PIDS

Journal of Philippine Development
Number Thirty-Two, Volume XVIII, No. 1, 1991

PIDS

ECONOMIC GROWTH AND DEFENSE SPENDING: EVIDENCE ON CAUSALITY FOR SELECTED ASIAN COUNTRIES*

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1. INTRODUCTION

In the last decade increasing attention has been focused on the role of military expenditures in developing countries. One reason for this is that world military expenditures in 1987 exceeded one trillion US dollars for the very first time; developing countries accounted for approximately 17 percent of this total. Despite the steady growth in defense spending, scholars, for the most part, know little about the effects of military spending on the local economy. As Saadat Deger (1986: 3) recently noted: "The numbers are mind-boggling; . . . But what is clear is that it is essential to study, analytically, the economic dimensions of military expenditure in less developed countries (LDCs) and carefully evaluate the costs and benefits involved. . . . the economics of militarization are crucial."

Another reason for the increased awareness of military expenditures is that developing countries have had to recently scrutinize the size of overall budgets, especially the defense component. In many cases the resource base has declined but the needs from other sectors of the economy have concomitantly increased. In many instances, defense expenditures have replaced high priority development projects with little knowledge on the part of governments as to the impact of such a decision.

Much of the current research in the field of defense economics can be attributed to the early work of Emile Benoit (1978) who concluded that, contrary to popular opinion, developing countries which had higher defense burdens (defense spending as a percentage of Gross National Product (GNP)) usually had higher rates of economic growth. This result was diametrically opposite to the usually-held belief that increases in defense spending meant lower growth; scarce resources were siphoned away from more productive uses elsewhere in the economy.

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*An earlier version of this paper was presented in 1989 at the Institute for Strategic and International Studies, Kuala Lumpur. I wish to thank two anonymous referees for making valuable suggestions.

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In the last decade, other aspects of defense spending in developing countries have received closer attention. Some of these areas are:

- how military spending affects rates of savings and investment, and consequently prospects for future growth;
- the economic and noneconomic determinants of defense spending;
- the determinants of arms industries;
- the production of major weapons systems by only certain developing countries;
- the discernible effects (both economic and noneconomic) of civilian versus military regimes; and
- human capital formation and development in the military.[1]

In a recent paper, Looney and Frederiksen (1990) examined the determinants of defense spending in six Asian countries: the Philippines, Indonesia, South Korea, Malaysia, Thailand, and Singapore. Their research suggested that economic variables and resource availability were the main determinants of military expenditures in these six countries. The purpose of this paper is to test, for the same set of countries, the widely-held hypothesis that the direction of causality is *from* military expenditures *to* economic growth, i.e., that defense spending can in fact "cause" economic growth. The alternative hypotheses are that (a) economic growth precedes defense spending, thereby allowing countries to increase defense outlays; (b) no relationship exists; or (c) a feedback loop exists whereby defense leads to growth which, in turn, leads to more defense, etc. The working hypothesis for this paper is that, *a priori*, one cannot specify the direction of causality for any individual country. In addition to testing the usually assumed hypothesis of defense to growth, this paper goes on to (a) extend the preliminary results obtained by Frederiksen and LaCivita (1987) on causality in the Philippines which originally appeared in this *Journal*; (b) extend the results obtained in LaCivita and Frederiksen (1991) from 1982 to 1988 for the Philippines and Thailand; and (c) include comparative research results for Indonesia,[2] Malaysia, Singapore, and South Korea.

THE CAUSALITY ISSUE

Most studies to date have assumed that defense spending is an exogenous variable and, thus, "causes" economic growth. In other words, the models which have been tested have specified economic growth as the

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1. For an excellent review see Deger (1986) and Lindgren (1988).
2. The results for Indonesia converting the period 1964-85 are reported in Frederiksen (1989). The results for Indonesia in this paper cover the period 1961-88.

dependent variable. Governments undertake military expenditure programs; and, presumably at some (unspecified) time in the future, the economy would either benefit or suffer as a result of this spending. Most of the studies in the 1980s focused on whether the effect was positive, neutral, or negative (see Deger 1986). The widely-held belief regarding the exogeneity of defense spending originated with Benoit. In his seminal paper, he recognized that the direction of causality could be either from defense to growth or from growth to defense. As Benoit noted:

