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ABSTRACT

Military burdens in hostile environments may be high, as countries choose to spend on the military for deterrence purposes. In this study, we test whether the convergence hypothesis is valid for military burdens of a panel of the Middle East and North Africa (MENA) countries. The results of the analysis suggest that there is unconditional β-convergence for the panel; however, individual convergence is valid for only Algeria, Egypt, Israel, Jordan, Morocco, and Saudi Arabia. We also test whether the military burdens of Israel and the United States influence the military burdens of the countries in the panel. The results suggest that only the military burdens of Kuwait, Morocco, Oman, Saudi Arabia, Tunisia, and Turkey converge to that of Israel, while individual convergence to the United States is only valid for Jordan, Kuwait, Morocco, Oman, and Tunisia.

Keywords: *Non-Linear Panel Unit Root Test, Military Burden, Convergence, Middle East*

MENA Bölgesinde Askeri Harcama Yüklerinin Yakınsaması

ÖZET

Çatışmalı ortamlarda ülkeler caydırıcılık amacıyla yüksek miktarda askeri harcama yapmayı tercih ettiğinden, ülkelerin askeri harcama yükleri yüksek olabilmektedir. Bu çalışmada Orta Doğu ve Kuzey Afrika (MENA) ülkelerinden oluşan bir panelde askeri harcama yükleri için yakınsama hipotezinin geçerliliği test edilmektedir. Analiz sonuçları panel için koşulsuz β yakınsaması olduğunu, ancak bireysel olarak sadece Cezayir, Mısır, İsrail, Ürdün, Fas ve Suudi Arabistan'ın askeri yüklerinin ortalamaya yakınsadığını göstermektedir. Ayrıca, paneldeki ülkelerin askeri yüklerinin İsrail ve ABD askeri yüklerine yakınsaması da test edilmiştir. Analiz sonuçları sadece Kuveyt, Fas, Umman, Suudi Arabistan, Tunus ve Türkiye askeri yüklerinin İsrail askeri yüküne yakınsadığını, ABD askeri yüküne yakınsamanın ise Ürdün, Kuveyt, Fas, Umman ve Tunus için geçerli olduğuna işaret etmektedir.

Anahtar Kelimeler: *Doğrusal Olmayan Panel Birim Kök Testi, Askeri Yük, Yakınsama, Orta Doğu*

Introduction

A variety of factors can affect a country's military spending. The literature lists many, including budgetary constraints, political system and ideology, institutional setup, strategic considerations, and so on. The choice of spending on the military also entails an opportunity cost. Resources allocated to defense and military may be used more productively elsewhere to bring about growth and development.[1] Although allocation of resources to the military may crowd-out public spending in other sectors, it may also increase social spending in cases where the military's share in socio-economic life is relatively large.[2] Nevertheless, in an environment where other countries spend on the military, the opportunity cost of zero spending may be extremely high in the form of human, land, and wealth losses. In this respect, states seek to keep up with the military spending of other states that they perceive as threats in order to deter against future aggression. Such behavior is more apparent between hostile neighbors or states in conflict zones, such as in the Middle East and North Africa (MENA) region. Four of the top 20 military spenders (Saudi Arabia, Turkey, Israel, and Iran) are situated in the MENA region, and the latest available data imply that approximately 5% of regional gross domestic product (GDP) on average is spent for military purposes.[3] High demand for military spending, in other words, creates a significant burden on MENA economies.

A basic explanation of the demand for military spending can be made within an action-reaction framework.[4] Considering two hostile countries, each seeks to match or equalize the military spending of the other to deter any possible threat or to match up with the military power of the other in a possible armed conflict. This approach, upon which the arms race model attributed to Richardson is based,[5] proposes three outcomes; both countries continue to build up their arms intensively, both countries disarm, and both countries continue arming up to a point where they achieve a stable equilibrium.[6] Yet, arms races may increase the probability of disputes and wars rather than equilibrium.[7]

Smith's pioneering work incorporates the effects of various factors into the arms race model in explaining the demand for military spending.[8] Smith models social welfare as a function of civilian output and security.[9] Subject to strategic, institutional, and budgetary constraints, the state seeks to maximize this function and to find a balance between the benefits of security provided by military

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1   J. Paul Dunne and Nan Tian, "Military Expenditure and Economic Growth, 1960-2014", *The Economics of Peace and Security Journal*, Vol. 11, No 2, 2016, p. 50-56., Emmanuel Athanassiou et al., " Greece: Military Expenditure, Economic Growth, and the Opportunity Cost of Defense", Jurgen Brauer and J. Paul Dunne (eds.), *Arming the South*, London, Palgrave Macmillan, 2002, p. 291-317.

2   Hamid E. Ali, "Military Expenditures and Human Development: Guns and Butter Arguments Revisited: A Case Study from Egypt", *Peace Economics, Peace Science and Public Policy*, Vol. 17, No 1, 2011, p.1-21., Eric S. Lin et al., "Does Military Spending Crowd Out Social Welfare Expenditures? Evidence from a Panel of OECD Countries," *Defence and Peace Economics*, Vol. 26, No 1, 2015, p. 33-48.

3   *SIPRI Military Expenditure Database*, Stockholm International Peace Research Institute SIPRI, 2018, https://www.sipri.org/databases/milex (Accessed 29.01.2019).

4   J. Paul Dunne and Sam Perlo-Freeman, "The Demand for Military Spending in Developing Countries", *International Review of Applied Economics*, Vol. 17, No 1, 2003, p. 23-48.

5   Lewis F. Richardson, A*rms and Insecurity*, Pittsburgh, Homewood, 1960.

6   David Bigelow, "An Analysis of the Richardson Arms Race Model", 2003, https://pdfs.semanticscholar.org/dda7/0e8615b1b80f845f669d7d92526434468a4f.pdf (Accessed 21 February 2019).

7   Douglas M. Gibler, et al., "Taking Arms Against a Sea of Troubles: Conventional Arms Races During Periods of Rivalry", *Journal of Peace Research*, Vol. 42, No 2, 2005, p. 131-147.

8   Ron P. Smith, "The Demand for Military Expenditure", *The Economic Journal*, Vol. 90, No 360, 1980, p. 811-820, Ron P. Smith, "The Demand for Military Expenditure: A Correction", *The Economic Journal*, Vol. 97, No 388, 1987, p. 989-990.

9   Smith, "The Demand for Military Expenditure", p. 811-813.

spending and the ensuing opportunity cost due to a loss in civilian output as a result of channeling output to military spending. In brief, if a state wants to sustain its current level of welfare, it should give up a certain portion of its income for military purposes. However, the choice of what portion to be spent on the military is also dependent on the choice of others, as Smith argues,[10] due to the stochastic nature of the relationship between welfare and security, which involves many actors such as bureaucracy, politicians, arms traders, and so on.

There are a number of reasons for the high demand for military spending in the MENA region. In addition to traditional political rivalries and armed conflict based on political and sectarian differences, fundamentalist terrorism and domestic security issues complicate security concerns in the region.[11] Thus, a significant portion of regional income in MENA countries is allocated to the military, creating a considerable burden. Ali and Abdellatif argue that overreliance on abundant natural resources as the engine of the economy may also be another reason for high military burdens in the MENA region,[12] as the survival of the regimes, as well as their roots, are closely linked to the military, especially in oil-producing states. In such countries, the military is deemed the protector of economic order and the income from natural resources, yet it is also a major player in the economy, which shares mutual interests with the private sector through its investments. Thus, the military burden in such countries may be high due to keeping the military present for the continuity of natural-resource income and regimes based on such income. It is further argued that the limited ability of the armed forces in most Arab countries in meeting traditional and new challenges make them "domestic and international burdens" rather than a factor of strategic deterrence both at home and abroad.[13] Hence, it is important to know how the MENA countries react to general regional security concerns in terms of military burdens. As such, the first research question of this study is whether MENA countries show similar behavior during times of regional disturbance and peace; that is, whether the military burdens of individual countries approach the mean regional-military burden.

