# THE DEMAND FOR MILITARY SPENDING IN EGYPT

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# The Demand for Military Spending in Egypt

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#### Abstract

Egypt plays a pivotal role in the security of the Middle East as the doorway to Europe and its military expenditure reflects its involvement in the machinations of such an unstable region, showing considerable variation over the last forty years. These characteristics make it a particularly interesting case study of the determinants of military spending. This paper specifies and estimates an econometric model of the Egyptian demand for military spending, taking into account important strategic and political factors. Both economic and strategic factors are found to play a role in determining military burden/spending, with clear positive effects of lagged military burden, suggesting some sort of institutional inertia, plus negative output and net exports effects. The strategic effect as a result of the impact of Israel's military burden is mostly positive and significant, though its impact is reduced when the impact of important strategic events are taken into account. The military spending of Egypt's allies Jordan and Syria generally seems to have had no effect on Egypt's spending. These results are consistent over a range of econometric techniques.

**Keywords:** Egypt, demand for military expenditure, political determinants, strategic determinants, cointegration **JEL classification:** H56, O53

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#### 1. Introduction

Egypt plays a pivotal role in the security of the Middle East as the doorway to Europe. Its military expenditure reflects its involvement in the machinations of such an unstable region and as a result has shown considerable variation over the last forty years. Being the major Arab country that confronted Israel since its foundation in 1948, Egypt has allocated a sizeable portion of its scarce resources to accumulate weapons and maintain its military forces, along with its neighbours. Its rich history and the availability of relatively good time series data make Egypt a very valuable case study for the determinants of military expenditure and for assessing whether it is the strategic or socioeconomic factors that are dominant. It is also a country that has received only modest attention in the literature.

This study undertakes a time series analysis of the evolution of military spending in Egypt over the period 1960-2009 using strategic and socioeconomic determinants for the demand for military expenditures. In the next section of the paper, the trends in Egyptian military spending, since the early 1960s, are discussed and the major strategic factors outlined. The third section specifies and estimates an econometric model of the demand for military spending and the fourth section presents some conclusions.

## 2. The Determinants of Military Spending

There are two broad groups of empirical studies in the literature on the determinants of military spending. First, studies based on the arms race model of Richardson (1960) that are suited to situations in which countries are in active conflict and have often failed to perform well empirically (Smith, 1989). Second, studies that focus on a range of economic, political and

strategic determinants of military spending, with the most satisfactory empirical analyses tending to take a relatively comprehensive approach. More recently, these two strands of research have been brought together with arms race dynamics introduced into demand models, giving a more complex structural model than an action-reaction framework and also considering economic, political and military factors.

Formal models often start from the neoclassical perspective that sees the country or state as maximising a social welfare function with security as an integral component (Smith; 1980, 1995). Most theoretical models lead to similar estimation equations for the empirical analysis, where the demand for military expenditure is a function of economic resources, threats to security, and political factors, such as the nature of the state. Defining social welfare to be a function of private consumption C and security S, conditioned on political, strategic, and demographic variables Z:

$$W = W(C, S, Z) \tag{1}$$

The level of security depends, in turn, upon the level of military expenditure *M*, conditioned on demographic and strategic variables *T*:

$$S = S(M,T) \tag{2}$$

Maximising the social welfare function (1) subject to a budget constraint,

$$Y = P_m M + P_c C \tag{3}$$

where *Y* is income, and  $P_m$  and  $P_c$  are the prices of *M* and *C* relative to an income deflator, gives a demand function:

$$M = D(Y, P_m, P_c, Z, T)$$
<sup>(4)</sup>

This equation can then be written also as shares in Y rather than levels to give us the demand function commonly used in many empirical studies (Smith, 1989, 1995).

To provide an estimable demand function, the income variable needs to be specified, and the political and strategic effects quantified. As in most developing countries, specific data on military prices is not available and the share of military spending in GDP (the military burden) is expressed as a function of GDP, of various other economic and strategic variables, and of political variables such as the type of regime. Population is also included to pick up possible public good effects.

