The negative shocks to arms imports as a percentage of GDP have negative and statistically significant effects on defence expenditure as a percentage of GDP (for the entire period), and positive and improving impacts on the indices of military in politics (for the entire period) and polity2 (after two years of initial shocks). The response of ethnic tensions to the negative shocks in arms imports as a percentage of GDP is negative and statistically significant, but the response of religious tensions is not significant. These results confirm our previous findings regarding the decreasing impact of arms embargoes on military spending as a percentage of GDP and its improving impact on political institutions. Decreases in arms imports can worsen ethnic tensions by limiting the government's military capabilities.

Figure 3



[3] This is available upon request.

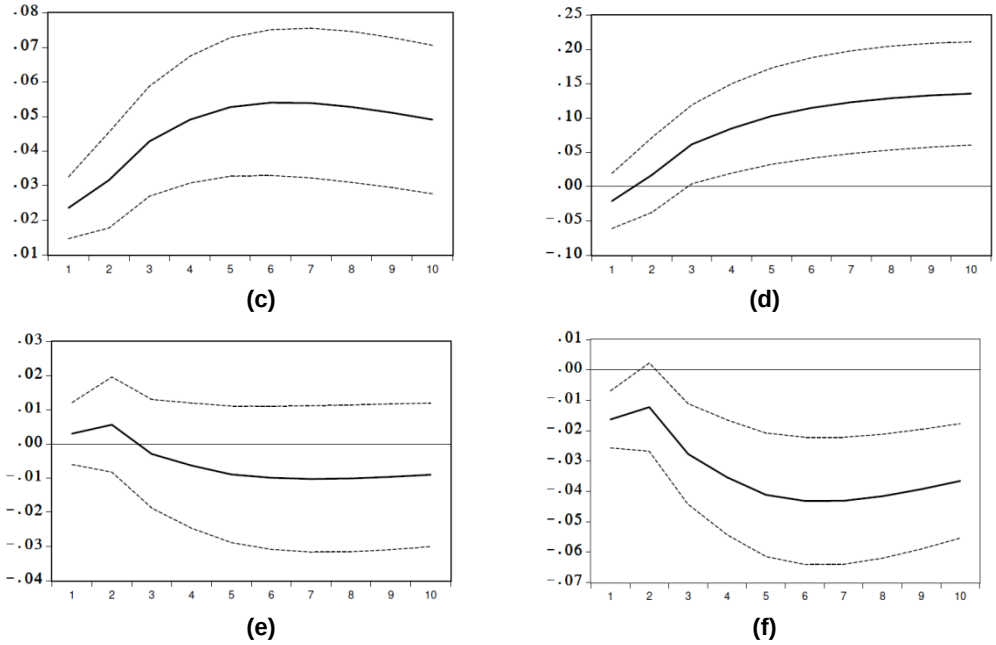


Figure 3 Impulse response functions related to a one standard deviation negative shock in arms imports as a percentage of GDP. **(a)** Response of arms imports as a percentage of GDP. **(b)** Response of military expenditures as a percentage of GDP. **(c)** Response of military in politics index. **(d)** Response of polity2 index **(e)** Response of religious tensions. **(f)** Response of ethnic tensions. *Notes*: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

3.3 Alternative definitions for democracy index and government stability

For robustness check, we use an alternative new measure of democracy known as electoral democracy. This measure is based on data from a large number of indices collected through the Varieties of Democracy (V-Dem) project (see Pemstein et al. 2017). The electoral component of democracy represents the core value of making rulers responsive to people through competition for the approval of a broad electorate during periodic elections. In the V-Dem structure, electoral democracy is the base of any other components of representative democracy- liberal, participatory, deliberative, egalitarian, or some other. It ranges from 0 to 1. The higher scores show the better quality of electoral democracy (Coppedge et al. 2015, p.3). We also replace the military in politics index with the government stability indicator to examine whether the arms embargo can destabilize sanctioned governments or not. Furthermore, we use ethnic tensions and internal conflict in our panel VAR model presented in Figure 4 to show the impacts on conflicts.[4]

[4] Internal conflicts and ethnic tensions showed significant responses according to our Panel VAR analysis in figures 1 and 3.

