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Military Expenditure and Economic Development

Anne Case

Princeton University

and

Junior Research Fellow
Institute for Policy Reform

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Military expenditure is a significant share of central government expenditure and gross domestic product in many developing countries. It is often argued that military expenditure leads to reduced growth in developing countries by crowding out productive investment. This paper considers the impact of military expenditure on economic growth in both developed and developing countries, using data from the US Arms Control and Disarmament Agency from 1973 to 1989. We find that the impact of military expenditure on economic growth depends upon the way in which it is financed. In OECD countries, military expenditure crowds out investment and provides a partial explanation for the relatively slow growth observed in those OECD countries carrying large defense burdens. In developing countries with low levels of political freedom, both military expenditure and gross domestic investment are financed out of reduced private consumption. Strong dictators appear to have the power to channel resources into both investment and military expenditure using means unavailable in weak dictatorships.

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Disclaimer

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Military Expenditure and Economic Development

Anne Case

EXECUTIVE SUMMARY

Military expenditure is a significant share of central government expenditure and gross domestic product in many developing countries. It is often argued that military expenditure leads to reduced growth in developing countries by crowding out productive investment. This paper considers the impact of military expenditure on economic growth in both developed and developing countries, using data from the US Arms Control and Disarmament Agency (ACDA) from 1973 to 1989.

The results suggest that the impact of military expenditure on economic growth depends on the way in which it is financed. In OECD countries, military expenditure crowds out investment and provides a partial explanation for the relatively slow growth observed in those OECD countries carrying large defense burdens during this period. This pattern is not repeated in developing countries. In low and lower middle income countries, high defense burdens are associated with high levels of investment; where resource mobilization is possible, it appears to lead to greater military spending, greater investment, and higher GDP growth.

Time series evidence suggests that military expenditure does not "cause" higher investment in developing countries. The correlation between the two appears, instead, to be due to the channel through which both are financed. In developing countries with lower

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levels of political freedom, military expenditure, general government consumption, and gross domestic investment are financed out of reduced private consumption. Strong dictators appear to have the power to channel resources into both investment and military expenditure using means unavailable in weak dictatorships or in democracies. This result stands in contrast to that found in low and lower middle income democracies, for which we find no evidence that military expenditure is financed by reducing consumption.

The results for the OECD countries and the developing world suggests that the relationship between military expenditure and investment mirrors the relationship between general government consumption and investment in a given country. Military expenditure appears to have the same implications for private consumption and gross domestic investment as do other government expenditures.

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I. Introduction

Military expenditure forms a significant share of central government expenditure and of gross domestic product in both developing and developed countries. Defense burden, military expenditure measured as a fraction of GNP, was roughly constant at 2.5% in the OECD countries during the 1970s and 1980s. The average defense burden grew markedly in Africa during the 1970s, from 2% to 4% on average. In Latin America, the average defense burden doubled between 1973 and 1983, from 1.5 to 3% of GNP. Mean defense burdens for Asia, Latin America, and the low and lower middle income countries of Africa are presented in Figure 1.[1]

There are two schools of thought on the impact of military expenditure on GDP growth. Beginning with Benoit [1972, 1973, 1978], some analysts have argued that military expenditure may have a positive overall effect on economic development. Proponents of this view suggest that military expenditure causes spinoffs in terms of human capital development and improvements in productivity. This approach, referred to in the literature as the "modernization model" [Chan and Mintz 1992] or the "military as modernizer approach" [Ball 1988], has found some support among researchers using a long time horizon. Babin [1989] and Kick and Dev Sharda [1986], for example, find military expenditure is correlated with higher growth rates in long time frames (12 years). Recent work by Hess and Mullan [1988] also finds a positive and significant relationship between defense burden and share of GDP devoted to education in a study of 77 developing countries.