The military burden of a country may also increase or decrease due to military alliances. States try to act in parallel with their allies in security matters and may choose to spend a portion of their incomes for military purposes, either for fulfilling obligations of alliance treaties or for reciprocity. Smith argues that the nature of alliances may also affect military burden.[14] Although military spending may increase in parallel to the spending of rivals, free-rider behavior in alliances may also decrease military burdens for free riders. Some states may choose to participate in regional and global alliances as a strategic choice and may become free riders by relying on the deterrence capability of the strongest or "leading" ally by spending less on defense. However, it should also be considered that the effect of allies' spending may change according to width, i.e. the number of countries and depth, i.e. military and economic power, the collaborating countries, and to the institutional, strategic, or tactical framework of an alliance. The United States is a major power that has interests and allies in the region. It is also a direct participant in armed conflicts in Iraq and Syria and runs a flexible policy mix of military intervention and strategic diplomacy.[15] Hence, the second research question is whether

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10 Ibid., p. 817

11 Imad Salamey, "Post-Arab Spring: Changes and Challenges", *Third World Quarterly*, Vol. 36, No 1, 2015, p. 111-129.

12 Hamid E. Ali and Omnia A. Abdellatif, "Military Expenditures and Natural Resources: Evidence from Rentier States in the Middle East and North Africa", *Defence and Peace Economics*, Vol. 26, No 1, 2015, p. 5-13.

13 Salamey, "Post-Arab Spring", p.116.

14 Smith, "The Demand for Military Expenditure", p. 814-816.

15 F. Gregory Gause III and Ian S. Lustick, "America and the Regional Powers in a Transforming Middle East", *Middle East Policy*, Vol. 19, No 2, 2012, p. 1-9.

military burdens in the MENA region are converging to the U.S. military burden. Since Israel is a major U.S. ally in the region, and due to its political differences with other nations in the region (i.e. since Israel is seen both as a threat and an ally), it is also interesting to see whether regional military burdens are converging to the Israeli military burden.

A more logical approach than arms-race modeling is to consider any country in a wider network of rivalry and alliance relationships, which was described by Rosh as a "security web".[16] A security web consists of neighboring countries and all other countries, close or far, that have an influence on a specific country's security considerations. In this respect, the aggregate military burden of a country's security web and, in particular, the aggregate military burden of its "potential enemies" become factors affecting a country's military burden.[17] Strategic responses of individual countries in a security web to changes in one another's behavior or changes in the global environment may differ,[18] but threat perceptions by neighboring countries may be correlated due to such reasons as regional and global events, domestic policy, and foreign policy. Dunne and Perlo-Freeman report that the main determinants of demand for military spending,[19] including neighbors' military spending, internal and external conflicts, democracy, and population, showed little difference during and after a major global strategic event such as the Cold War, with internal conflicts in the post-Cold War era becoming an important factor.

In this study, we take 12 MENA countries (Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Morocco, Oman, Saudi Arabia, Tunisia, Turkey) as a security web consisting of allies and rivals in geographical proximity. A security web framework, as Dunne and Perlo-Freeman argue,[20] is "a particularly useful approach" that accounts for the effects of military burdens of all proximate and distant countries in a security web on the military spending behavior of any country in the web. We use convergence analysis because we assume that military the burdens of countries in a security web in an unstable region such as MENA would increase or decrease in parallel to the behavior of other members of the web. In the first step of the analysis, we test whether the individual military burdens in this security web "catch-up" with the mean military burden of the web. In the second step, we check whether the military burdens of the remaining 11 countries converge to that of Israel. Convergence to the Israeli military burden is important since Israel is the U.S. major ally of and is seen as an adversary by most of the countries in the region. In the third step, we check if the military burdens in the original panel of 12 countries converge to the U.S. military burden since the United States is a major power and an ally for many MENA countries. We also check for structural breaks, as did Dunne and Perlo-Freeman,[21] to check whether any domestic, regional, or international strategic event affects the convergence of military burdens.

We choose convergence analysis as a tool to answer our research questions. Although conceptualized to analyze differences in growth between countries, convergence analysis can be applied to different fields. The aim of all convergence analyses is to determine whether a relatively

16 Robert M. Rosh, "Third World Militarization: Security Webs and the States They Ensnare", *Journal of Conflict Resolution*, Vol. 32, No 4, 1988, p. 671-698.

17 J. Paul Dunne et al., "The Demand for Military Expenditure in Developing Countries: Hostility Versus Capability", *Defence and Peace Economics*, Vol. 19, No 4, 2008, p. 293-302.

18 Ibid, p. 296-297.

19 J. Paul Dunne and Sam Perlo-Freeman, "The Demand for Military Spending in Developing Countries: A Dynamic Panel Analysis", *Defence and Peace Economics,* Vol. 14, No 6, 2003, p. 461-474.

20 Ibid, p. 462.

21 Ibid, p. 470-472.

low-performing (or underdeveloped) country will catch-up with developed countries in the future in terms of income, expenditure, growth, etc.[22] The concept of convergence, which is basically a measure of the speed with which poorer countries catch up with rich countries, is based on the neoclassical growth model. β-convergence is a check of whether the low-performers in the past are doing relatively well in comparison to the high-performers of the past.[23] β-convergence is defined as the catch-up of the per capita incomes of poor countries with those of rich countries as a result of relatively higher growth in poor countries. If mean reversion is found in the growth rates of a variable X in a cross-section of countries, this is interpreted as evidence of β-convergence of X among the countries.[24] β-convergence, in its basic sense, is concerned with the speed with which the logarithm of X approaches to its steady state from some initial condition.[25] σ-convergence, on the other hand, is concerned with the cross-sectional variance of a variable over time and is detected if there is a downward trend in variance over time.[26] σ- convergence means that the differences between per capita incomes of the studied countries tend to decrease over time. Thus, β-convergence is a necessary but insufficient condition for the σ-convergence, since a decrease in the differences of per capita incomes cannot occur before catch-up.[27] Citing Mankiw et al.,[28] Jones[29] explains that there is conditional convergence if there is a negative partial correlation between growth and initial income. That is, if the coefficient of initial income is negative in a cross-sectional regression of growth on the initial income of a group of countries, then we can say that these countries converge conditionally. If the coefficient on the initial income is negative in a univariate regression, then there is absolute convergence. Unconditional convergence is the convergence of all to a common steady state, while conditional convergence means the convergence of each country to its own individual steady state. In this study, we take Israel as a "regionally superior" (i.e. developed) military power and the United States as an "internationally superior" military power in this security web, and look for whether the military burdens of the selected panel of MENA countries unconditionally converge to the military burdens of these two countries. In this respect, similar to other studies on convergence, we look for the unconditional convergence of the "relatively underdeveloped" to the developed in terms of military burdens.

Recognition of non-stationary processes in convergence literature is an important discussion, since Nelson and Plosser reported that most time series display non-stationary behavior because of the occurrence of crises and shocks.[30] This study utilizes a nonlinear and powerful approach in

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22 Farhad Rassekh, "The Convergence Hypothesis: History, Theory, and Evidence", *Open Economies Review*, Vol. 9, No 1, 1998, p. 85-105.

23 Eric Neumayer, "Beyond Income: Convergence in Living Standards, Big Time", *Structural Change and Economic Dynamics*, Vol. 14, No 3, 2003, p. 275-296.

24 Leo Michelis and Simon Neaime, "Income Convergence in the Asia-Pacific Region", *Journal of Economic Integration*, Vol. 19, No 3, 2004, p. 470-498.