> A question arose, however, about the direction of this interaction. Might not the correlation be explained by the influence of growth rates on defense expenditures rather than vice versa? Countries with rapid growth might feel better able to indulge themselves in the luxury of elaborate defense programs. . . . These plausible hypotheses did not appear to be supported by the evidence. . . . Thus growth appeared to exert only a weak influence on defense burdens. (Benoit 1978: 275-76)

The assumed exogeneity of defense has recently been challenged by Joerding (1986) who examined data for 57 countries and concluded that defense expenditures were not strongly exogenous. Whether or not defense spending promotes economic growth is important for those developing countries searching for ways to improve economic performance—or at least to spend so as not to retard economic growth. Joerding's work is undoubtedly an important contribution to the literature. But as was pointed out in Frederiksen and LaCivita (1987) and LaCivita and Frederiksen (1991), there are two major criticisms of Joerding's work. First, Joerding lumps all countries into one sample. This suggests that if a causal relationship exists it is common to all countries. It is quite likely that in some countries defense causes growth, in others growth causes defense, and yet in others a feedback relationship or even no relationship exists. The second point is that Joerding assumed a common and arbitrary four-year lag structure on the defense and growth variables in his pooled set. It is reasonable to assume that the lag structure might differ from one country to another depending on the structure of the economy, the type of defense spending, and the like.

In Frederiksen and LaCivita's study (1987) of the Philippines during 1956 and 1982 they used Joerding's procedure (explained more fully below) to test for causality. No statistically significant relationship was found to exist between defense and growth when the lagged values for the variables were arbitrarily chosen to be four years. When the model was re-estimated with an arbitrary lag value of two, it was found that growth causes defense. These initial results suggest that, since both of the lag structures tested (two and four years) were chosen arbitrarily, one cannot say which is the correct specification.

DATA SOURCES

The primary data source[3] on Gross Domestic Product (GDP) and on the rate of growth of real GDP (except for Malaysia between 1961 and 1970) was the International Monetary Fund's (IMF) *International Financial Statistics Yearbook.* The *Yearbook: 1984* was used for data up to 1959, the *Yearbook: 1990* for data between 1960 and 1980, and the *Yearbook: 1991* for the period 1981-88. Defense expenditures were drawn from the United Nation's *Statistical Yearbook* (annual issues through to 1983/84). The rate of growth of real GDP was not reported by the IMF for Malaysia between 1961 and 1970. A series was constructed using the nominal GDP adjusted for inflation/deflation by the Consumer Price Index (CPI). The defense burden through to 1983 (for all countries except Singapore and Indonesia) was calculated as the percentage of GDP allocated to defense expenditures. The defense burden data for the remaining years (1984-88) were reported by the United States Arms Control and Disarmament Agency (ACDA) in *World Military Expenditures and Arms Transfers* (annual issues). A comparison of several overlapping years (Appendix A) indicated similar ratios for the military burden whatever the source used.[4] Defense expenditures for Malaysia between 1969 and 1985 were taken from the Institute of Southeast Asian Studies' *Defense Spending in Southeast Asia,* (1987). The defense burden for Singapore was derived exclusively from ACDA data. The defense burden for Indonesia for the period 1961-66 was reported by the Stockholm International Peace Research Institute's (SIPRI), *SIPRI Yearbooks on World Armaments and Disarmament.* The remaining years were drawn from USACDA.

The following sections describe, respectively, the methodology by which the optimal lag length and correct direction of causality were calculated *and* the empirical results for the Philippines (1956-88), Thailand (1956-88), South Korea (1955-88), Malaysia (1961-88), Singapore (1967-88), and Indonesia (1961-88).

METHODOLOGY

Hsiao (1981) has developed a systematic method for choosing lag lengths to avoid the problems associated with arbitrary lag lengths. His method combines Granger causality and Akaike's final prediction error (FPE). Initially a series of regression equations is estimated on the depend-

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3. The data used in the study appears as Appendix A, Tables A1-A6.