Figure 4

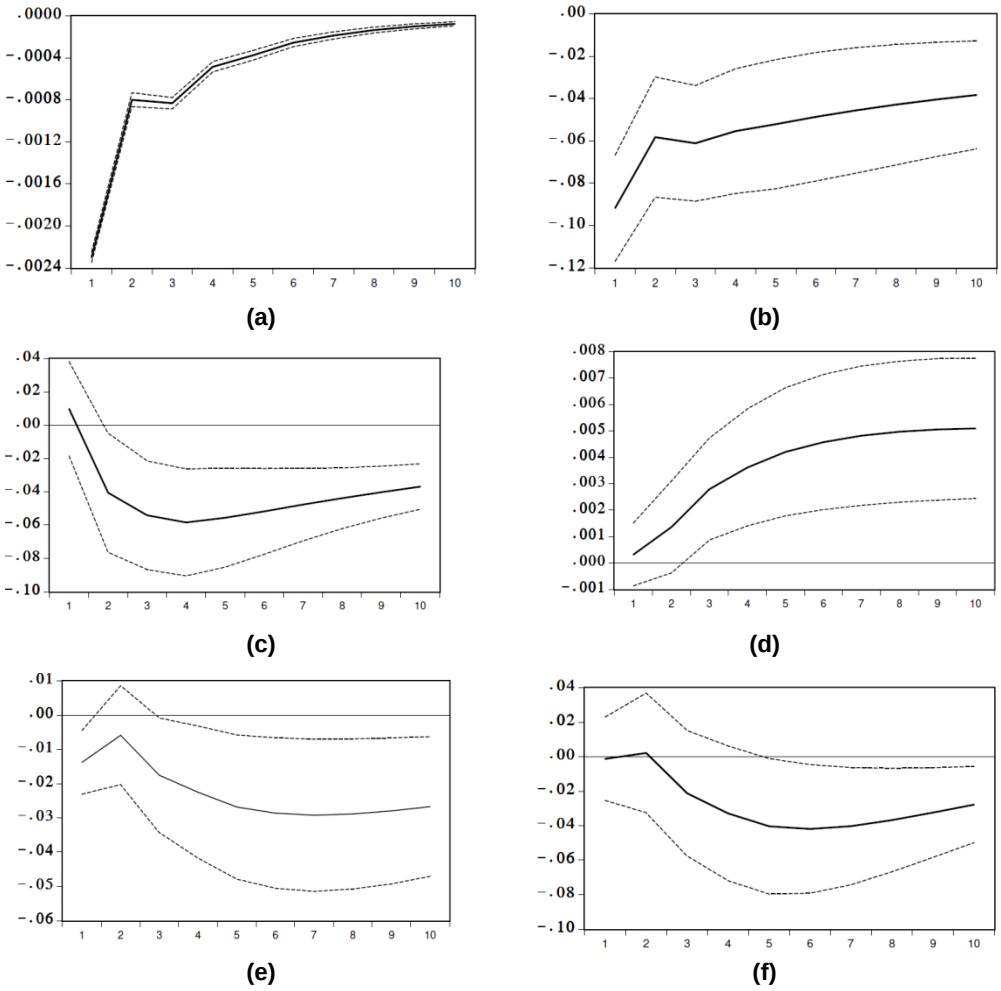


Figure 4 Impulse response functions related to a one standard deviation negative shock in arms imports as a percentage of GDP. a Response of arms imports as a percentage of GDP. b Response of military expenditures as a percentage of GDP. c Response of government stability index. d Response of electoral democracy index e Response of ethnic tensions. f Response of internal conflict.
Notes: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

We apply 2 lags for the variables according to LR, FPE, and HQ criteria. The VAR stability condition test verifies the stability of our PVAR model. Therefore, the standard errors of the impulse responses are valid. Figure 4 indicates that a one standard deviation negative shock in arms imports (as percentage of GDP) will have negative and statistically significant impact on military expenditures (as percentage of GDP) and government stability index, but a positive and significant (after one year of initial shock) on the electoral democracy index. The responses of ethnic tensions and internal conflicts are negative and statistically significant after 2 and 4 years of initial negative shock to arms imports respectively. These indicate that arms embargoes may destabilize the government by weakening the military sector. This improves the quality of democracy but may lead to heightened ethnic tensions and internal conflict by undermining the military and destabilizing the central government.