25 Kevin Lee et al., "Growth and Convergence in a Multi-Country Empirical Stochastic Solow model", *Journal of Applied Econometrics*, Vol. 12, No 4, 1997, p. 357-392.

26 Nasfi Fkili Wahiba, "Convergence and Divergence among Countries", *Asian Economic and Financial Review*, Vol. 5, No. 3, 2015, p. 510-520.

27 Xavier X. Sala-i-Martin, "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence", *European Economic Review*, Vol. 40, No 6, 1996b, p. 1325-1352.

28 Gregory N. Mankiw et al., "A Contribution to the Empirics of Economic Growth", *The Quarterly Journal of Economics*, 1992, Vol. 107, No 2, 1992, p. 407-437.

29 Basil Jones, "Economic Integration and Convergence of Per Capita Income in West Africa", *African Development Review*, Vol. 14, No 1, 2002, p. 18-47.

30 Charles R. Nelson and Charles I. Plosser, "Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications", *Journal of Monetary Economics*, Vol. 10, No 2, 1982, p. 139-162.

testing the convergence of military burdens in a panel of MENA countries. Although the concept of convergence is widely used in studies on development and growth, the literature on the convergence of military expenditures is developing. The study therefore aims to contribute to this developing literature by investigating whether differences in military burdens in a panel of MENA countries are decreasing over time with respect to the average regional burden, to the Israeli military burden, and to the U.S. military burden.

The rest of the study is organized as follows: A short review of the literature is provided in the next section of the study. The methodology is given in the third section. Data and empirical results are presented in the fourth section. The fifth section concludes.

Literature Review

A number of factors affect the choice of allocating resources to the military, with government being an important factor. Töngür et al.[31] report that social democratic regimes tend to spend less on military in comparison to other forms of government. The political inclination of the government is an important factor, as military spending tends to be higher during the incumbency of right-wing administrations.[32] Institutional setup may also affect military spending decisions. It is argued that democracy and high levels of political participation may shape decisions about peace and war.[33] Democracy and freedom may significantly decrease the military burden, yet the military burden may change according to the type of democratic administration and electoral system.[34] Bove and Brauner argue that even the type of dictatorship results in differences in demands for the military burden.[35]

In addition to ideology, conscription and threats may be other factors affecting military spending.[36] Refenes et al. report the quantity of soldiers to be a decisive factor of military burden.[37] Töngür et al.[38] also conclude that army size, as well as military spending by rivals and threat perception, are positively related to military burden. In fact, some states may choose to increase military spending as an indicator of demand for the recognition of their international (or regional) status, which may help explain the high burdens in Turkey, Iran, Israel, and Saudi Arabia, which are competing for regional supremacy.[39] Rents from natural resources, especially oil rents, may be another reason for high military burdens, as demand for military spending may increase with the purpose of protecting natural

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31 Ünal Töngür et al., "Military Expenditures and Political Regimes: Evidence from Global Data, 1963–2000", *Economic Modelling*, Vol. 44, 2015, p. 68-79.

32 Vincenzo Bove et al., "Political Cycles in Public Expenditure: Butter vs Guns", *Journal of Comparative Economics*, Vol. 45, No 3, 2017, p. 582-604.

33 Mauro Rota, "Military Spending, Fiscal Capacity and the Democracy Puzzle", *Explorations in Economic History*, Vol. 60, 2016, p. 41-51.

34 Daniel Albalate et al., "Institutional Determinants of Military Spending", *Journal of Comparative Economics*, 2012, Vol. 40, No 2, 2012, p. 279-290.

35 Vincenzo Bove and Jennifer Brauner, "The Demand for Military Expenditure in Authoritarian Regimes", *Defence and Peace Economics*, Vol. 27, No 5, 2016, p. 609-625.

36 J. Paul Dunne et al., "Models of Military Expenditure and Growth: A Critical Review", *Defence and Peace Economics*, Vol. 16, No 6, 2005, p. 449-461.

37 Apostolos N. Refenes et al., "External Security Determinants of Greek Military Expenditure: An Empirical Investigation Using Neural Networks", *Defence and Peace Economics*, Vol. 6, No 1, 1995, p. 27-41.

38 Töngür et al., "Military Expenditures and Political Regimes" p. 76.

39 Hans Kammler, "Not for Security Only: The Demand for International Status and Defence Expenditure an Introduction", *Defence and Peace Economics*, Vol. 8, No 1, 1997, p. 1-16.

resources and extraction infrastructures.[40] It is shown that oil and forestry rents have a significant impact on the military burdens of MENA and GCC countries during the period 1987-2012.[41]

Budget constraints are also an important factor. Rationally, states can only spend within the limitations of their budgets. The portion of national income reserved for the military, after all, is an important public choice question. Capitalist economies may choose to increase military spending to boost aggregate demand in order to cope with internal macro problems.[42] Yet, it is argued that the military burden over a threshold level may not bring about desired growth effects.[43]

Variations in military spending can also be a result of the proximity of allies as well as responses to changes in the doctrines of strategic alliances.[44] For example, some Gulf countries have enjoyed the advantages of U.S. deterrence and hosted US strategic assets for a long time. Such a strategic alliance seeks not only to maintain a presence in the main energy source for Western economies but also to dissuade Gulf countries, such as Saudi Arabia,[45] from developing nuclear weapons as a response to Iran's nuclear capabilities.[46] Withdrawal of the US assets from the region due to changing threats and political interests in the region may force Gulf countries to increase the resources allocated for military purposes.[47] Geographical proximity to rivals or expected threats may also shape military spending decisions. Kollias and Paleologou report that the Greek defense burden is affected by the Turkish military burden and any strategic event that is important for both countries.[48] Sezgin and Yildirim[49] report that Turkey's military burden is affected by both NATO and Greek military burdens in the short-run; however, the Greek defense burden is not an explanatory factor for the Turkish military burden in the long-run. Similar results are also found by Ali,[50] who concludes that the Israeli burden significantly affects the military burdens of 12 MENA countries, and Kollias et al.,[51] who report that domestic conflict and the military spending of neighbors are important determinants of the military burdens in 12 Latin American countries.

40 Sam Perlo-Freeman and Jennifer Brauner, "Natural Resources and Military Expenditure: The Case of Algeria", *The Economics of Peace and Security Journal*, [S.I], Vol. 7, No. 1, January 2012, p.15-21.

41 Ali and Abdellatif, "Military Expenditures and Natural Resources, Nasser Al-Mawali, "Do Natural Resources of Rentier States Promote Military Expenditures? Evidence from GCC Countries, *Journal of Economics& Finance*, Vol. 03, No 03, 2015, p. 49-53.

42 Michael Reich, "Does the US Economy Require Military Spending?", *The American Economic Review*, Vol. 62, No 1/2, 1972, p. 296-303.

43 Chien-Chiang Lee and Sheng-Tung Chen, "Non-Linearity in the Defence Expenditure–Economic Growth Relationship in Taiwan", *Defence and Peace Economics*, Vol. 18, No 6, 2007, p. 537-555.

44 Justin George and Todd Sandler, "Demand for Military Spending in NATO, 1968–2015: A Spatial Panel Approach", *European Journal of Political Economy*, Vol. 53, 2018, p. 222-236.

45 W. Andrew Terrill, *Arab Threat Perceptions and the Future of the U.S. Military Presence in the Middle East*, Carlisle Barracks: U.S. Army War College. Strategic Studies Institute, 2015, p. 2-3.

46 David J. Trachtenberg, "US Extended Deterrence: How Much Strategic Force is Too Little?", *Strategic Studies Quarterly*, Vol. 6, No. 2, 2012, p. 62-92.