4. Since the tests are more robust with longer periods, we feel more than justified in using ACDA data on the military burden for the later years especially given the similarity to the ratio computed (using UN and IMF data) for earlier years. A data sheet for each country, together with a copy of the computer output, is appended to this paper.

ent variable. In the first regression equation, the dependent variable is lagged one year, and in succeeding regressions, an additional lag is added. That is, M regression equations are estimated in the form:

$$G_t = \alpha + \sum_{i=1}^{m} \beta_{t-1} G_{t-1} + \varepsilon_t$$

where G is economic growth and where M, the maximum lag length, takes on the value from 1 to M.[5]

For each regression, the final prediction error (FPE) is computed in the following manner:

$$FPE(m) = \frac{T+m+1}{T-m-1} ESS(m)/T,$$

where T is the sample size, and $FPE(m)$ and $ESS(m)$ are the final prediction error and the sum of squares, respectively. The optimal lag length, m^*, is the lag length which produces the smallest final prediction error, i.e., the most accurate forecast. Once m^* has been calculated, another set of regressions is estimated with lagged values of D, the defense variable, added sequentially in the same manner which was used to determine m^*. Thus, six additional regressions are estimated in the form:

$$G_t = \alpha + \sum_{i=1}^{m^*} \beta_{t-1} G_{t-1} + \sum_{i=1}^{n} \gamma_{t-1} D_{t-1} + \varepsilon_t,$$

with n taking on the values from one to six. We then compute the FPE for each of these regression equations as:

$$FPE(m^*,n) = \frac{T+m^*+n+1}{T-m^*-n-1} ESS(m^*,n)/T,$$

and we choose the optimal lag length for D, n^*, as the regression equation with the lowest prediction error.

In the same manner, another set of equations is estimated, with D as the dependent variable, and lagged values of D are included to find m^*. Then, lagged values of G are included to find n^*.

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5. Although the choice of M is arbitrary, it should be as large as possible, consistent with the sample size and the underlying process. Because of the relative shortness of time series data for most developing countries, M was limited to six years.

The final procedure is to test for causality, and this consists of three steps:

STEP 1: The final prediction error for the model $G = f(G_L)$ is compared to the *FPE* for the model $G = f(G_L, D_L)$. If the *FPE* decreases (i.e., the model's predictive power increases as we add lagged values of D), we conclude that defense Granger causes growth. If, on the other hand, the *FPE* increases then we conclude that defense does not Granger cause growth.

STEP 2: The *FPE* for the model $D = f(D_L)$ is compared to the *FPE* for the model $D = f(D_L, G_L)$. If the *FPE* declines, we conclude that growth Granger causes defense. If the *FPE* increases, we conclude that growth does not Granger cause defense.

STEP 3: We compare the *FPE*s under Step 1 and Step 2. If the *FPE* increased in both cases, we conclude no relationship between D and G. If the *FPE* declines in both cases, we conclude a feedback relationship exists. If the *FPE* declined under Step 1 but increased under Step 2, we find that defense Granger causes growth. If the *FPE* increased under Step 1 but declined under Step 2, we find that growth Granger causes defense.

EMPIRICAL RESULTS

Lag Lengths

The optimal lag lengths using Hsiao's method on each country appear as Table 1.[6] The paired numbers in the first column indicate the optimum lag lengths, m^* and n^*, respectively, when economic growth is the dependent variable and lagged values of G and lagged values of the defense variable are the independent variables. The paired numbers in the second column indicate optimum lag lengths, m^* and n^*, when defense is the dependent variable.

As hypothesized, the estimated optimal lag lengths differ slightly among the countries. While we are unable at this aggregate data level to specify reasons for individual lag length differences among the countries, it is comforting to see that most of the lag lengths are either one or two years. These results support the findings of Looney and Frederiksen (1990) who looked at the determinants of defense spending in these countries.

Past growth of GDP has an immediate impact (one year) on current GDP in four of the countries. The one anomaly is a six-year lag rate for Malaysia. However, this result must be looked at with caution since Hsiao's model, while relatively consistent, tends to overestimate lag lengths. The

6. The final prediction errors have not been reported in the paper. As noted previously, the results can be obtained directly from the author.

Table 1
OPTIMAL LAG LENGTHS (Years)

Country	$G = f(G_L, D_L)$	$D = f(D_L, G_L)$
Philippines	(1, 1)	(1, 1)
Thailand	(1, 1)	(1, 2)
South Korea	(1, 5)	(1, 3)
Malaysia	(6, 1)	(2, 3)
Singapore	(2, 2)	(2, 1)
Indonesia	(1, 1)	(1, 1)

result for Malaysia, while not spurious, is probably less than the computed six-year computed lag. In other words, earlier rates of growth of the GDP have a more recent effect on current GDP growth than indicated by the estimated results. In addition, the six-year lag is an average over a twenty-eight year period and is most likely considerably shorter if examined using only recent data.