3.4 Alternative definitions for negative arms imports shocks and military effect

In figure 5 we estimate a Panel VAR model using the "decreasing arms imports" and replace the military expenditures as a percentage of GDP with armed forces personnel (as % of total labor force). This will further help us to understand how the arms embargo motivates demilitarization by affecting the armed forces personnel. Another point is that positive and negative external shocks may have asymmetric effects on military, conflict and political system (Dizaji et al 2016 and Dizaji 2019a) by creating a ratchet effect. Imposing arms embargoes will cause negative shocks on target countries arms imports. Therefore, it can be informative to consider asymmetric shocks on arms imports to test whether negative changes in this variable affect the political situation and conflict indices. For this purpose, we define the decreasing trend in arms imports as a shock variable. According to Mork (1994), which offers an asymmetric definition of oil price shocks to highlight the differences between positive and negative oil shocks, we define the negative changes in the arms imports as follows:

$$armimp_t^- = \min(0, (armimp_t - armimp_{t-1})) \quad (3)$$

SIC and HQ criteria suggest 2 lags for the variables. The Panel VAR stability condition test shows that the specified PVAR model is stable. Figure 5 shows that a one standard deviation shock in the "negative changes" of arms imports leads to negative and statistically significant response of armed forces personnel and significant improvements in military in politics and polity2 measures. The responses of ethnic tensions (after second year of initial shock) and internal conflict (until the 8th year) are negative and statistically significant. These results reveal that negative changes in arms imports due to the arms sanctions demilitarize the target country by reducing the number of armed forces personnel. This will decrease the military's involvement in politics and improve the quality of electoral democracy. However, weaknesses in the military structure due to the sanctions may worsen ethnic tensions and internal conflicts in the sanctioned countries.[5]

[5] We have also used the negative shocks to the ratio of arms imports to GDP like before (instead of defining the asymmetric shocks to negative changes in the ratio of arms imports to GDP). The overall results by and large agree. These results are available upon request.