47 Joshua Rovner and Caitlin Talmadge, "Less is More: The Future of the U.S. Military in the Persian Gulf", *The Washington Quarterly*, Vol. 37, No 3, 2014, p. 47-60.

48 Christos Kollias and Suzanna-Maria Paleologou, "Domestic Political and External Security Determinants of the Demand for Greek Military Expenditure", *Defence and Peace Economics*, Vol. 14, No 6, 2003, p. 437-445.

49 Selami Sezgin and Jülide Yıldırım, "The Demand for Turkish Defence Expenditure" *Defence and Peace Economics*, Vol. 13, No 2, 2003, p. 121-128.

50 Hamid E. Ali, "Military Expenditures and Inequality in the Middle East and North Africa: A Panel Analysis", *Defence and Peace Economics*, Vol. 23, No 6, 2012, p. 575-589.

51 Christos Kollias et al., "The Demand for Military Spending in Latin American Countries", *Latin American Economic Review*, Vol. 27, No 11, 2018, p. 1-17.

The literature on the convergence of military burdens generally reports convergence for different groups of countries over different periods. For example, Lau et al.[52] test the unconditional β-convergence of the military burdens of 37 countries and find that more than half of the countries converge to the world average spending and, although at 10% significance, to U.S. military spending. Apergis et al. report three convergence clubs in terms of defense burden in a panel of 17 EU countries.[53] Using a new dataset by SIPRI covering an extended time period, Arvanitidis and Kollias report β-convergence of defense burdens in a sample of 86 countries,[54] but no club convergence among countries with similar spending trends.

The convergence of military burdens may also be affected by changing international circumstances. Using the new SIPRI dataset in a panel of 167 countries between 1950 and 2015, Arvanitidis and Kollias,[55] find divergence of defense burdens for the Cold War period and convergence for the post-Cold War period in the form of lower military burdens and contend that post-Cold War convergence should be studied more carefully considering effects of copying best practices, transnational terrorism, and the search for an optimum defense budget. A similar finding is reported by Arvanitidis et al.[56], who point out that a process of convergence of defense burdens in a panel of 128 countries between 1988 and 2008 is mainly due to the adoption of defense policies reflecting similar characteristics at least in terms of allocation.

After checking for the linearity of military expenditures, Güriş et al.[57] obtain two different panels of NATO members and apply different tests to nonlinear and linear military burden series to conclude that of all NATO members, only the military expenditures of Germany, Greece, Portugal, the UK, and Luxembourg converge to the NATO mean. Yazgan et al.[58] investigate whether military burdens in a panel of 14 NATO members converged to that of the United States in the period 1960-2014 and report a significantly nonlinear convergence to the U.S. military burden. Shahbaz et al.[59] use different tests, allowing for structural breaks, to find out that exogenous shocks to military spending are temporary, and that military spending is stationary for all countries and groups of countries included in the study.

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52 Chi Keung Marco Lau et al., "A Nonlinear Model of Military Expenditure Convergence: Evidence from ESTAR Nonlinear Unit Root Test", *Defence and Peace Economics*, Vol. 27, No 3, 2016, p. 392-403.

53 Nicholas Apergis et al., "Convergence in Public Expenditures across EU Countries: Evidence from Club Convergence", *Economics & Finance Research*, Vol. 1, No 1, 2013, p. 45-59.

54 Paschalis Arvanitidis and Christos Kollias, "Converging Defence Burdens? Some Further Findings", *Peace Economics, Peace Science and Public Policy*, Vol. 22, No 4, 2016, p. 365-375.

55 Paschalis Arvanitidis and Christos Kollias, "Global Patterns of Convergence and Divergence in Defence Burdens: 1950-2015. A Bird's Eye View", *CESPIC Working Paper*, 2018, 2018/03. https://www.unizkm.al/images/CESPIC/kollias_WP%20(3).pdf, Accessed: 13 September 2018.

56 Paschalis Arvanitidis et al., "Is There an International Convergence in Defence Burdens? Some Initial Findings", *Peace Economics, Peace Science and Public Policy*, Vol. 20, No 4, 2014, p. 611-620.

57 Selahattin Güriş et al., "Do Military Expenditures Converge in NATO Countries? Linear and nonlinear unit root test evidence", *Theoretical & Applied Economics*, Vol. 29, No 2 (611), 2017, p. 237-248.

58 Şekip Yazgan et al., "Military Expenditure Convergence in the Selected NATO Countries: Evidence from Non-linear Unit Root Tests" (in Turkish), *Akdeniz Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, Vol. 18, No 37, 2018, p. 118-132.

59 Muhammad Shahbaz et al., "Military Spending Response to Defense Shocks? International Evidence", 2018, *MPRA Paper*, No. 87362, https://mpra.ub.uni-muenchen.de/87362/, Accessed: 14 September 2018.

Methodology

In this study, we employ the panel stationarity test of Bahmani-Oskooee et al.[60] (BCW hereafter), which can be considered an extension of the test of Carrion-i-Silvestre et al.[61] (CL hereafter). The CL panel stationarity test allows for multiple sharp breaks whose locations or numbers do not need to be known *a priori*. BCW extend the test by incorporating the Fourier function to allow for smooth breaks as well.

We estimate the following equation to test whether military burdens converge in the MENA region:

$$y_{i,t} = \alpha_i + \sum_{l=1}^{m_i} \theta_{i,1} DU_{i,1,t} + \gamma_{1,k} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2,k} \cos\left(\frac{2\pi kt}{T}\right) + u_{i,t} \tag{1}$$

where m_i stands for the number of sudden breaks and DU represents the dummy variable which is defined as:

$$DU_{i,k,t} = \begin{cases} 1 & if \ \ t > TB_l^i \\ 0 & otherwise \end{cases}$$

where TB_i^l shows the break date(s) for the i th individual series.

While dummy variables are added into the equation to allow for sudden breaks, trigonometric terms are incorporated into the equation to capture the behavior of smooth breaks. *k, t* and *T* indicate frequency, time trend, and the number of observations, respectively. To test the null hypothesis of stationarity against the alternative of unit root in the panel, the following test statistic is used:

$$Z = \frac{\left(\sum_{i=1}^{N} LM_i - N\overline{\mu}_{LM}\right)^{0.5}}{\sigma_{LM}} \tag{2}$$

where $\overline{\mu}_{LM}$ and σ_{LM} represent the mean and standard deviation of LM. LM is the test statistic which is computed for the i th individual as follows:

$$LM = \hat{\omega}_i T^{-2} \sum_{t=1}^{T} \hat{S}_{it}^2$$

Here, $\hat{S}_{it}$ and $\hat{\omega}_i$ show the partial sum of the $u_{i,t}$ and a HAC estimator of the long-run variance of $u_{i,t}$, respectively.

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60 Mohsen Bahmani-Oskooee et al., "Revisiting Purchasing Power Parity in African Countries: Panel Stationary Test with Sharp and Smooth breaks", *Applied Financial Economics*, Vol. 24, No 22, 2014, p. 1429-1438.

61 Josep Lluís Carrion-i-Silvestre et al., "Breaking the Panels: An Application to the GDP Per Capita", *The Econometrics Journal*, Vol. 8, No 2, 2005, p. 159-175.

BCW suggest a two-step procedure to compute the panel test statistic in Equation 2. In the first step, the values of m and k are determined by following the procedure of Bai and Perron.[62] We first set a maximum value for k, then store the sum of squared residuals and select the optimum $k*$ that minimizes the SSR. By replacing the values of $k*$ in Equation 1, we then re-estimate Equation 1 to determine the number and locations of the breaks by choosing the m that minimizes the SSR. After determining the values of m and k, the significance of the nonlinear component is tested in the second step, using the following F statistic:

$$F\left(k*\right)=\frac{\left(SSR_{UR}-SSR_{R}\left(k*\right)\right)/2}{SSR_{R}\left(k*\right)/\left(T-q\right)}$$

SSR_{UR}, and SSR_{R} show the sum of squared residuals from Equation 1 with and without nonlinear components. The rest of the procedures are the same as the CL test.