Importantly, the data indicate an almost immediate effect of the defense burden on growth: a one-year lag for all countries except Singapore which experiences a two-year lag (see Column 1) and South Korea (five-year lag). In addition, the impact of past defense spending on current defense spending is immediate (one year) in four of the countries, and two years for Thailand and Singapore. This result also supports earlier research findings on the determinants of defense spending. It appears as if the "jumping off point" for the current military budget is either the military burden or the growth rate in GDP of the preceding year. Past GDP growth rates have a one-year lagged impact on defense for the Philippines, Singapore and Indonesia. Past GDP from two years ago impacts the current defense budget in Thailand, and the impact is three years for South Korea and Malaysia.

DEFENSE/GROWTH RELATIONSHIPS

The final step in the procedure is to compare the final prediction error for the regression equations to determine causality, if any. The relationships appear in Table 2.

For a half of the sample, the data suggest a clear direction of causality: from economic growth to defense for Malaysia and from defense to growth for Singapore and Indonesia. For the remaining three countries there is either no relationship between growth and defense (Philippines and South

Table 2
DEFENSE AND GROWTH RELATIONSHIPS

Country	Relationship
Philippines	No relationship
Thailand	Feedback
South Korea	No relationship
Malaysia	Growth to Defense
Singapore	Defense Granger causes Growth
Indonesia	Defense Granger causes Growth

Korea) or a feedback loop (Thailand). As noted above, the aggregative nature of the data prohibits us from identifying the specific defense expenditure which causes the economic growth or even the timing of the economic growth which induces the follow-on defense spending. This is primarily due to the examination of data for a thirty-year period. Presumably, for Singapore and Indonesia, the existence of a large arms industry (especially in the case of Singapore) or of growth-inducing types of military spending (on infrastructure, education, housing, and the like) has had positive effects on the economy. These are the effects that Benoit suggested might take place in developing economies. For Malaysia the final prediction error suggests that economic growth is an important determinant of defense spending, which is opposite to the pattern suggested by Benoit. For Thailand, the final prediction error declined when *G* and *D* were the respective dependent variables. This suggests a "feedback" relationship whereby growth has led to more defense which, in turn, has created more growth, and so on. This was the predominant case in the larger study conducted by LaCivita and Frederiksen (1991). For two of the countries, the Philippines and South Korea, the results indicate no relationship between defense and growth. For Korea this is somewhat puzzling given the often perceived importance of the defense sector in economic development. However, this result might be due to the inclusion of relatively recent data (through to 1988) in the model; Korea's growth in the last decade or so may no longer depend on the defense sector (as much as it did earlier), and other factors (such as technological advances and economic diversity) have been the main engines of growth. For the Philippines, as in the case of Korea, the inclusion of the defense burden as an independent variable (with *G* as the dependent variable) or the inclusion of *G* as an independent variable when *D* was the dependent variable led to increases in the final prediction error; defense expenditures in the Philippines apparently have no Granger causality effect

on economic growth, and growth does not "cause" defense. Presumably either pattern could have happened (or is happening) if we were to take shorter periods within the thirty-year period. Unfortunately the shorter the time period examined, the weaker is the statistical test.

From a policy point of view, planners in South Korea and the Philippines should therefore not rely on defense expenditures as a major policy tool for economic growth in their respective economies. The implication of these results is that any effort to impose arbitrary lag lengths along the lines of Joerding on models which try to uncover causality will likely hide the true relationship. The appropriate relationship can only be detected by a proper specification of the model, and the appropriate relationship will more than likely differ from one country to another—an assumption not felt likely by earlier authors such as Benoit.

SUMMARY AND CONCLUSIONS

This paper has examined the defense/growth causality issue for six Asian countries. The purpose was (a) to extend an earlier paper in this *Journal* dealing with lag lengths in the Philippines; (b) to update prior causality studies on the Philippines and Thailand through 1988; and (c) to include comparative studies on Indonesia, South Korea, Singapore, and Malaysia.