Strategic factors can be dealt with in a number of ways. Firstly, following Murdoch and Sandler (2002, 2004), by introducing the military spending of neighbours, to consider spillovers. The effects of alliances in the case of allies and of arms races in the case of enemies. In Egypt's case, a positive sign on Jordan and Syria's military spending would suggest some 'alliance' effects, while a negative sign would suggest free riding (Chen, Feng and Masroori, 1996). A positive sign on Israel's military spending would suggest some form of arms race. Secondly, following Rosh (1988) and Dunne and Perlo-Freeman (2003a), the level of external threat can be proxied by looking at the country's 'Security Web', defined as all of its neighbours, and any other powers that may be able to affect the country's security. Rosh calculates the degree of militarisation of a nation's Security Web by averaging the military burdens or military spending of those countries in the web. Thirdly, following Dunne and Perlo-Freeman (2003a) by introducing an External War dummy (EW) taking the value one when the country was engaged in an all-out war and zero otherwise. Finally, it is widely found that democratic countries spend less on the military than non-democracies (e.g. Rosh, 1988; Maizels and Nissanke, 1986). Autocratic states are more likely to rely at least partly on the military to retain power, along with

a culture and ideology of militarism to justify its rule. Totalitarian states are also more likely to be able to maintain unjustifiable and inefficient levels of spending by the military and other government departments in pursuance of the interests of a public elite rather than the country as a whole. The political system in Egypt certainly has autocratic features that have changed over time. Rather than creating simple dummy variables to reflect political systems, the POLITYIV database was used to construct a variable that reflects the degree of democracy/autocracy in a range of -10 (perfect autocracy) to +10 (perfect democracy). The data for Egypt is presented in Figure 2.

Recent cross country studies have shown the importance of introducing the strategic factors. For a large sample of developing countries, Dunne and Perlo-Freeman (2003a, b) estimated crosssection demand functions using average data for Cold War (1981-88) and post-Cold War (1990-97) periods. They found little evidence of a change in the underlying cross-section relationship with the end of the Cold War, but when a dynamic model was estimated on an unbalanced panel of annual data there was evidence of structural change. They find that it is in fact the military expenditure of rivals (Potential Enemies in their classification) that is of particular importance in determining military spending. They also question the interpretation of arms race models arguing that threat can be capability and intention, but that most studies measure only capability and so do not tell us about arms races in the conventional sense. This point is made for the case of India and Pakistan by Oren (1994), who introduces an index of hostility, based on events data and finds that the level of hostility significant and positive, but that the military spending reaction coefficients are actually negative.

A different approach was taken by Collier and Hoeffler (2002) who used a pooled static panel of five-year averages with a range of strategic variables. They found the effect of neighbour's military expenditure to be quite large, meaning that increases in military expenditure are escalated among neighbours, making them a regional public bad.

Using a cointegrating ARDL approach, Nikolaidou (2008) estimates demand equations for the 12 largest EU countries separately, finding that the differences between the results suggest that panel methods might not have been appropriate. This implicitly suggests that developing case study analysis is particularly important. In a case study of Greece, Kollias and Paleologou (2003) follow the usual modelling path, but put particular emphasis on incorporating variables that reflect the domestic political changes.

It has become apparent that case studies of particular countries do need to have some understanding of the political history of the country, both to be able to construct relevant strategic variables, from available data and to provide some context for interpretation of the results (Batchelor, Dunne and Lamb, 2002). A brief outline of Egypt's history is provided in the next section.

### 3. Military Spending and Strategic and Political Events

Military spending in Egypt has seen several episodes of expansion and contraction that were related to the political and military developments in the region. A summary of the major events that have shaped the pattern of military spending of Egypt is presented in Table 1. The starting point for the modern Egyptian state was the 1952 revolution that was led by the *Free Officers Movement*, following the defeat of the Arab and Egyptian troops in Palestine in 1948 (Helal, 2005). After two years as President, General Mohamed Naguib was replaced by Abdel Nasser in 1956, who maintained what was in essence a military government. Military officers made up 64.4% of the cabinet and, with one exception, the Prime Ministers were military

officers. The political system obtained legitimacy from the charismatic personality of Abdel Nasser and his relation with Egyptian and Arab citizens. His popularity increased after the victory over the tripartite attack by England, France and Israel in 1956 and the nationalization of the Suez Canal (Helal, 2005).

Egypt and Syria signed a coalition agreement in 1958, which established the United Arab Republic that lasted until 1961 and, as Figure 1 indicates, Egypt's military burden rose until 1965. Despite a decline in military burden in 1965-67, the general pattern was rapidly rising military burden till 1974, reflecting a number of security threats and military adventures. The military intervention of Egypt in Yemen began in September 1962 and led to heavy losses for Egypt. In April 1967, there were serious Israeli-Syrian air clashes over Syrian air space and Nasser asked the UN to remove the UNEF from the Egyptian-Israeli frontier in Sinai and declared he was closing the Strait of Tiran to Israeli shipping. Jordan and Iraq signed defence agreements with Egypt and in June Israel launched a full-scale attack on Egypt, Jordan, and Syria. In three hours, at least 300 of Egypt's 430 combat aircraft were destroyed, many on the ground, as the pilots did not have time to take off. By June 11, the Arab defeat was total; Israel now held all of historic Palestine, including the Old City of Jerusalem, the West Bank, and the Gaza Strip, as well as Sinai and part of the Golan Heights of Syria (Abu-Qarn and Abu-Bader, 2009).