Data and Empirical Results

Due to data availability, we limit our study to 12 MENA countries (Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Morocco, Oman, Saudi Arabia, Tunisia, and Turkey) over the period 1977-2017.[63] We apply the Catmull-Rom Spline method to interpolate the missing value for Saudi Arabia in 1986[64].

Before proceeding to the analysis, we first report the descriptive statistics of the military burden of the countries in Table 1.

Table 1: Descriptive Statistics

Countries	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
Algeria	0.0309	0.0294	0.0642	0.0121	0.0132	0.8604	3.1415	5.0933***
Bahrain	0.0472	0.0473	0.0854	0.0208	0.0119	0.4385	4.3748	4.5427
Egypt	0.0417	0.0324	0.1311	0.0129	0.0267	1.3756	4.5063	16.8072*
Iran	0.0384	0.0282	0.1111	0.0120	0.0248	1.2586	3.8146	11.9584*
Israel	0.1129	0.0850	0.2309	0.0465	0.0545	0.6381	2.0787	4.2322
Jordan	0.0723	0.0627	0.1253	0.0430	0.0243	0.6063	2.1151	3.8498
Kuwait	0.1063	0.0598	1.1735	0.0301	0.1889	4.7794	26.5547	1103.91*
Morocco	0.0409	0.0395	0.0662	0.0221	0.0104	0.8902	3.1247	5.4416***
Oman	0.1546	0.1475	0.2793	0.0758	0.0479	0.6206	2.7199	2.7659
Saudi Arabia	0.1193	0.1128	0.1900	0.0725	0.0338	0.4108	1.9661	2.9794
Tunisia	0.0205	0.0190	0.0459	0.0126	0.0066	2.0088	8.0938	71.8998*
Turkey	0.0322	0.0353	0.0471	0.0185	0.0081	-0.3020	1.7590	3.2543

Note:*, and *** show the significance at the 1%, and 10% levels respectively.

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62 Jushan Bai and Pierre Perron, "Estimating and Testing Linear Models with Multiple Structural Changes", *Econometrica*, Vol. 66, No 1, 1998, p. 47-78.

63 The SIPRI dataset consists of 20 countries in the MENA region but, since there are missing observations in the series, we could only use 12.

64 The dataset and application files of this article can be accessed via Harvard Dataverse system: https://dataverse.harvard.edu/dataverse/uidergisi.

Table 1 shows that Oman has the highest mean military burden, while Tunisia has the lowest. Skewness values of military burdens show that the series for Egypt, Iran, Kuwait, and Tunisia are highly skewed, while kurtosis values show that the military burdens of Israel, Jordan, Oman, Saudi Arabia, and Turkey are platykurtic, and the remaining series of military burdens are leptokurtic. On the other hand, the Jarque-Bera statistics show that while half of the series are distributed normally, the remaining are non-normally distributed. A noteworthy element in Table 1 is the high value of Kuwait in the maximum column. In order to examine this situation more closely, time paths of the series is plotted in Figure 1.

Figure 1: Logs. of Military Burdens of MENA Countries
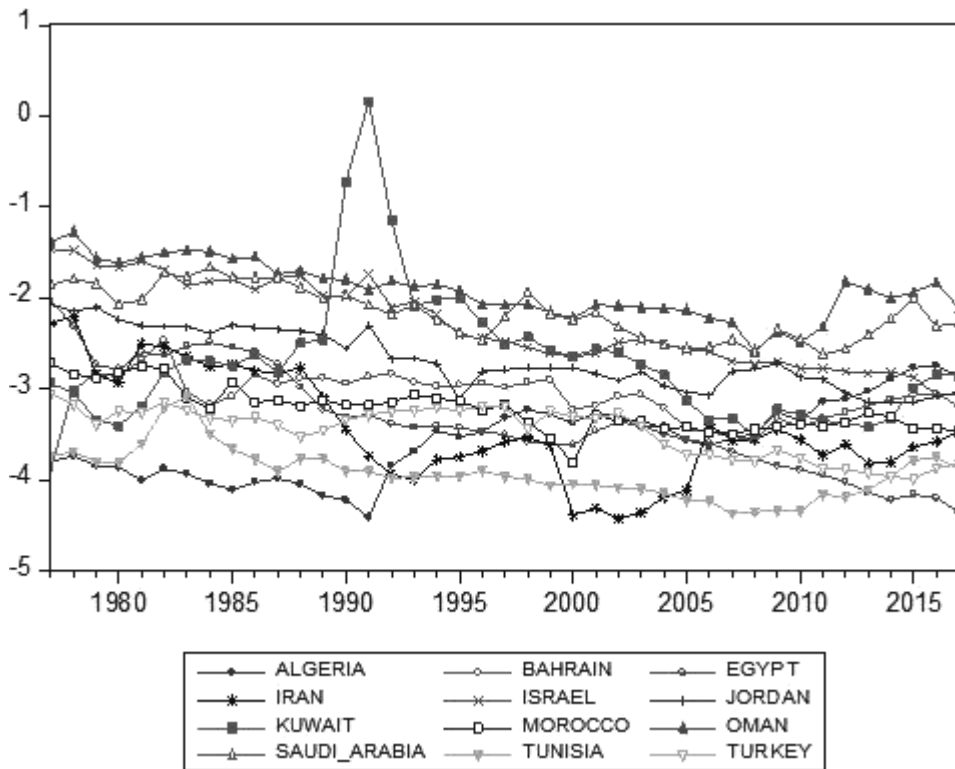
The leap in Kuwait's military burden series was due to the Gulf War in 1991. On the other hand, the highest military burden values belong to Oman during these years, while the lowest values belong to Tunisia and Algeria.[65]

Following the studies of Lau et al.[66] and Liu et al.[67], we test the convergence hypothesis by testing the stationarity of $y_{it} = \ln(g_{i,t} / \overline{g}_t)$ where $g_{i,t}$ shows the ratio of military spending to the GDP of ith country and $\overline{g}_t$ shows the mean of these series for twelve countries. Although there may be a number of factors, including economic constraints and strategic considerations,[68] affecting military

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65 We also obtained descriptive statistics and time-path graphs of the military spending of the MENA countries that are available from the authors upon request.

66 Lau et al. "A Nonlinear Model".

67 Tie-Ying Liu et al., "Better is the Neighbor?", *Defence and Peace Economics*, Vol. 30, No 6, 2019, DOI: 10.1080/10242694.2017.1422321, p. 706-718.

68 Kollias et al., "Latin American Countries", p. 1-5.

spending by a country, the ratio of military spending to GDP (i.e. military burden) may be a good tool in checking convergence. Ferreiro et al.[69] also point out that convergence is more detectable when military spending as a share of GDP is used as a variable. The selection of military burden as the only factor may be contestable, since there are many factors and individual differences among countries that may affect this ratio. We think that this ratio reflects the choice of military spending under the constraint of other factors. For example, Kuwait allocated about 50% of its GDP to military during the 1990s, especially after the Gulf War, but decided to keep its military burden around 11% throughout the 2010s. Thus, we think that the military burden is reflective of differences in military spending among the selected panel of MENA countries, and assume that all the limitations or advantages put up by these differences are reflected in military burdens.

We report the test results in the last row of Table 2. The null of stationary cannot be rejected for the whole panel since the test statistic is smaller than the critical values. These results prove that the military burdens in MENA converge to the mean in the long-run. We tabulate the individual test statistics in the remaining rows of Table 2.