Figure 5

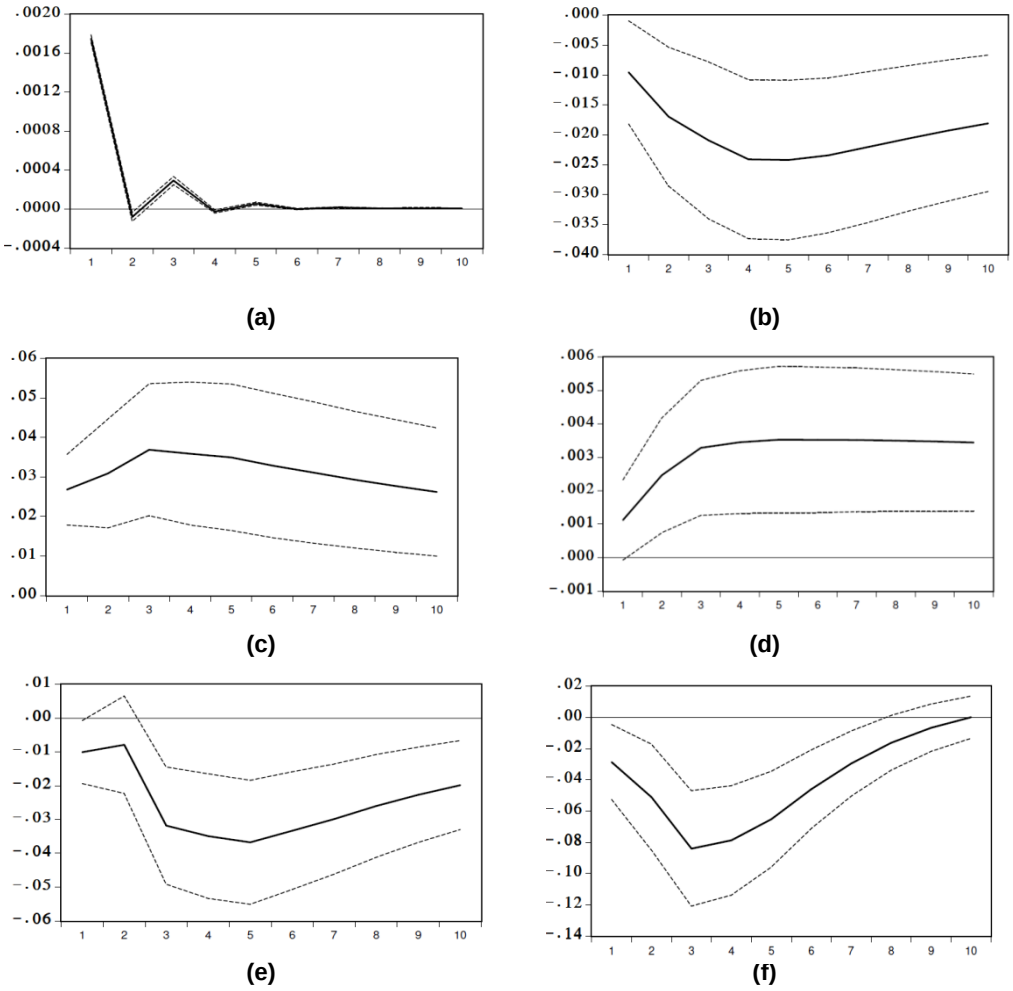


Figure 5 Impulse response functions related to a one standard deviation shock to negative changes in arms imports as a percentage of GDP. **(a)** Response of arms imports as a percentage of GDP. **(b)** Response of armed forces personnel (% of total labor force). **(c)** Response of military in politics index. **(d)** Response of electoral democracy. **(e)** Response of ethnic tensions. **(f)** Response of internal conflict. *Notes*: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

3.5 Panel generalized impulse responses including different V-DEM democracy indices

The electoral part is important element of the V-Dem conceptual scheme; democratic regimes have necessarily the electoral democracy. However, holding elections alone is not sufficient, and also countries may feign "democratic features" without having real electoral democracy (Coppedge et al 2015). We therefore consider other components of democracy that offer different ways for defining democracy, i.e. liberal, participatory, deliberative, and egalitarian democracy beside electoral democracy.

- "The *liberal* part of democracy refers to the intrinsic value of preserving individual and minority rights against a potential "tyranny of the majority."

This is obtained through constitutionally preserved strong rule of law, civil liberties, and effective checks and balances that restrict the use of executive power.

- The *participatory* component includes the values of direct rule and active participation by citizens in all political procedures; it highlights non-electoral shapes of political participation such as through civil society organizations and mechanisms of direct democracy.
- The *deliberative* component includes the core value that political decisions in pursuit of the public good should be informed by respectful and reasonable dialogue at all levels rather than by solidary attachments, emotional appeals, parochial interests, or compulsion.
- The *egalitarian* component includes that material and immaterial inequalities prevent the actual exercise of formal rights and liberties; then a more equal distribution of resources, education and health facilities among different groups should improve political equality" (Coppedge et al 2015, p.5).

Ordering of these democracy indices in the PVAR model is important, and a different setting may lead to different panel impulse responses (Dizaji 2019b). Generally, theory should guide us to opt for the most suitable ordering so that some variables follow the other variables rather than leading them. The panel generalized impulse response function (PGIRF) approach, which is based on Koop et al. (1996) and Pesaran and Shin (1998), suggests a useful solution when the theory is unable to link the variables clearly. The PGIRFs offer an orthogonal set of innovations that is not relying on the ordering of the variables in the Panel VAR system. Accordingly, we test the panel generalized impulse responses of the introduced democracy indices (i.e., electoral, participatory, liberal, deliberative, and egalitarian democracies), and arms imports as a as a percentage of GDP to a one standard deviation shock to asymmetric negative changes in arms imports as a as a percentage of GDP.

According to Figure 6 the responses of electoral democracy, egalitarian democracy, liberal democracy, deliberative democracy, and finally participatory democracy indices to the negative changes in arms imports as a percentage of GDP are positive and statistically significant during the entire period.[6] The overall results indicate that the restrictions on arms imports will encourage all electoral, liberal, participatory, deliberative, and egalitarian democracy indices in the developing countries.