Hostilities continued in January 1969, with the War of Attrition against Israel as Egypt started an intensive eighty-day bombardment along the Suez Canal (Elsaiid, 1977). While Israeli positions along the Bar-Lev Line survived the attack, they suffered heavy damage and the Egyptian forces then undertook commando raids on the line itself and against Israeli patrols and installations. Israel then launched reprisals that included bombing raids against military and strategic targets deep in the interior of Egypt. The United Nations attempted to facilitate a ceasefire and to broker peace negotiations and, in August 1970, a cease-fire negotiated by the United States with Soviet support ended the fighting.

In September 1970 Nasser died and Sadat became president, heralding a move towards democracy and a more open foreign policy. In particular, Egyptian politicians pushed forward a new peace initiative and, on February 4 1971, Sadat announced a new peace initiative that contained a significant concession: a willingness to accept an interim agreement with Israel in return for a partial Israeli withdrawal from Sinai. A timetable would then be set for Israel's withdrawal from the rest of the occupied territories in accordance with UN Resolution 242. Egypt would reopen the canal, restore diplomatic relations with the United States, which had been broken after the June 1967 War, and sign a peace agreement with Israel. Sadat's initiative fell on deaf ears in Tel Aviv and in Washington, as the United States was not well disposed to assisting the Soviet Union's major client in the region. In October 1973 Egyptian troops crossed the Suez Canal after an Air Force strike against the Israeli Forces positions in Sinai and destroyed the Israeli defences, the "Barlev Line", in the occupied territories. This victory was seen as paving the way for peace negotiations towards a permanent cease-fire, which began in December 1973 (Schulze, 2008).

Sadat used the October war as a political key to open and maintain diplomatic processes and sought the help of the U.S. to return the Sinai region (Stein, 1997). Kissinger started diplomatic peace negotiations between Egypt and Israel in 1974, but little progress was made until Sadat made a historic visit to Jerusalem in 1977 and the Camp David treaty was signed in Washington in 1979. Israel agreed to withdraw from Sinai within three years of the treaty; normal diplomatic and trade relations were to be established, and Israeli ships would be allowed to pass unhindered through the canal. Egypt, would, however, not have full sovereignty over Sinai and a multinational observer force would be stationed there, with the United States monitoring events. This treaty officially ended the state of enmity between the two countries (Schulze, 2008). Between 1974 and 1981 the share of military spending in GDP fell from its high of 56% to 14%.

On the 6<sup>th</sup> of October 1981, President Sadat was assassinated by elements opposing his policy and Hosni Mubarak, Sadat's handpicked successor, was elected president. He continued the "open door" economic policy and announced that opposition political parties would be allowed to organize, but slowly. In addition, he announced the application of a plan for the technological improvement of the Egyptian armed forces, which seems to have slowed the decline in military burden for a few years, but did not halt it (Rubin, 2001).

Egypt's economic situation showed some improvement in the early 1990's with the U.S. erasing \$7 billion in military debt, after Egypt's help in the 1991 Gulf War and other bilateral lenders following suit. IMF-sponsored reforms saw the budget deficit and inflation reduced and debt servicing improved. Privatization continued to be slow, partly because of state-owned enterprises' debts and overstaffing. Although the Israeli front remained quiet after the signing of the peace treaty, Egypt's security concerns continued and military spending increased a little to secure both internal and external borders (Cordesman, 2004). Domestic terrorist attacks by Islamic militants were launched occasionally and caused severe losses to tourism, Egypt's most lucrative export sector. The September 11, 2001 attacks added to the grim outlook for tourism and consequently slowed the growth of the Egyptian economy.