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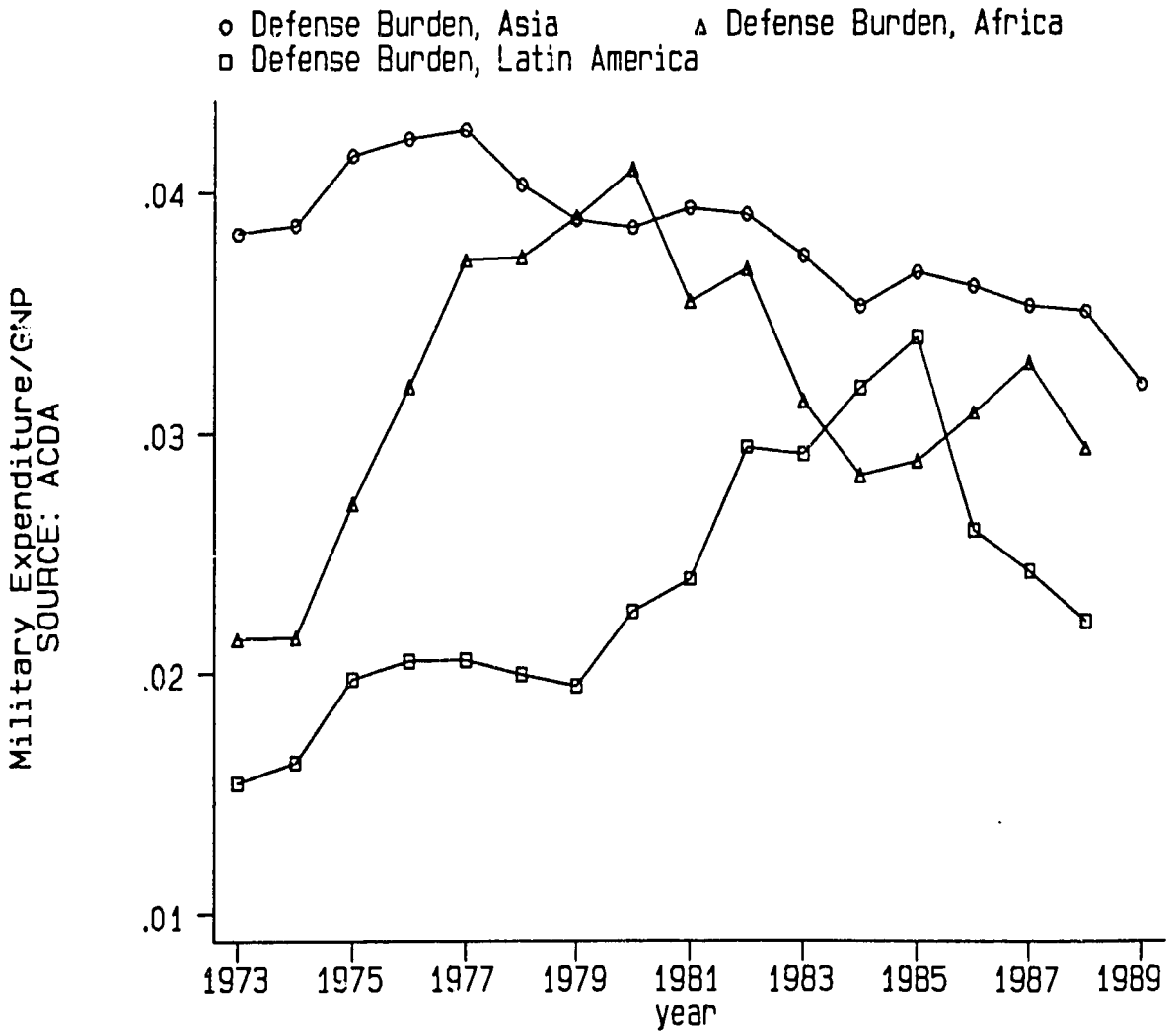
[1]The countries used in this analysis are presented in Appendix One. Variable creation is discussed in greater detail in Appendix Three.

Figure 1 Military Expenditure/GNP by Region



Others argue that, although spinoffs are possible, their positive effect is overshadowed by the negative effect military spending has on investment. Deger [1986] summarizes the "capital formation model" argument:

> Empirical estimates support [the] view that military spending does not increase growth rates in LDCs; rather, taking all evidence together, there is a negative relationship between these two variables. There are two constraints on the growth process in LDCs, one structural (the role of 'modernization') and the other resource based (lack of domestic savings). The military may have stimulating effects on the former but certainly depresses the latter." (p. 193-4)

These researchers believe "the general consensus emerging from the literature is that military expenditures reduce economic growth through reductions in resources allocated to ... investment."[2] However, the mechanism through which military expenditure crowds out productive investment is not always made clear by proponents of the capital formation model. In a world with perfect capital markets, investment in a country will occur until the expected return on the marginal dollar invested is equal to the world market rate of interest. It is unclear why this equilibrium point is not independent of the level of defense spending. The idea that military spending crowds out investment must rely on an implicit assumption of imperfection in capital markets, perhaps an imperfection induced by the taxation necessary to finance defense spending, or an assumption that military spending reduces the productivity of the resources invested.

It is difficult to generalize the empirical findings in this literature, primarily for two reasons. First, results appear to be sensitive to the functional form chosen for analysis.