[6] We have also alternatively investigated the generalized impulse response functions of different components of democracy to negative shocks in ratio of arms imports in GDP (rather than the shocks to the asymmetric negative changes in arms imports to GDP ratio). The overall results confirm previous findings implying that arms embargo has positive impact on different components of democracy in developing countries. These results are available upon request.

Figure 6

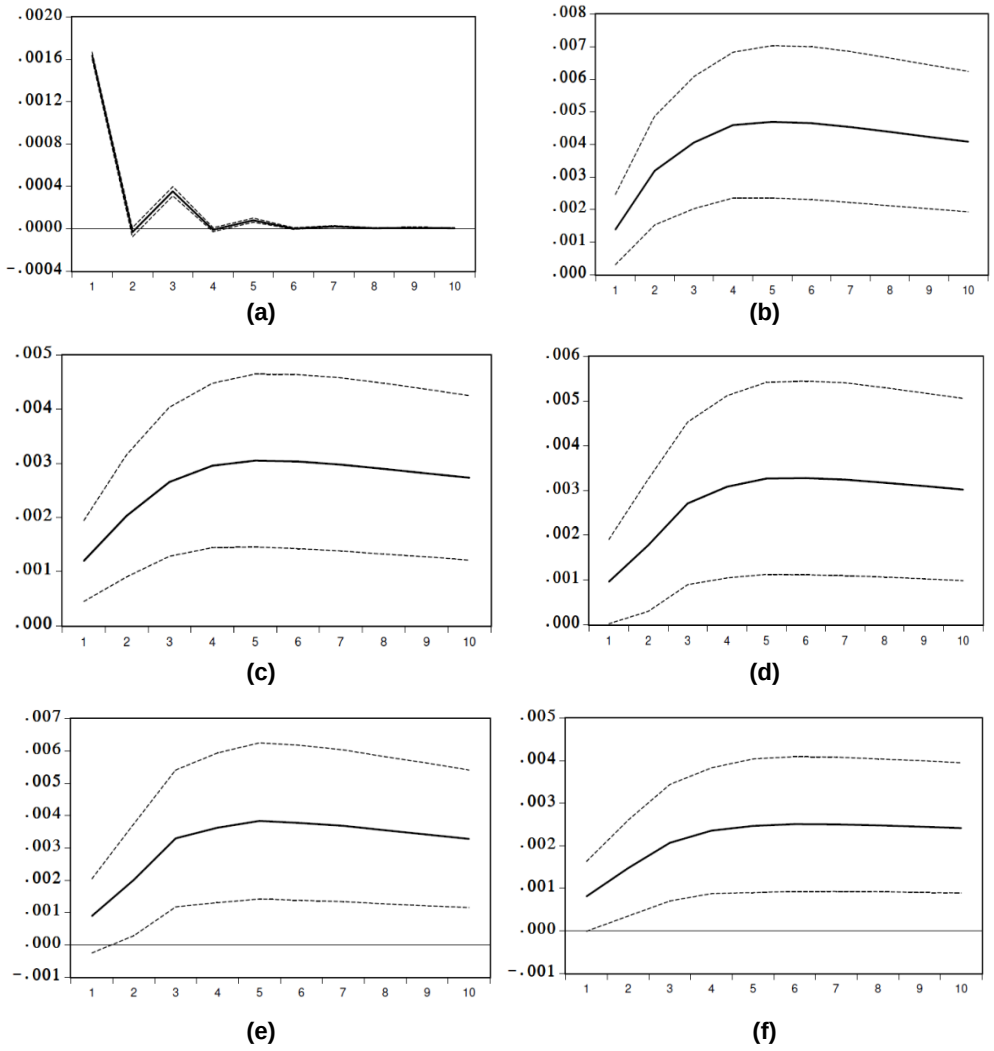


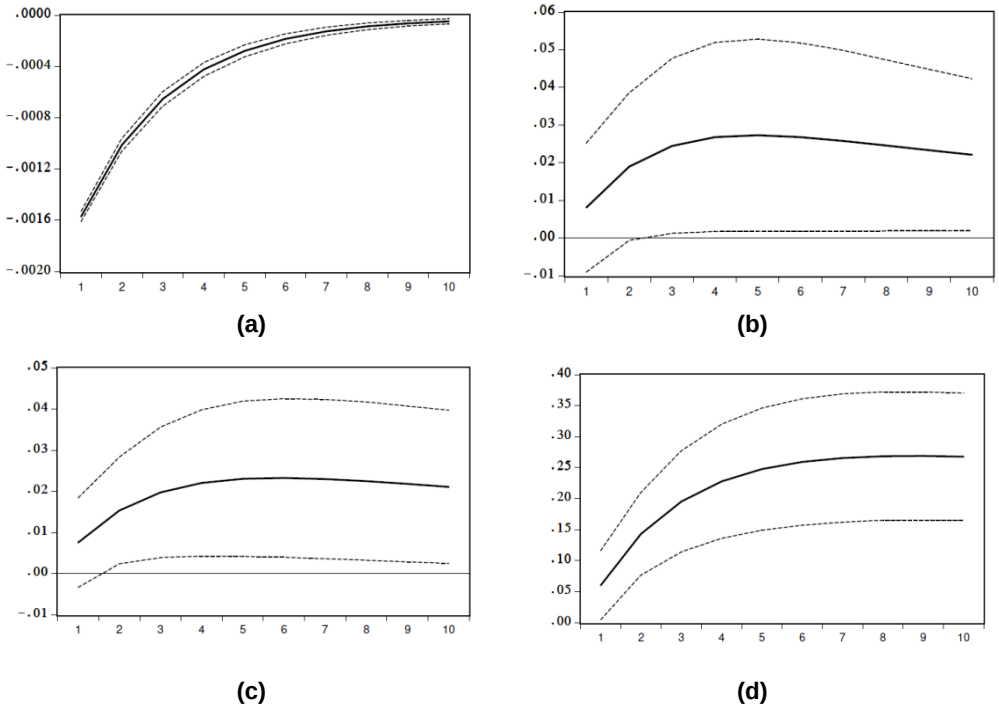
Figure 6 Impulse response functions related to a one standard deviation shock to negative changes in arms imports as a percentage of GDP. **(a)** Response of arms imports as a percentage of GDP. **(b)** Response of electoral democracy. **(c)** Response of egalitarian democracy. **(d)** Response of liberal democracy. **(e)** Response of deliberative democracy. **(f)** Response of participatory democracy. *Notes*: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

3.6 The impact on government non-military expenditures and growth

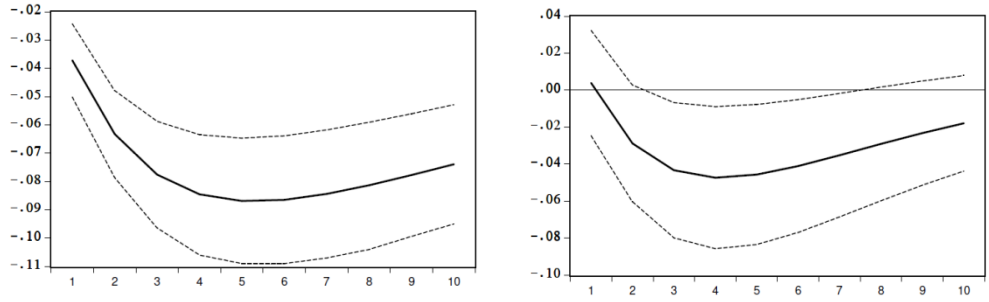
The arms embargo may influence non-military expenditures (such as education expenditures and health expenditures), besides their impact on military expenditures. In figure 7 we have replaced military burden with education expenditures (as percentage of GDP). We examine the impact of one standard deviation negative shocks in arms imports on education expenditures (as percentage of GDP), as well as political and conflict indices for 32 developing

countries over the period of 1990-2017.[7] The results show that arms embargoes increases education expenditures (as percentage of GDP) and improves political indices while it intensifies ethnic tensions and internal conflict in developing countries. We have also applied health expenditures (as percentage of GDP) as well as general government total expenditures (as percentage of GDP) alternatively and in different PVAR models. The results show that arms embargoes have positive and statistically significant impact on health expenditures[8] (as a percentage of GDP) while its impact on general government total expenditures (as percentage of GDP) is negative and statistically significant.[9]

Figure 7



[7] Due to the lack of consistent data on education expenditures, we have decreased the number countries to 32 developing countries for the mentioned period.
[8] Our time period decreases to 2000-2017 when we use health expenditures (as percentage of GDP) in PVAR model.
[9] These results are available upon request.