Most past studies have assumed that defense spending precedes or "causes" economic growth—i.e., that correlation implies causation. Joerding suggested that defense spending is not exogenous. The two criticisms of the Joerding paper were that (a) he used a pooled sample, and (b) he chose an arbitrary lag structure.

This six-country study determined on a country-by-country basis the optimal lag structure for the defense and growth variables, on the one hand, and the appropriate direction of causality for each country, on the other hand.

The results indicate that the lag structure differs from country to country as hypothesized. However, when broadly examined, the lag lengths are primarily one or two years. The similarity is further strengthened when one considers that the model used in this paper tends to overestimate the lag period. Past growth and past defense have an almost immediate impact on current growth, and similarly, past defense and past growth have a very quick impact on current defense.

The results also confirmed that the causal relationship differs from country to country. For Singapore and Indonesia the results indicate that defense Granger causes defense—the presumed direction according to Benoit. Only in Malaysia did economic growth appear to be a determinant of defense spending. In the case of Thailand our results suggest a feedback

relationship; for the remaining two countries–Philippines and South Korea–no discernible relationship between defense and growth was uncovered.

The implication for further research is that neither defense or growth can be considered as exogenously determined. Furthermore, we do not expect one model to fit all countries or even a group of countries in the same region. The lag lengths are likely to differ from country to country, as does the causal relationship between the defense burden and economic growth. Given the complexity of the interaction of the defense and growth variables, a fruitful area for future research might be to uncover exactly how defense affects growth on a country-by-country and year-by-year basis–a task made difficult due to the aggregative nature of the reported data. Given further breakdowns as to the types of military spending (on, for example, capital equipment or R&D), more complete insights might be uncovered as to the role of military expenditures on the economy.

APPENDIX A

Table A1
DATA, REPUBLIC OF THE PHILIPPINES

Year	Gross Domestic Product[a]	Defense expenditure[b]	Defense burden (percent)	USACDA defense burden (percent)	Growth rate of real GDP (percent)
1956	10	166	1.6		6.9
1957	11	157	1.4		5.3
1958	12	181	1.5		3.5
1959	13	181	1.4		6.7
1960	14	190	1.4		1.5
1961	15	197	1.3		5.6
1962	17	206	1.2		4.8
1963	20	209	1.0		7.0
1964	21	230	1.1		3.5
1965	23	225	1.0		5.2
1966	26	249	1.0		4.4
1967	29	290	1.0		6.1
1968	32	345	1.1		5.6
1969	35	326	0.9		4.8
1970	42	458	1.1		4.6
1971	50	543	1.1		4.9
1972	56	602	1.1		4.8
1973	72	855	1.2		9.2
1974	100	1941	1.9		5.0
1975	115	3982	3.5		6.4

Table A1 (continued)

Year	Gross Domestic Product[a]	Defense expend-iture[b]	Defense burden (percent)	USACDA defense burden (percent)	Growth rate of real GDP (percent)
1976	135	4118	3.1		8.0
1977	154	4325	2.8		6.1
1978	178	3552	2.0	2.0	5.5
1979	218	4995	2.3	2.3	6.3
1980	265	5115	1.9	1.9	5.2
1981	305	5526	1.8	1.8	3.2
1982	341	5552	1.6	1.7	3.6
1983	384	6106	1.6	1.6	1.9
1984				1.2	-7.6
1985				1.3	-7.4
1986				1.9	3.4
1987				1.8	4.8
1988				1.7	6.3

a. Billions of pesos.
b. Millions of pesos,
Sources: GDP and Growth Rate of Real GDP: IMF, *International Financial Statistics Yearbook: 1984* (1956-1959), *Yearbook: 1990* (1960-1980), *Yearbook: 1991* (1981-1988). 1956-1983 Defense Expenditures from United Nations, *Statistical Yearbook,* Annual Issues. Defense Burden (1978-1988) from USACDA, *World Military Expenditures and Arms Transfers: 1989.*

Table A2
DATA, THAILAND

Year	Gross Domestic Product[a]	Defense expend-iture[b]	Defense burden (percent)	USACDA defense burden (percent)	Growth rate of real GDP (percent)
1956	43	817	1.9		6
1957	44	1567	3.6		-1.6
1958	45	1390	3.1		3.4
1959	48	1421	3.0		6.9
1960	54	1378	2.6		10.0
1961	59	1080	1.8		5.3
1962	63	1570	2.5		8.1
1963	68	1609	2.4		8.4
1964	75	1745	2.3		6.6
1965	84	1877	2.2		7.9
1966	101	2055	2.0		12.2
1967	108	2437	2.3		7.8