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[2]Tufts University Interim Report 1990, "Impact of Military Expenditures on Economic Development," p.16.

Biswas and Ram [1986], for example, present evidence that the estimated effect of military spending on GDP growth depends critically on the way in which military expenditure is entered in a growth equation. In addition, results also appear to be sensitive to the other explanatory variables chosen for inclusion in growth equations. Levine and Renelt [1992] sound a cautionary note on the use of cross-country growth models in general, noting that "the cross-country statistical relationships between long-run average growth rates and almost every particular policy indicator considered by the profession are fragile: small alterations in the "other" explanatory variables overturn past results." (p. 943.) Levine and Renelt found defense burden was not robustly correlated with GDP growth. Of the several dozen potential conditioning variables tested by Levine and Renelt, the only robust relationship found with respect to GDP growth was investment share. If military expenditure crowds out investment spending in some parts of the world, it may have an indirect effect on GDP growth. We return to this below.

This paper re-examines the relationship between military expenditure and GDP growth, using data from the Arms Control and Disarmament Agency (ACDA) and the World Bank World Tables of Economic and Social Indicators from 1973 to 1989. Our primary focus is on documenting relationships between gross domestic investment, military expenditure and economic growth during this time period. We find that the impact of military expenditure on economic growth depends upon the way in which it is financed. In OECD countries, military expenditure crowds out investment and provides a partial explanation for the relatively slow growth observed in those OECD countries carrying large defense burdens during this period. In low and lower middle income countries, high defense burdens are associated with high

levels of investment; where resource mobilization is possible, it appears to lead to greater military spending, greater investment, and higher GDP growth. Time series evidence suggests that military expenditure does not "cause" higher investment in developing countries. The correlation between the two appears, instead, to be due to the channel through which both are financed.

To explore further the differences in countries' abilities to mobilize resources for military expenditure and investment, we explicitly model differences in the behavior of dictatorships and democracies. Strong dictators may have the power to channel resources into both investment and military expenditure using means unavailable in weak dictatorships or in democracies. This would induce a positive correlation between military expenditure and economic growth in dictatorships that, in fact, may be due to the positive correlation between military expenditure and investment.

We find evidence of this in low and lower middle income countries from 1973 to 1989. Specifically, we find a positive and significant correlation between defense burden and investment share within the group of countries in which elections do not take place, or take place with only one slate of candidates. Results of vector autoregressions suggest that, within dictatorships, increases in defense expenditure and investment are financed out of reductions in private consumption. In contrast, in low and lower middle income countries in which there are greater political freedoms, it does not appear that increases in military expenditure are financed out of consumption, and no pattern emerges between defense burden and investment share or between military expenditure and GDP growth.

In the next section, we will provide cross-sectional evidence on the relationship

between military expenditure, investment and economic growth. Section III provides time series support for these results, using vector autoregressive models. Section IV discusses lack of political freedom as an indicator that states may have the power to finance investment and military spending out of reductions in private consumption. Section V presents avenues for future research.

II. Military Expenditure, Investment and GDP Growth: Cross-Sectional Evidence

To provide a framework within which to view the relationship between military expenditure, investment, and GDP growth, we begin by running cross-country regressions and plotting the country averages of defense burden (military expenditure/GNP, average 1973-89), investment share of GNP (average 1972-88), and growth in real GDP per capita, (terms of trade adjusted, average 1972-88), by region. We begin with a cross-country, regional analysis for two reasons. Proponents of the capital formation model argue that when the positive effect of military expenditure on GDP growth is weighed against the negative effect of military expenditure on investment, the net effect on GDP growth is negative. If this were true, then *ceteris paribus* a net negative effect should be visible in the cross-country averages. In addition, cross-country analysis makes plain the fact that relationships between military expenditure and economic growth vary by region. The reasons different authors have found different relationships between military expenditure, investment share and GDP growth become apparent in an examination of regional differences in the relationship between these

variables.[3]

Figure 2 presents the relationships found in the high income countries. The left panel of Figure 2 presents the country average relationships between defense burden and investment share of GNP.[4] The relationship is negative and significant: a one percentage point increase in investment share is associated with a two tenths of a point reduction in defense burden, on average. This result is mirrored in the right panel of Figure 2, in which average defense burden and GDP per capita growth are plotted. Below the figure, regression coefficients and t-statistics are printed from robust least squares estimation of country mean defense burdens (1973-89) regressed on country mean investment shares (1972-88) and, separately, on country mean per capita GDP growth (1972-88). These are provided to gauge the significance of the relationships shown.