Throughout the post-peace treaty period, Egypt continued its strategy of peace and the maintenance of security and became a major recipient of U.S. military aid to modernise its forces, with Egypt's armed forces retaining considerable social and economic power. A diminishing demand for military goods and ammunition led to the military working with government officials to attempt the conversion of military factories to more civil production, to create more profits and employment opportunities (Khilji, 2005; Rubin, 2001). The fact that Egypt is at peace with Israel remains a major factor for stability in the region. As figure 3 shows the active Egypt and Israeli military manpower was relatively constant 2007-2009, in contrast to Egypt's military burden which decreased from 2.5% in 2007 to 2.1% in 2009 (SIPRI, 2010). In 2009, Egypt's defence budget was still the largest among Israel's neighbours (4.4 billion USD), but substantially lower than Israel (14.7 billion USD). With the changing political situation in the Middle East region, the existence of well based and armed groups, such as Hezbollah, and the Iranian threat, Israeli's defence budget is changing. While this does put some pressure on neighbours to maintain the military balance in the region, Egypt does not seem to have felt threatened as there was no significant increase in military spending between 2007 and 2009. The recent Arab Spring movements, the fall of Mubarak in January 2011 and the decisive victory of the Muslim Brotherhood Movement in the parliamentary and presidential elections have changed the political and military environment in Egypt and introduced a period of strategic uncertainty in the region.

#### 4. Empirical Analysis

For this study, the empirical specification of the model was a general first order dynamic version of:

$$MIL = F(Y, \sum_{i} MIL, POP, Z)$$
(5)

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where MIL is the log of military burden/real military spending in constant 2000 prices in US dollars; Y, log constant 2000 price GDP in US dollars;  $\sum$  MIL the military burden/military spending of other countries, in this case Israel, Jordan and Syria; POP, log of population; and Z, other political and strategic variables such as the POLITY variable discussed above, net exports to GDP ratio (XMY), measure of military burden/military spending for Egypt's Arab allies, Jordan and Syria, both separate and aggregate and policy change dummy variables. Data for 1960-2009 was collected from several sources, including the World Bank's World Development Indicators (WDI) online database, SIPRI online, and Abu-Qarn and Abu-Bader (2009).

Estimating equation (5), gave the results in Table 2, using both the military burden and level of military spending. The over-specified equation suggested evidence of persistence of military burden/spending and little else, since the only significant coefficient was of the lagged military measure of Egypt. While the diagnostic tests did not suggest problems of serial correlation (Lagrange multiplier test), normality (skewness and kurtosis) or heteroscedasticity (squared residuals on squared fitted values), there was evidence of functional form problems (Ramsey reset test). Undertaking variable deletion tests led to the exclusion of the military burden/spending of Jordan and Syria's, population, polity and the lagged variables of GDP, and of net exports.

The results for the parsimonious specification in Table 3 suggest that the military burden/spending in Egypt is mainly determined by an autoregressive (AR) process, but with some important economic and strategic factors. An increase in GDP decreases the military burden (note that this implies a positive effect of GDP on the level of military spending) while an increase in the share of net imports reduces the military burden. While there is no evidence that the military burden of Egypt's allies, Jordan and Syria affects its military burden, Israel's military burden has a positive but insignificant effect and a significant positive effect in the levels equation. US military burden was also considered, but was found to be insignificant and is not included in the results presented here.

The functional form problem indicated by the Reset test in Table 2 remains with the new specification and plotting the results indicated a number of extreme values which might explain this. These 'outliers' do seem to be consistent with particular important strategic events, the 1966-7 outlier reflecting the 1967 war with Israel and Egypt's involvement in the North Yemen civil war and the 1988 one the return to Camp David and the return to Egypt of the town of Taba. When dummies for these years were added, the functional form test was no longer significant and the dummies were significant and negative, with little change in the other coefficient estimates.

Consulting the residuals again suggests two further extreme values remain, both of which again reflect important events. One was 1978, the mid-point between Sadat's visit to Israel in 1977 and the peace talks at Camp David in 1979 that provided a framework for peace between Israel and Egypt and led to a treaty that saw Israel withdraw from Sinai in the same year. A second was 1976, the year after Israel agreed to withdraw and a buffer zone was set up in Sinai and the build-up to Sadat's visit to Israel. Sadat also visited the US in 1975, moving away from Soviet influence, liberalised the economy, encouraged FDI and released political prisoners.

All of the impulse dummies that were found to be negative and significant are presented in Table 4 alongside the variables that remained from variable deletion tests. What is striking about the impact of the dummies is that they reduce the size and significance of the coefficients on Israel's military burden/spending and increase the size and significance of those on the lagged dependent variables. In addition, the high military burden/spending in Egypt clearly has some institutional rigidity, with the share of military expenditures in GDP and the level of military expenditures in a given year heavily influenced by what it was the previous year. The Polity 2 variable that reflects changes in the political system is not significant, which could result from the fact that this indicator was relatively stable. Military burden is affected by economic factors, with increases in output generally leading to a decline in military burden, although this does not necessarily imply a decrease in the level of military spending, while increasing net imports also tends to have a negative impact. While there is no evidence of any alliance effects for Jordan and Syria, the coefficient on Israel's military burden remains positive but is insignificant once the dummy variables are included. This suggests that Israel's military burden is a poor indicator of the strategic environment and that more detailed strategic information is needed to explain the pattern of military spending/burden.