Table 2: Conditional β-convergence Results Relative to Mean

Countries	Test Stat.	Critical Values			Break Dates	Opt Freq	F Stat	Critical Values		
		90%	95%	99%				90%	95%	99%
Algeria	0.0639	0.0993	0.1247	0.1899	1991,1995	1	24.1652	2.4801	3.2493	5.2467
Bahrain	0.158	0.1196	0.1506	0.2185	1991	5	4.4636	2.4556	3.2121	5.2542
Egypt	0.0659	0.0904	0.1144	0.1638	1988,2012	2	7.1996	2.5542	3.4274	5.519
Iran	0.1414	0.0374	0.0441	0.0562	1989,1993,1999,2005,2010	1	3.9693	2.5895	3.3877	5.587
Israel	0.0806	0.0828	0.1049	0.151	1989,1996	1	37.1524	2.4997	3.3704	5.1395
Jordan	0.1064	0.107	0.1351	0.1884	1989,1995,2006,2011	5	1.7406	2.4672	3.2622	5.1321
Kuwait	0.256	0.0481	0.0562	0.0728	1981,1989,1996,2001	3	14.1236	2.4945	3.3502	5.3704
Morocco	0.0609	0.0561	0.0654	0.081	1982,1988,1992	2	5.6288	2.6137	3.4525	5.664
Oman	0.1932	0.0926	0.1156	0.1677	1989,1993	4	6.083	2.6509	3.4513	5.4189
Saudi Arabia	0.0553	0.0994	0.1274	0.1822	1989,1996	4	2.7189	2.5489	3.3593	5.3605
Tunisia	0.1364	0.0943	0.1196	0.1785	1989,1994	4	8.2611	2.5656	3.3437	5.396
Turkey	0.2578	0.0547	0.0645	0.0837	1983,1991,2010	3	9.1429	2.6047	3.4004	5.3473
PANEL	3.3438	6.0898	7.3731	10.1936	-					

The results in Table 2 show that we cannot reject the null of stationarity for Algeria, Egypt, Israel, Jordan, Morocco, and Saudi Arabia at the 5% significance level. According to these results, unconditional β-convergence is valid for the military burdens of the aforementioned countries. Break dates may be reflective of responses to other domestic and international threats faced by individual countries. Examples are plentiful. Domestic disturbances due to fundamentalist terrorism and political conflicts were very intense in Algeria in 1995. Morocco's political detachment with France also became apparent in 1982, as the country started to buy weapons from the United States and continued to buy

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69 Jesús Ferreiro et al., "Convergence of Public Expenditures and Implementation of a Single Model of Public Finances in the European Union", *Revista de economía mundial*, Vol. 37, 2014, p. 75-102.

weapons intensively between 1988 and 1991. Efforts at constitutional reform in the early 1990s might also have decreased Morocco's military burden. In Egypt, the military's seizure of power in 2013 may have caused increased military spending. An increase in food prices resulted in riots in Jordan in 1989, 1996 and 2011, which were suppressed with armed intervention. Suicide bombings in November 2005 that killed foreign nationals may be a reason for increased military burden of Jordan in 2006. The terrorist attack in Dhahran in 1996 may have caused an increase in military burden in Saudi Arabia. Another reason for convergence may be geographical proximity. Saudi Arabia, Jordan, Egypt, and Israel are geographically situated at the "conflict core" of the region. Thus, it may be said that these countries increase or decrease defense spending in parallel with the intensity of proximate threats or disturbances. On the other hand, being far from the conflict core but close to Europe, Algeria and Morocco may be said to increase or decrease defense budgets according to domestic threats and terrorism, and for stopping illegal migration to Europe. We also supply the fitted functions graphs along with the series in Appendix 1. The graphs show that the functions fit well.

The Arab-Israeli conflict not only involves Israel and its Arab neighbors but also major global powers who seek security in a region that supplies energy for their developed economies. According to Abu-Qarn and Abu Bader,[70] the intensity of such an environment of conflict is reflected in the significant military burdens of Israel and its neighbors. Given the political importance attached by Israel to deterrence and investments in military technologies, the Israeli burden may be an important parameter for the rest of the region. Therefore, consideration of changes in the Israeli military burden may be a reason for changes in the military burdens of other MENA countries. In order to check this, we test whether the military burdens of the remaining 11 countries in the panel converge to that of Israel. If the series of these 11 countries are stationary, then we can say that there is unconditional β-convergence to the military burden of Israel. We report statistics of the stationarity test of military burdens relative to that of Israel's in Table 3.

Table 3: Conditional β-Convergence Results Relative to Israel

Countries	Test Stat.	Critical Values			Break Dates	Opt Freq.	F Stat	Critical Values		
		90%	95%	99%				90%	95%	99%
Algeria	0.1591	0.0907	0.1178	0.175	1991, 1995, 2008, 2013	3	4.886	2.5867	3.4154	5.5646
Bahrain	0.1657	0.0593	0.0741	0.1059	1980, 1991, 2012	4	4.0575	2.5925	3.4549	5.3974
Egypt	0.1424	0.0787	0.0953	0.1315	1986, 1998, 2003, 2013	4	30.374	2.5732	3.3778	5.5863
Iran	0.3065	0.1073	0.1372	0.1966	1989, 1994, 1999, 2005	5	3.0583	2.397	3.1807	5.0483
Jordan	0.2443	0.0718	0.0907	0.1319	1995, 2001, 2006	2	3.5673	2.5986	3.3795	5.4519
Kuwait	0.0529	0.1302	0.1684	0.2488	1989	1	50.2089	2.3263	3.0134	5.1162
Morocco	0.0381	0.0917	0.1155	0.1684	1991, 2000, 2012	3	9.1155	2.462	3.2367	5.2116
Oman	0.0516	0.0862	0.1089	0.1629	1991, 2011	3	3.87	2.3925	3.157	5.0164
Saudi Arabia	0.0512	0.123	0.1617	0.2542	1981, 1997, 2001, 2008, 2013	4	4.6393	2.568	3.3681	5.4022
Tunisia	0.044	0.0561	0.0666	0.0931	1981, 1990, 2005, 2010	2	52.2837	2.5854	3.3947	5.5307
Turkey	0.0722	0.0644	0.0776	0.1089	1981, 1991	2	17.6244	2.4917	3.2665	5.3065
PANEL	2.7741	5.9865	7.0588	8.112						

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70 Aamer S. Abu-Qarn and Suleiman Abu-Bader, "On the Dynamics of the Israeli–Arab Arms Race", *The Quarterly Review of Economics and Finance*, Vol. 49, No 3, 2009, p. 931-943.

The last row of Table 3 shows β-convergence when the whole panel is considered. The results show that we cannot reject the convergence for the whole panel. The remaining rows of Table 3 show individual test results. We conclude that the convergence hypothesis is valid only for Kuwait, Morocco, Oman, Saudi Arabia, Tunisia, and Turkey. As a result, it can be said that the unconditional β-convergence hypothesis seems plausible for these six countries; these countries individually converge to Israel in terms of military burden. All other non-converging countries except Iran are allies of the United States in the region against fundamentalist and transnational terrorism.

The effects of the First Gulf War in 1990-1991 can be seen from the break dates, as the military burdens of all converging countries supporting Operation Desert Storm, except Kuwait and Saudi Arabia, increased. It should also be noted that Tunisia was not a party to the coalition forces during the First Gulf War. A similar effect can be seen as a response to the Arab Spring in the 2010s, except in Turkey and Kuwait. Thus, convergence in these two periods may be seen as reactions to different threats. In the most heightened period of the First Intifada, Kuwait declared in a note to the Arab League that it contributed U.S.$83 million to the Intifada, which may explain the break in Kuwaiti series in 1989.[71] The 2005 break in Tunisia seems to have resulted from the intensified reaction to domestic fundamentalist terrorism, while the 1981 break coincides with armed conflict with Libya. It is most likely that the military coup in Turkey had an effect on increasing the military burden at the beginning of 1980s. Saudi Arabia's breaks in 2001 and 2008 concur with renovation of Saudi air force.