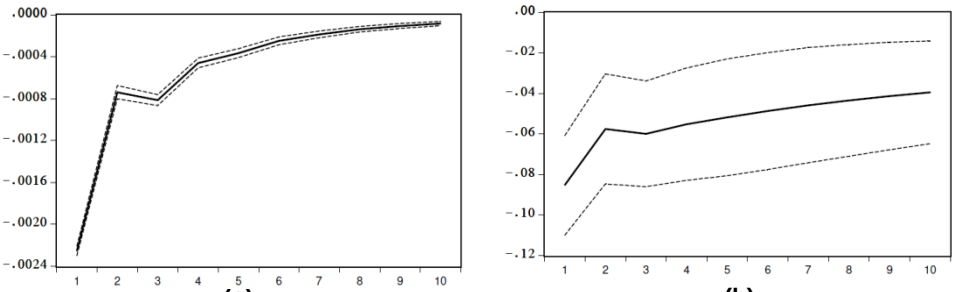


(e) **(f)**

Figure 7 Impulse response functions related to a one standard deviation negative shock in arms imports as a percentage of GDP. **(a)** Response of arms imports as a percentage of GDP. **(b)** Response of government education expenditures as a percentage of GDP. **(c)** Response of military in politics index. **(d)** Response of polity2 index **(e)** Response of ethnic tensions. **(f)** Response of internal conflict. *Notes*: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

Figure 8 illustrates the responses of the military burden, political development, economic development (captured by GDP per capita), as well as conflict variables to arms embargoes. According to this figure, the response of GDP per capita to negative shocks in arms imports is positive and statistically significant.[10] The responses of others variables confirm our previous findings. Therefore, arms embargo decreases military burden and may improve political and economic development in sanctioned countries. However, decreases in the military capabilities of the government may worsen ethnic tensions and internal conflicts.

Figure 8



(a) **(b)**

[10] We have also included GDP per capita in other PVAR models using education expenditures or health expenditures or government expenditures instead of military expenditures. We found the positive response of GDP per capita to negative shocks in arms imports in all of these specifications. These results are available upon request.