These are interesting findings, but there remain some concerns. First, the possibility of structural breaks in the military spending/burden data. Using the Bai and Perron (2003) test for multiple endogenous structural breaks, gave the results in Table 5. Several alternatives were considered and the results verified that the military burden/spending of Egypt exhibit several breaks all of which correspond to important strategic and political events that shaped Egypt's pattern of militarization. As an example the year of Sadat's historical visit to Israel (1977) appears under most specification as a likely structural break. Incorporating the likely break dates from the test into the regression gave the results in Table 6, which confirm the previous results and reinforce the conclusions that Egypt's military spending is determined by both economic and strategic factors. While the coefficient on net exports is significant for the military burden specification, it fails to enter the level of military spending equation significantly. Israel's burden/spending is now positive and significant as hypothesized and is the only significant

explanatory variable coefficient in the level of military spending equation. As before, the level/burden of the Arab adversaries of Israel were not significant factors, individually, for Jordan and Syria, or jointly as reported in Table 6.

As a further robustness check, the long-run determinants of the demand of military spending of Egypt were investigated using cointegration methods. Firstly, testing whether the relevant variables are stationary or have unit roots, using the Augmented Dickey-Fuller (ADF) unit root tests for both levels and first differences, gave the results in Table 7. These show all variables are to be I(1), i.e. have a unit root, meaning there is a possibility of a long-run relationships between the variables. Secondly, three single-equation methods; Fully Modified OLS (FMOLS), Dynamic OLS (DOLS), and Canonical Cointegrating Regression (CCR) were employed to identify the relevant cointegrating relations. These methods, which eliminate the long run dependence between the cointegrating equation and stochastic regressors innovations, gave the results in Table 8 and show Egypt's military spending/burden to be strongly related to the level of GDP and Israel's level/burden of military spending. These results are in tandem with our previous findings, with once again the individual and combined military spending/burden for Syria and Iraq failing to play a significant role in the determination of Egypt's military spending/burden. Similar results were obtained when the likely endogenous structural breaks were used in the estimation of the cointegration equations, as shown in Table 9. Compared with the results of Table 8, the significance of coefficient on Y is lower and less significant in explaining the level of military spending is reduced. As a final robustness test the Johansen (1988) method was used, to estimate the model without structural breaks. This approach allows for the possibility of more than one multiple cointegrating relations, but the tests only suggested the existence of one and the results were consistent with the single equation cointegration methods (see Appendix A)

Overall, the empirical results suggest that military burden/spending has a very high institutional inertia and, while effected by economic concerns and possibly some reference to Israel's military burden, is greatly influenced by specific changes in the security environment. These results were relatively robust, being consistent across a number of estimation methods. They would seem consistent with the argument of Dunne et al (2008) that arms race models in the usual sense, using military spending of the protagonists, are only dealing with capability and not with hostility. This suggests that more work needs to be done to find suitable measures of security perceptions and that this will need to move beyond the Polity variables which failed to achieve significance.

#### 5. Summary and Conclusions

Understanding the determinants of military spending Egypt is an important task. It provides information on a key player in the Middle East region and Africa and constitutes a valuable case study to add to the growing literature. This paper has attempted to provide a detailed analysis of the economic and strategic factors that drive military spending in the country. In considering the historical background it illustrated the rather 'interesting' history of a country heavily engaged in the Middle East turmoil, large changes in military burden over the last five decades, and an important role for the military throughout.

Estimating an empirical demand model on data using World Bank and SIPRI sources produced an interesting model in which both economic and strategic factors play a role in determining military burden. A simple model seemed to work well. There were clear positive effects of lagged military burden, suggesting some sort of institutional inertia, plus negative output and net exports effects. The results for the strategic factors are interesting. While the military spending/burdens of Egypt's allies Jordan and Syria were not significant (individually or jointly), Israel's military burden had a mostly positive and significant coefficient. When analysis of the residuals showed outliers that correspond to important strategic and political events and these were used to construct impulse dummy variables for the respective years, the coefficient on Israel's military spending/burden became insignificant. This suggest that Israel's military spending/burden might be a useful general indicator of the strategic environment, but that there are important strategic events that better explain the pattern of Egypt's military spending. Checking the robustness of the results by testing for endogenous structural breaks and incorporating them into our demand equations of Egypt, gave consistent results. Using several cointegration techniques (FMOLS, CCR, DOLS and Johansen) to uncover the long-term determinants of military spending of Egypt underlined the robustness of the results.