Table A2 (continued)

Year	Gross Domestic Product[a]	Defense expenditure[b]	Defense burden (percent)	USACDA defense burden (percent)	Growth rate of real GDP (percent)
1968	117	2990	2.6		8.5
1969	129	3638	2.8		7.9
1970	147	4898	3.3		10.5
1971	153	5383	3.5		5.0
1972	170	5721	3.4		4.1
1973	222	5950	2.7		9.9
1974	279	7104	2.5		4.4
1975	303	7870	2.6		4.8
1976	347	9987	2.9		9.4
1977	403	12566	3.1		9.9
1978	488	17367	3.6	3.6	10.4
1979	559	22978	4.1	4.2	5.3
1980	659	27019	4.1	4.1	4.8
1981	760	29143	3.8	3.9	6.3
1982	820	33652	4.1	4.2	4.1
1983	910	34944	3.8	3.9	7.3
1984				3.9	7.1
1985				4.4	3.5
1986				3.9	4.9
1987				3.5	9.5
1988				3.1	13.2

a. Billions of baht.
b. Millions of baht.
Sources: GDP and Growth Rate of Real GDP: IMF, *International Financial Statistics Yearbooks: 1984* (1956-1959), *Yearbook: 1990* (1960-1980), *Yearbook: 1991* (1981-1988). 1956-1983 Defense Expenditures from United Nations, *Statistical Yearbook*, Annual Issues. Defense Burden 1978-1988 from USACDA, *World Military Expenditures and Arms Transfers, 1989*.

Table A3
DATA, SOUTH KOREA

Year	Gross Domestic Product[a]	Defense expend-iture[a]	Defense burden (percent)	USACDA defense burden (percent)	Growth rate of real GDP (percent)
1955	113	6	5.3		4.5
1956	150	11	7.3		-1.3
1957	196	11	5.6		7.6
1958	203	13	6.4		5.5
1959	216	14	6.5		3.9
1960	243	15	6.2		1.2
1961	291	17	5.8		5.8
1962	352	21	6.0		2.1
1963	500	20	4.0		9.1
1964	711	25	3.5		9.7
1965	798	30	3.8		5.7
1966	1024	41	4.0		12.2
1967	1259	50	4.0		5.9
1968	1630	65	4.0		11.3
1969	2130	84	3.9		13.8
1970	2724	101	3.7		8.8
1971	3379	136	4.0		9.2
1972	4170	171	4.1		5.9
1973	5416	181	3.3		14.4
1974	7569	254	3.4		7.9
1975	10224	194	1.9		6.5
1976	13996	771	5.5		13.2
1977	18074	1008	5.6		10.9
1978	24327	1438	5.9		9.7
1979	31323	1597	5.1		7.4
1980	38041	2252	5.9		-2.0
1981	47482	2831	6.0		6.7
1982	54443	3163	5.8		7.3
1983	63833	3405	5.3		11.8
1984				5.1	9.4
1985				5.1	6.9
1986				4.8	12.4
1987				4.4	12.0
1988				4.3	11.5

a. Billions of won

Sources: GDP and Growth Rate of Real GDP: IMF, *International Financial Statistics Yearbooks: 1984* (1955-1959), *Yearbook: 1990* (1960-1980) *Yearbook: 1991* (1981-1988). Defense Expenditures from United Nations, *Statistical Yearbook,* Annual Issues. Defense Burden (1984-1988) from USACDA, *World Military Expenditures and Arms Transfers: 1989.*