Table 4 presents the results of unit root tests for the military burden series relative to that of United States.

Table 4: Conditional β-Convergence Results Relative to the US

Countries	Test Stat.	Critical Values			Break Dates	Opt Freq.	F Stat	Critical Values		
		90%	95%	99%				90%	95%	99%
Algeria	0.1256	0.0873	0.1074	0.1516	1992, 1997	2	66.0936	2.2465	3.0087	4.8093
Bahrain	0.092	0.0611	0.0732	0.0979	1982, 1990, 1995, 2012	1	40.6345	2.5308	3.3241	5.4254
Egypt	0.3769	0.0481	0.0589	0.0805	1980, 1987, 2003, 2007	1	7.7578	2.649	3.4602	5.5377
Iran	0.1327	0.0882	0.1042	0.1396	1985, 1999, 2011	4	47.9685	2.3338	3.1032	5.1276
Israel	0.1167	0.0568	0.0671	0.0928	1981, 1991, 2007	2	15.6975	2.4213	3.1877	5.209
Jordan	0.0797	0.1098	0.1435	0.2123	1980, 1995, 2003	5	8.7208	2.4431	3.2288	5.1905
Kuwait	0.0427	0.1074	0.1343	0.1863	1989, 1996, 2004	5	6.636	2.4645	3.2534	5.2242
Morocco	0.0412	0.0462	0.0535	0.0723	1981, 1990, 2003, 2012	4	2.8375	2.4741	3.2759	5.4753
Oman	0.0724	0.0986	0.1171	0.1479	1986, 2007, 2011	2	42.0006	2.3329	3.0772	5.0171
Saudi Arabia	0.2928	0.1908	0.2576	0.409	1997, 2002, 2013	4	1.9465	2.4603	3.2886	5.2241
Tunisia	0.0318	0.0658	0.0786	0.1096	1981, 1991, 2013	2	113.7675	2.3916	3.1838	5.2368
Turkey	0.1859	0.0552	0.0649	0.0871	1989, 2003, 2010	2	92.5659	2.4641	3.295	5.1425
PANEL	0.7662	6.9619	8.3226	11.6045	-					

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71 Jacob Goldberg and Joseph Kostiner, "Kuwait", in *Middle East Contemporary Survey,* Vol. 19,1990 Ami Ayalon (Ed.), Boulder: Westview Press, 1992, p. 508.

The results in Table 4 show that we cannot reject the null of stationarity for Jordan, Kuwait, Morocco, Oman, and Tunisia at the 5% significance level. The panel test statistic is tabulated in the last row of the table and shows that the panel is stationary. Breaks in individual series may be reflective of regional and international strategic events. The breaks in the early 1990s in Algeria, Bahrain, Israel, Morocco, and Tunisia may be associated with the First Gulf War. Bahrain and Morocco were members of the coalition for the First Gulf War in 1990-1991 and associated breaks may have resulted from deploying considerable numbers of their armed forces to the Gulf region. However, it should also be noted that there are no breaks observed in the same years in the other members of the coalition: Egypt, Oman, and Saudi Arabia. A possible explanation may be the level of preparedness of the armed forces and keeping spending in line with the major power ally, as there is no such break in Kuwait during the beginning of the 1990s, which was caught off-guard by the Iraqi invasion. The break in Israeli series can be viewed as a consequence of Iraqi attacks during the Gulf War. Breaks at the beginning of the 1980s in Bahrain, Egypt, Israel, Jordan, Morocco, and Tunisia may have been a strategic response to the onset of Iran-Iraq War, but the role of domestic disturbances in Morocco and Tunisia may also be effective. The break in 1986 in Oman may be reflective of the minor regional conflict between Qatar and Bahrain. Egypt, on the other hand, started to receive U.S. military aid of over one billion dollars in 1987, which has continued until today. The break in 1989 in Turkey may have been a response to the end of the Cold War, whereas the break in Kuwait in the same year to the end of Iran-Iraq War. The break in 1995 in Jordan coincides with the official break-up of relations with Iraq and the start of joint military exercises with the United States as well as U.S. arms purchases. Bahrain openly confronted Iran over its alleged interference in Bahraini domestic affairs in 1994 and 1995. Algeria became important for U.S. foreign policy in the mid-1990s during its internal struggle with fundamentalists, and a major U.S. arms sale took place in 1997. The breaks at the beginning of the 2000s in Egypt, Jordan, Kuwait, Morocco, Saudi Arabia, and Turkey may be interpreted as responses related to the Second Gulf War (Iraqi War) in 2003. The break in Oman in 2007 may have resulted from the sharp decrease in the U.S. aid from 2007 to 2008.[72] The breaks in 2010 and 2013 may be resulting from domestic disturbances due to Arab Spring or from responses to the fight against transnational terrorism. It should also be noted that the start of the Yemeni Civil War and the increasing involvement of Iran and the Saudi-led coalition including Morocco, Egypt, Jordan, Kuwait, and Bahrain, may be other reasons for these breaks. Iran's convergence to the U.S. military burden is a special case since it openly confronts the United States and has been under an embargo for most of the studied period. The break in the military burden of Iran in 1985 may have resulted from the increased intensity of the Iran-Iraq War, while the break in 1999 from domestic disturbances. On the other hand, the Israeli break in 2007 may have reflected Israel's changing threat perception of its Arab adversaries from 2003 onwards after the Iraq War.[73]

Conclusion

This study followed a nonlinear approach to explore convergence dynamics in selected MENA countries. First, the convergence of the military burdens of the individual countries in the panel to the mean of the panel was tested, followed by the convergence of the military burdens of the remaining

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72 Kenneth Katzman, *Oman: Reform, Security, and US Policy*, United States Congressional Research Service Report, RS21534, 26 April 2016, p. 15-16.

73 Wuyi Omitoogun, *Appendix 10E. Military Expenditure in the Middle East After the Iraq War*, SIPRI YEARBOOK, 2004, p. 381-388.

panel of 11 countries to that of Israel. In the third step of the analysis, the convergence of military burdens of the panel of 12 countries to the U.S. military burden was tested, followed by the individual convergence dynamics of each country.

BCW panel stationarity test was used for the analysis. The results showed unconditional β-convergence in the military burdens of the panel of 12 countries over the period 1977-2017. This may be an indicator of the effect of the general military spending behavior of the security web on the individual military spending behavior of its members. However; Algeria, Egypt, Israel, Jordan, Morocco, and Saudi Arabia converged to the mean with breaks according to individual test results. It is interesting that four of the individual convergents – Egypt, Israel, Jordan, and Morocco – were designated as "major non-NATO allies" by the United States. Algeria and Saudi Arabia are also close U.S. allies. However, since the United States is not included in the panel, this may be interpreted as domestic disturbances, rather than regional security concerns, having a significant effect on military burdens of these countries.

When Israel is taken out of the panel, the results of the test confirmed convergence to the Israeli military burden in the panel of remaining 11 countries. As a result, it can be said that Israel is an important reference for other countries in MENA in allocating resources for military purposes. This indicates that the military burden in a security web may also be affected by the military burden of regional powers or perceived threats. However, individual convergence to the Israeli military burden was only valid for Kuwait, Morocco, Oman, Saudi Arabia, Tunisia, and Turkey. It should also be noted that Turkey, Israel, and Saudi Arabia are powers competing for supremacy in the region.