While our findings seem robust the analysis does suggest that further research is needed to consider how to measure changes in the security environment in a more sophisticated way, that reflects the intentions of protagonists rather than just their changing relative strength. One possible route for a future study is to follow Kollias and Paleologou (2003) in introducing domestic political and electoral variables.

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Table 1 - Major	Strategic and	<b>Political Events</b>
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Year	Events
1952	The Egyptian revolution - adopt six main principles one of which is the establishment of a
	strong national army.
1954	Egypt signed the withdrawal agreement with the U.K.
1955	A National Military Service Law was enacted, aiming to reform and upgrade the armed
	forces and a treaty with Czechoslovakia to supply modern weapons.
1956	British troops withdraw from Egypt in July 1956 and the Suez Canal is nationalized,
	leading to the tripartite aggression by England, France and Israel and the move to build
	strong national army.
1962	In September the Egyptian Army intervenes in Yemen civil war
1963	Egyptian troops in Yemen rise from 20,000 in 1963 to 70,000 by 1965, but fail to defeat
	the royalists.
1966	Egypt and Syria signed a five-year defence pact. Israeli forces destroy Assamu' in
	Jordan's West bank as retaliation for increasing Palestinian guerrilla raids.
1967	Arab-Israeli war
1970	Cease-fire negotiated by the United States with Soviet support in August. Sadat,
	succeeded Nasser in September.
1971	Sadat peace initiative fails and leads to end of ceasefire.
1972	Internal problems and preparations for war.
1973	Egyptian assault on Israeli defences in Sinai. Permanent ceasefire in December.
1974	The first disengagement agreement was signed separately by Sadat and Golda Meir.
1975	The second disengagement agreement between Egypt and Israel.
1977	Sadat visits Jerusalem.
1979	Camp David treaty signed in Washington.
1981	Sadat was assassinated by some elements opposing his policy.
1982	Hosni Mubarak, Sadat's hand-picked successor, is elected president.
1991	The U.S. forgives \$7 billion in military debt after Egypt's help in the Gulf War.
1997	Attack on tourists by Islamic militants at Luxor.
2001	Fallout from 9/11.

Independent Variable: Log of Egypt's				
	Military Burden	Military Spending		
Intercept	1.58	3.41		
	(0.66)	(1.43)		
MIL_EGY(-1)	0.77	0.72		
	(7.63)	(6.14)		
Y_EGY	-0.59	0.99		
	(-0.51)	(0.69)		
$Y_EGY(-1)$	-0.05	-1.27		
	(-0.06)	(-1.14)		
XMY_EGY	-0.05	-0.08		
	(-1.03)	(-1.24)		
XMY_EGY(-1)	-0.03	-0.06		
	(-0.57)	(-0.85)		
MIL_ISR	-0.05	0.20		
	(-0.32)	(1.13)		
MIL_JOR	0.086	-0.05		
	(0.58)	(-0.28)		
MIL_SYR	0.24	0.16		
	(1.60)	(1.00)		
MIL_ISR(-1)	0.01	-0.05		
	(0.11)	(-0.26)		
MIL_JOR(-1)	0.07	0.1		
	(0.46)	(0.59)		
MIL_SYR(-1)	-0.13	-0.11		
	(-0.80)	(-0.61)		
Population EGY	1.34	0.02		
	(0.87)	(0.01)		
POLITY2	-0.03	-0.01		
	(-0.67)	(-0.28)		
R <sup>2</sup> Adjusted	0.988	0.896		

# Table 2 – General First Order Dynamic Model

**Variables:** MIL – log of military burden/military spending for Egypt (EGY), Israel (ISR), Jordan (JOR), and Syria (SYR); Y – log GDP; XMY – log of net exports in GDP; POLITY2– polity index. t-stat is in parentheses. ٠

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Independent Variable: Log of Egypt's				
	Military Burden	Military Spending		
Intercept	3.24	4.06		
	(3.11)	(3.72)		
MIL_EGY (-1)	0.83	0.74		
	(11.57)	(8.44)		
Y	-0.27	-0.29		
	(-2.98)	(-3.19)		
XMY	-0.08	-0.10		
	(-2.28)	(-2.41)		
MIL_ISR	0.09	0.17		
	(1.27)	(2.25)		
R <sup>2</sup> Adjusted	0.99	0.91		

Table 3 – Model with Variables Deletion

• **Variables**: MIL – log of military burden/military spending for Egypt (EGY), Israel (ISR); Y – log GDP; XMY – log of net exports in GDP.