The relationship between GDP growth and defense burden is stronger when attention is focused on the large industrialized countries. In cross-country regressions run for the ten largest economies, the relationship between defense burden and investment share is even more significant (t-statistic = 5.63) and between defense burden and GDP growth is marginally significant (t-statistic = 1.86).[5] Overall, Figure 2 provides some evidence that in high income

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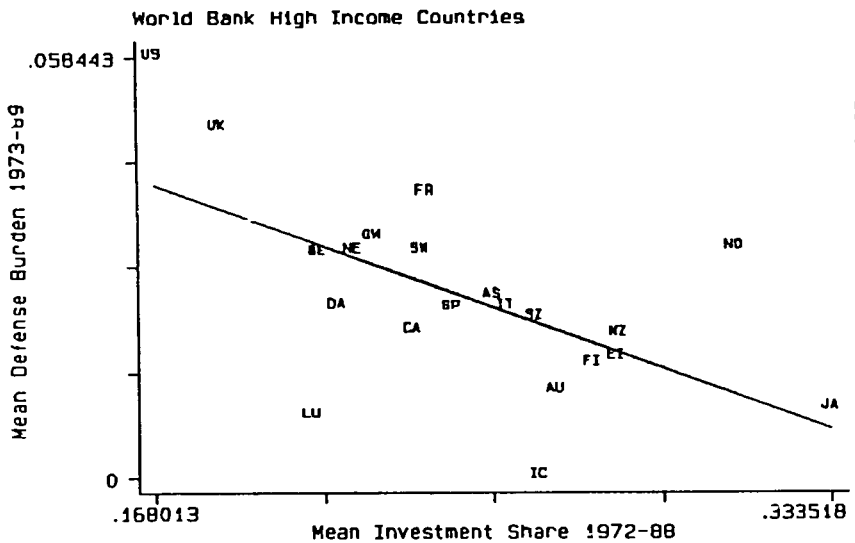
[3]If variables are measured with error, the country averages will also provide a less noisy measure of defense burden, investment share and GDP growth if measurement error is independently and identically distributed within countries.

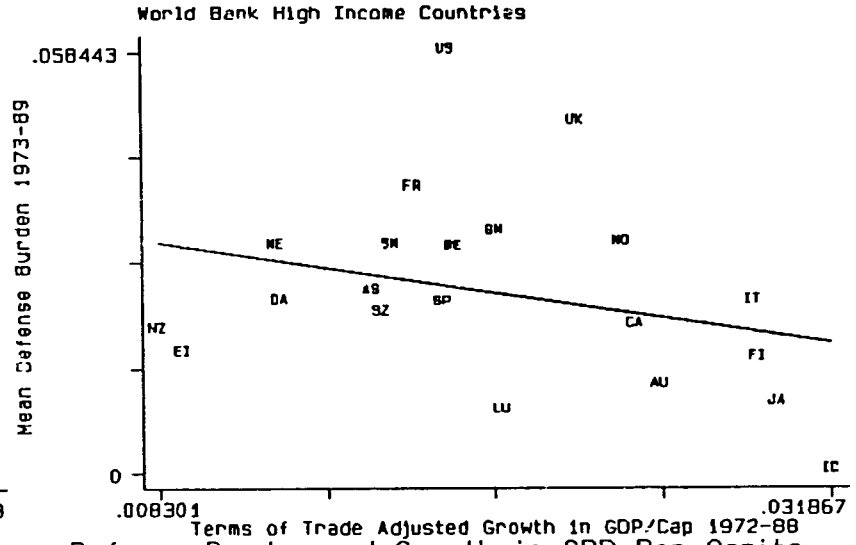
[4]The correlation between military expenditure and investment share found in high income countries remains large, negative and significant when we restrict attention to OECD countries.

[5]The ten largest economies, measured as those with the highest average GNPs (1972-88) in 1980 dollars, are: United States, Japan, West Germany, France, United Kingdom, Italy, Canada, Spain, Australia, Netherlands.

Figure 2 **High Income Countries**



Defense Burden and Investment Share



Defense Burden and Growth in GDP Per Capita

Defense Burden and Investment Share: regression coefficient = -0.204 (t=2.85)
Defense Burden and Growth in GDP/Cap: regression coefficient = -0.589 (t=1.57)

Regressions with Huber standard errors.
All High Income Countries except Middle Eastern Countries (Israel, Kuwait, UAE)

countries military expenditure crowds out investment. This will be further substantiated by the time series evidence presented in Section III. It is interesting to speculate on the mechanism through which this crowding out occurs. We would expect to find such a result, for example, if the increased taxes necessary to support larger defense burdens drove a wedge between optimal investment and investment in equilibrium.[6] We will explore differences in financing in Section IV.