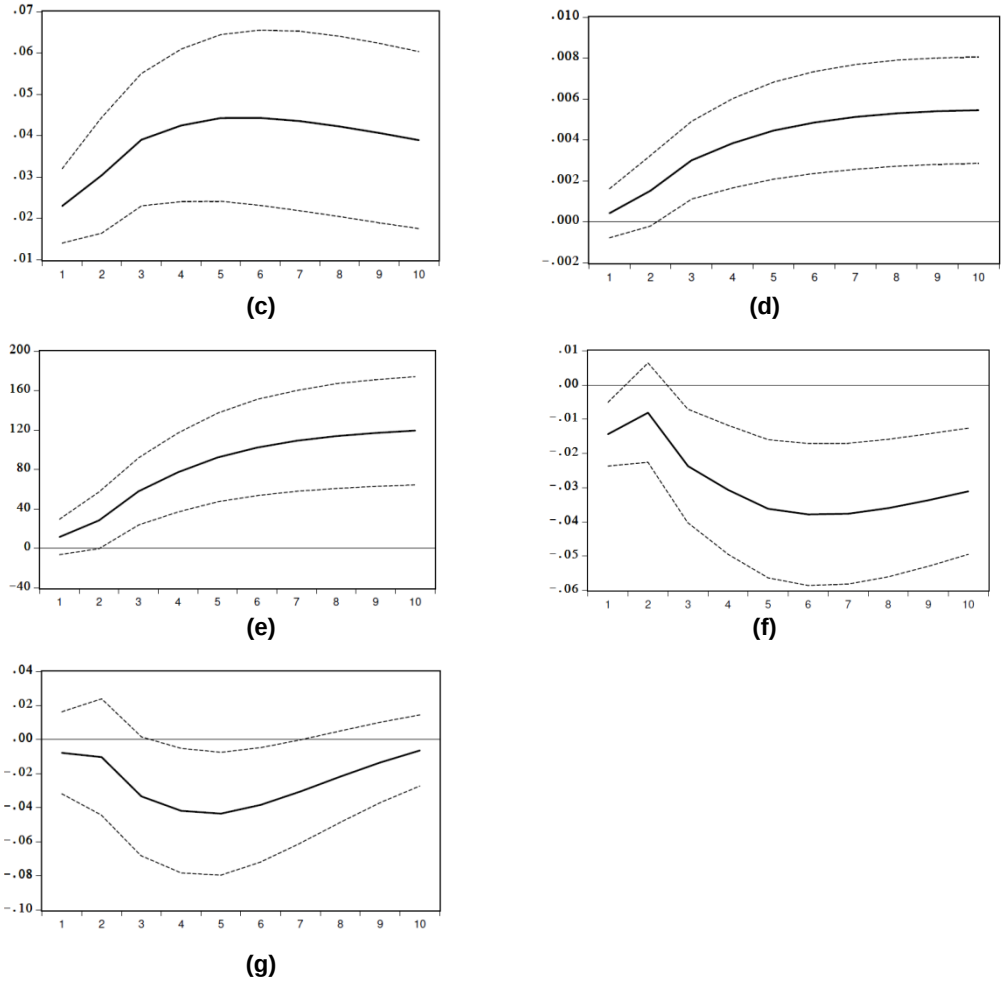


Figure 8 Impulse response functions related to a one standard deviation negative shock in arms imports as a percentage of GDP. **(a)** Response of arms imports as a percentage of GDP. **(b)** Response of military expenditures as a percentage of GDP. **(c)** Response of military in politics index. **(d)** Response of electoral democracy index **(e)** Response of GDP per capita. **(f)** Response of ethnic tensions. **(g)** Response of internal conflict.
Notes: The dotted lines depict ±1 standard deviation. The horizontal axis displays the time periods (years) after the initial shock.

4 Conclusions

This study simulates the impact of arms embargo on military expenditures, democracy indices and conflict variables in developing countries for the period of 1990-2017. The results of impulse responses functions based on the estimated PVAR models reveal that negative shocks in arms imports make negative impact on military expenditures and armed forces personnel, decrease military involvement in politics and improve democracy indices. However, arms embargoes may intensify ethnic tensions and internal conflicts in developing countries through reducing central government military power and destabilizing the government. This may be because sanctions increase the degree of factionalism in society and exacerbate existing inequalities. Another reason could be that many countries are at an early stage of their democratic transition. Hegre et. Al (2001) indicate that conflict risk is lowest in both established autocracies and democracies. As many developing countries have only experienced democracy recently, improvements in democratic credentials can, at least initially, trigger pent up tensions and ethnic conflict.

The responses of political system and different indices of democracy including electoral, participatory, deliberative, liberal, and egalitarian democracy to decreases in arms imports are positive and statistically significant. This is one of the innovations of our paper, as we are able to separate liberal and electoral aspects of democracy and capture smaller and more continuous alterations in democratic quality. Furthermore, our findings show that while arms restrictions decrease military burden and general government total expenditures (as percentage of GDP), their impact on education expenditures (as percentage of GDP), health expenditures (as percentage of GDP) and GDP per capita are positive and statistically significant. This indicates that arms embargoes may substitute non-military expenditures (such as education and health expenditures) for military expenditures, and this can counter the negative impact of military expenditures on economic growth and political development in developing countries. These results are robust to different approaches of defining the negative arms shocks, and different measurements of political conditions (V-DEM democracy indices and polity2), as well as different orderings of variables in the PVAR models.

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Appendix

List of the countries

Algeria, Angola, Argentina, Bahrain, Bangladesh, Bolivia, Brazil, Chile, China, Colombia, Ecuador, Egypt, Ghana, Hungary, India, Indonesia, Iran, Jordan, Kazakhstan, Kuwait, Latvia, Lebanon, Lithuania, Malaysia, Mexico, Morocco, Myanmar, Nigeria, Oman, Pakistan, Peru, Philippines, Poland, Qatar, Romania, Saudi Arabia, South Africa, Sri Lanka, Sudan, Syria, Thailand, Tunisia, Turkey, UAE, Uruguay, Venezuela, Vietnam, Yemen.