• t-stat is in parentheses.

Independent Variable: Log of Egypt's				
	Military Burden	Military Spending		
Intercept	1.98	2.52		
	(2.67)	(2.68)		
MIL_EGY(-1)	0.94	0.89		
	(18.28)	(11.63)		
Y	-0.16	-0.17		
	(-2.53)	(-2.26)		
XMY	-0.07	-0.07		
	(-2.60)	(-2.08)		
MIL_ISR	0.02	0.05		
	(0.39)	(0.85)		
D66-7	-0.30	-0.33		
	(-4.37)	(-3.49)		
D76	-0.30	-0.21		
	(-3.20)	(-1.63)		
D78	-0.35	-0.33		
	(-3.82)	(-2.53)		
D88	-0.42	-0.44		
	(-4.58)	(-3.38)		
R <sup>2</sup> Adjusted	0.99	0.94		

# Table 4 – Estimation with Year Impulse Dummy Variables

• Variables: MIL – log of military burden/military spending for Egypt (EGY), Israel (ISR); Y – log GDP; XMY – log of net exports in GDP; Dxx – impulse dummy variable for year xx.

• t-stat is in parentheses.

Model	No trend	Linear trend	Quadratic trend	
	$y = c_0 + \varepsilon$	$y = c_0 + c_1 t + \varepsilon$	$y = c_0 + c_1 t + c_2 t^2 + \varepsilon$	
Military Spending	1968 1977 1987	1965 1971 1977	1965 1977 1983 1989	
Without explanatory	2000	1987	1996	
variables				
With explanatory	1965 1974 1987	1969 1977 1987	1969 1977 1987	
variables				
<u>Military Burden</u>	1968 1977 1987	1965 1973 1979	1965 1971 1978 1987	
Without explanatory	1994 2003	1987 2000	2000	
variables				
With explanatory	1965 1971 1977	1965 1974 1980	1965 1974 1980 1987	
variables	1983 1989 1999	1987 1995	1995	

Table 5 - Bai and Perron (2003) Endogenous Structural Breaks for Egypt

• Estimation with a minimum of 6 years between breakpoints.

• The number of likely breakpoints is based on BIC.

• Other Xs include burden (level) of Israel, Arab burden (level), and Egypt's GDP.

Independent Variable: Log of Egypt's				
	Military Burden	Military Spending		
Intercept	23.24	5.78		
	(3.39)	(0.85)		
Y	-2.28	-0.17		
	(-3.20)	(-0.24)		
XMY	0.13			
	(2.19)			
MIL_ISR	0.35	0.44		
	(1.97)	(3.30)		
MIL_ARA	0.24	0.17		
	(0.93)	(0.73)		
Trend	0.09	-0.00		
	(2.40)	(-0.09)		
R <sup>2</sup> Adjusted	0.97	0.84		

# Table 6 – Estimation with Year Step Dummy Variables

• **Variables**: MIL – log of military burden/military spending for Egypt (EGY), Israel (ISR), Arab (ARA); Y – log GDP; XMY – log of net exports in GDP; Dxx – step dummy variable that takes the value of 1 from year xx onwards and zero otherwise.

• t-stat is in parentheses.

Table 7 –	ADF	Unit	Root	Test
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	Level	First Difference
Log GDP per capita	-2.40	-3.94
	(0.38)	(0.00)
L	og Military Burden o	f
Egypt	-2.71	-4.71
	(0.24)	(0.00)
Arab	-1.71	-6.85
	(0.73)	(0.00)
Israel	-2.42	-7.84
	(0.36)	(0.00)
Jordan	-1.86	-8.20
	(0.66)	(0.00)
Syria	-1.78	-7.16
	(0.70)	(0.00)
Lo	g Military Spending	of
Egypt	-2.68	-5.19
	(0.25)	(0.00)
Arab	-1.65	-5.96
	(0.76)	(0.00)
Israel	-1.80	-6.53
	(0.69)	(0.00)
Jordan	-1.88	-7.38
	(0.65)	(0.00)
Syria	-1.67	-6.45
	(0.75)	(0.00)

The level equation includes an intercept and trend while the first difference equation includes only an intercept. Optimal lag length is based on AIC. •

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P-value is in parentheses. •