Table A4
DATA, MALAYSIA

Year	Gross Domestic Product[a]	Defense expend-iture[a]	Defense burden (percent)	USACDA defense burden (percent)	Growth rate of real GDP (percent)	Consumer Price Index
1961	6696	108.8	1.6		-2.1	97
1962	7056	127.4	1.8		5.4	97
1963	7515	154.9	2.1		3.3	100
1964	8056	216.5	2.7		7.2	100
1965	8837	303.1	3.4		8.6	101
1966	9394	379.5	4.0		6.3	101
1967	9774	366.6	3.8		6.1	99
1968	10160	379.3	3.7		3.9	99
1969	11629	329.6	2.8		15.6	98
1970	12155	436.7	3.6		2.4	100
1971	12955	546.0	4.2		7.1	102
1972	14220	707.6	5.0		9.4	
1973	18723	725.3	3.9		11.7	
1974	22858	954.7	4.2		8.3	
1975	22332	1053.8	4.7		0.8	
1976	28085	1117.2	4.0		11.6	
1977	32340	1324.0	4.1		7.8	
1978	37886	1406.0	3.7		6.7	
1979	46424	1704.0	3.7		9.3	
1980	53308	2253.0	4.2		7.4	
1981	57613	3332.0	5.8		6.9	
1982	62579	3694.0	5.9		5.9	
1983	69941	3489.0	5.0		6.3	
1984	79550	2626.4	3.3		7.8	
1985	77547	1850.2	2.4		-1.0	
1986				4.2	1.0	
1987				4.5	5.4	
1988				2.8	-0.1	

a. Millions of ringgit

Note: Only 1960-88 data used. Real GDP for earlier years unavailable.

Sources: GDP (1960-1970) and Consumer Price Index (1961-1970) from IMF, *International Financial Statistics Yearbook: 1990.* Defense Expenditures 1961-68 from United Nations, *Statistical Yearbook,* Annual Issues. Defense Expenditures 1969-1985 from *Defence Spending in Southeast Asia,* ed. Chin Kin Wah (Singapore: Institute of Southeast Asian Studies, 1987), p.174. Defense Burden 1986-1988 from USACDA, *World Military Expenditures and Arms Transfers, 1989.* Growth Rate of Real GDP for 1961-1970 computed by taking current GDP and adjusting using Consumer Price Index; for 1971-1988 from *International Financial Statistics Yearbook: 1990.*

Table A5
DATA, SINGAPORE

Year	USACDA defense burden (percent)	Growth rate of real GDP (percent)
1967	2.1	11.8
1968	2.8	13.9
1969	6.0	13.7
1970	8.8	13.7
1971	7.8	12.5
1972	6.0	13.4
1973	5.2	1.5
1974	4.7	6.3
1975	5.0	4.1
1976	5.5	7.5
1977	6.2	7.8
1978	5.3	8.6
1979	4.9	9.3
1980	5.2	9.7
1981	5.3	9.6
1982	5.1	6.9
1983	4.2	8.2
1984	5.2	8.3
1985	5.9	-1.7
1986	5.5	2.0
1987	5.1	9.4
1988	5.3	11.1

Sources: Defense Burden from USACDA, *World Military Expenditures and Arms Transfers*, annual issues. Growth Rate of Real GDP, 1967-1980 from IMF, *International Financial Statistics Yearbooks: 1984;* 1981-1988 from *Yearbook: 1991.*

Table A6
DATA, INDONESIA

Year	Defense burden (percent)	Growth rate of real GDP (percent)
1961	6.3	5.1
1962	4.6	2.4
1963	2.9	-2.4
1964	2.0	5.5
1965	2.2	0.0
1966	1.2	2.3
1967	2.6	2.3
1968	3.1	11.1
1969	3.2	6.0
1970	3.3	7.5
1971	3.5	7.0
1972	3.4	9.4
1973	2.9	11.3
1974	2.9	7.6
1975	3.8	5.0
1976	3.5	6.9
1977	3.3	8.8
1978	3.3	7.8
1979	3.3	6.3
1980	3.1	9.9
1981	3.2	7.9
1982	3.2	2.2
1983	2.7	4.2
1984	2.6	7.0
1985	2.4	2.5
1986	2.5	5.9
1987	2.1	4.1
1988	1.8	6.5

Sources: Defense Burden (1961-1966): Stockholm International Peace Research Institute, *SIRPI Yearbook 1990, World Armaments and Disarmaments,* (Oxford University Press, 1990) Table 5A.3. 1967- 1988 from USACDA, *World Military Expenditures and Arms Transfers,* annual issues. Growth Rate of Real GDP (1961-1980) from IMF, *International Financial Statistics Yearbooks: 1984;* 1981-1988 from *Yearbook: 1991.*

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