There is also convergence to the U.S. military burden. This is unsurprising, since the United States has been a major player in the region and its military involvement notably increased in the 2000s. Individual convergence to the U.S. military burden was only valid for Jordan, Kuwait, Morocco, Oman, and Tunisia. A possible explanation of this may be the "major non-NATO ally" status recognized by the United States to Jordan, Kuwait, Morocco, and Tunisia. Although Oman has not been given such a status, the country has been a significant recipient of the U.S. military aid and has been allowing the United States to use its airports for military operations. However, it is also interesting that the other major non-NATO U.S. allies Egypt and Bahrain and traditional U.S. allies Israel and Saudi Arabia are not converging individually in the presence of breaks. The reason for this difference may be that the convergent allies are showing "follower" behavior in matters related to regional security. It should also be noted that the size of the army may be a determinant of free-rider behavior, as Jordan, Kuwait, Oman, Bahrain, Tunisia, and, to some extent, Israel, have relatively small armies and are dependent on the U.S. deterrence. Non-convergent U.S. allies that have large armies, such as Egypt and Turkey, may be relying on their own capabilities, although enjoying advantages of being U.S. allies at the same time. Nevertheless, the level of the development of the defense industry and military technologies may also be shaping their choices of following or free riding. Another interesting result of the analysis is that the military burden of Iran is not converging individually to that of the United States, either showing Iran's trust in its own capabilities or the effectiveness of U.S. deterrence.

As a result, our analysis shows that the regional military burden and the military burdens of Israel and the United States may be important references in the military spending decisions of the

MENA countries. Our results are in agreement with Rosh,[74] who concluded that the military burden of a country is affected by the military burden of its security web. Dunne et. al.[75] also report a similar result; however, they elaborate that although demand for military spending may be a result of trying to keep up with rivals' arms purchases, it is more likely that the overall threat perceptions of the security web increases the demand for military spending. Our results also supported similar results by Kollias et al.,[76] as the results may also be seen as an indicator of policy convergence. In this sense, our results agreed with those of Arvanitidis et al.[77] and Arvanitidis and Kollias,[78] who report convergence in a wider panel and argue a weak and slow policy convergence. Lastly, our results showed convergence to the military burdens of strong allies and rivals in a security web and supported Lau et. al.,[79] Ali,[80] Yazgan et al.,[81] who found that the military burdens of NATO members converged to that of the United States.

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74 Rosh, "Security Webs", p. 671-698.

75 J Paul Dunne et al., "Determining Military Expenditures: Arms Races and Spill-Over Effects in Cross-Section and Panel Data," Discussion Papers 0801, British University in Egypt, Faculty of Business Administration, Economics and Political Science, 2008, p. 11.

76 Kollias et al., "Latin American Countries", p. 1-17.

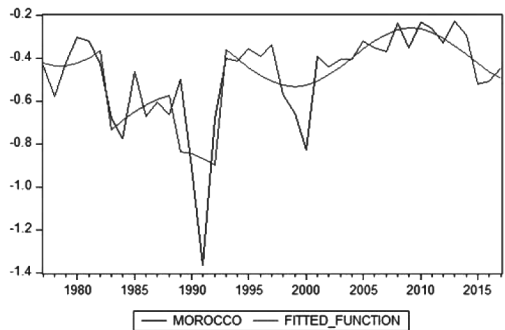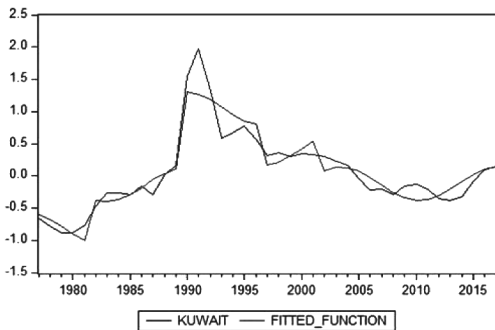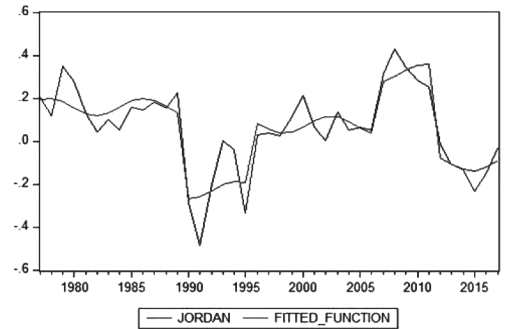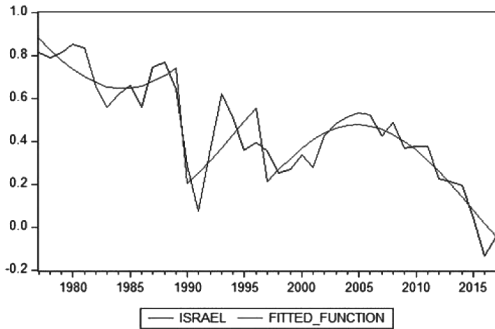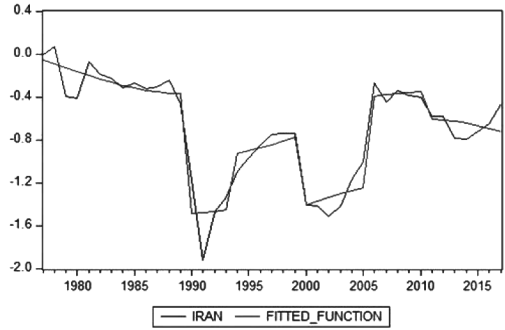77 Arvanitidis et al., "Some initial findings", p. 611-620.
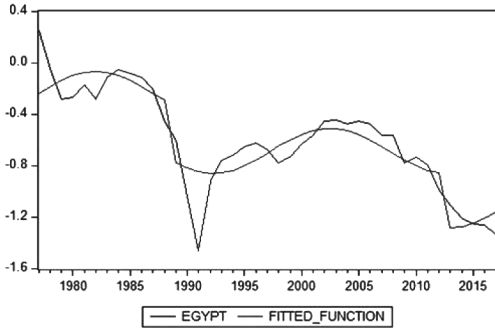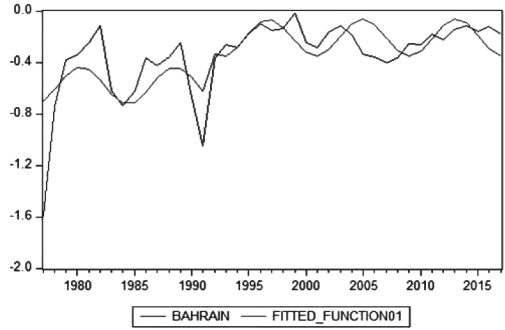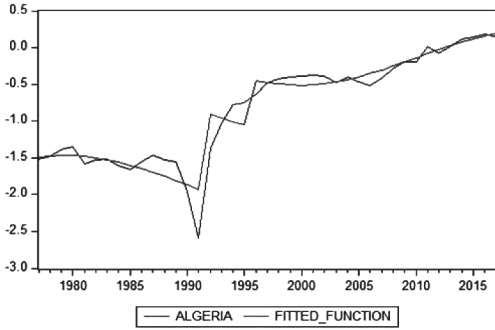
78 Arvanitidis and Kollias, "Converging Defence Burdens".

79 Lau et al., "A Nonlinear Model", p. 392-403.

80 Ali, "Military Expenditures and Inequality", p. 575-589.

81 Yazgan et al., "Military Expenditure Convergence", p. 118-132.

Appendix-1: Time series plots of the military burdens of MENA countries relative to the mean and fitted nonlinearities