Independent Variable: Log of Egypt's **Military Burden Military Spending** Method **FMOLS** FMOLS CCR DOLS **FMOLS** FMOLS CCR DOLS Intercept 38.24 33.7 36.62 57.47 32.81 30.96 29.29 55.52 (6.29)(7.51)(14.37)(3.80)(9.07) (7.01)(6.37)(5.89)Y -3.93 -3.45 -3.75 -5.84 -3.21 -3.06 -2.83 -5.48 (-6.85)(-6.25) (-7.41)(-14.22) (-4.87)(-5.86) (5.24)(-8.48)0.50 0.54 MIL\_ISR 0.52 0.50 0.83 0.43 0.39 0.40 (3.00)(4.40)(3.29) (3.60)(3.08)(5.15)(2.98)(2.55)0.29 040 -0.27 0.41 MIL\_ARA 0.40 0.46 (1.82)(1.63)(-1.09) (1.87)(2.19)(1.14)MIL\_JOR 0.23 0.37 (1.23)(1.99)MIL\_SYR 0.22 0.03 (1.12)(0.15)Trend 0.16 0.13 0.12 0.11 0.24 0.15 0.23 (5.36) (5.74)(11.71)(3.80)(4.39)(3.89) (7.39)R<sup>2</sup> Adjusted 0.95 0.95 0.95 0.99 0.75 0.77 0.77 0.94

 Table 8 – Cointegration Tests

• **Variables**: MIL – log of military burden/military spending for Egypt (EGY), Arab (ARA), Jordan (JOR), Israel (ISR), Syria (SYR); Y – log GDP.

• t-stat is in parentheses.

• Net exports of GDP was not found to be significant in any of the specifications.

Independent Variable: Log of Egypt's						
	Military Burden			Military Spending		ing
Method	FMOLS	CCR	DOLS	FMOLS	CCR	DOLS
Intercept	17.23	20.71	97.22	6.24	6.95	53.59
	(2.09)	(2.56)	(14.83)	(0.91)	(0.82)	(11.92)
Y	-1.59	-1.93	-9.94	-0.24	-0.31	-5.65
	(-1.86)	(-2.39)	(-14.57)	-0.34)	(-0.37)	(-11.78)
MIL ISR	0.55	0.71	0.58	0.48	0.49	0.81
_	(2.62)	(2.27)	(4.04)	(3.48)	(2.89)	(8.74)
MIL ARA	0.01	-0.16	-0.50	0.17	0.14	0.34
_	(0.03)	(-0.35)	(-2.29)	(0.73	(0.42)	(2.68)
Trend	0.04	0.05	0.41	-0.00	0.00	0.24
	(0.95)	(1.39)	(12.62)	(-0.04)	(0.05)	(10.85)
R <sup>2</sup> Adjusted	0.96	0.96	0.99	0.83	0.83	0.97

 Table 9 – Cointegration Tests (with Endogenous Structural Breaks)

• Variables: MIL – log of military burden/military spending for Egypt (EGY), Israel (ISR), Arab (ARA); Y – log GDP.

• t-stat is in parentheses.

• Net exports of GDP was not found to be significant in any of the specifications.

# Appendix A

As can be seen in Table 10, the results of the cointegration test confirm the previous findings; GDP, military burden/spending of Israel and other Arab adversaries of Israel, and net exports in GDP all play a pivotal role in determining Egypt's military expenditures. The significant positive coefficient of Israel's spending indicates that Egypt and Israel are involved in a military race. Spending of other Arab adversaries of Israel negatively affects Egypt's spending and would imply alliance effect among Arab countries.

Independent Variable: Log of Egypt's				
	Military Burden	Military Spending		
VAR optimal lag	4	4		
# of cointegrating equations	4	4		
Normalized	l cointegration equa	tion		
Y	-11.25	-10.76		
	(-4.28)	(-3.67)		
MIL ISR	3.58	2.29		
_	(4.21)	(3.63)		
MIL ARA	-3.41	-1.99		
	(-3.63)	(-2.66)		
XMY	-0.91	-1.14		
	(-2.01)	(-2.49)		
Trend	0.41	0.50		
	(2.92)	(3.17)		

## **Table 10 – Johansen Cointegration Tests**

• **Variables**: MIL – log of military burden/military spending for Egypt (EGY), Israel (ISR), Arab (ARA); Y – log GDP; XMY – log of net exports in GDP;

- VAR optimal lag order according to AIC
- Testing with constant and trend in the cointegration equation
- t-stat is in parentheses.



Figure 1- Military Burden (BUR) for Egypt and Neighbours

Figure 2: Polity 2 Values for Egypt





Figure 3: Egypt and Neighbours Comparative Manpower

Source: SIPRI (Various Issues)