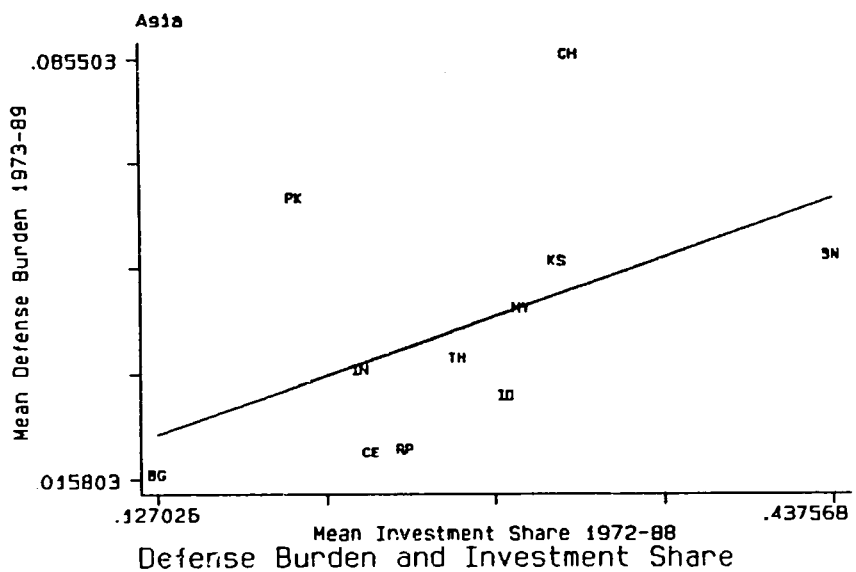
A very different pattern emerges in Asia, results for which are presented in Figure 3. In the left panel, we see a country's investment share is positively and significantly correlated with its defense burden. This relationship carries over to the relationship between defense burden and GDP growth. This does not, however, imply that military spending "caused" economic growth; it may be that military spending is correlated with investment share and, here, proxies for investment share. Causality tests in Section III are consistent with this latter interpretation for Asia and for the Middle East, in which patterns similar to those presented in Figure 3 are also found.

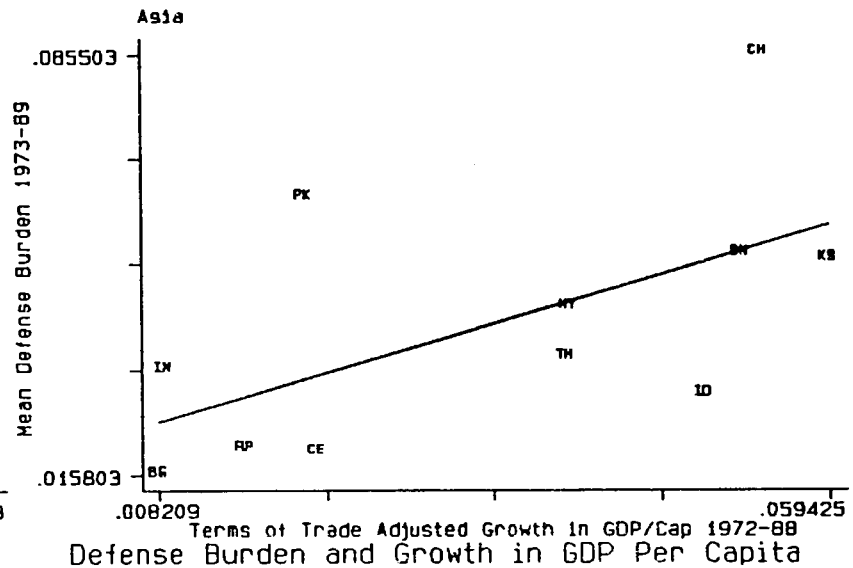
We contrast these results with those for Africa in Figure 4. There is a weakly positive relationship between defense burden and investment share in the countries of Africa, but no significant relationship between defense burden and GDP growth, as is seen in the right panel of Figure 4.

We take these figures as prima facie evidence that the relationship between military expenditure and GDP growth may work through the impact military expenditure has on the

[6]Increased defense burdens may also increase the probability that a country will go to war, changing the risk premium associated with investing in that country.

Figure 3 **Asia**





Defense Burden and Investment Share: regression coefficient = 0.126 (t=2.17)
Defense Burden and Growth in GDP/Cap: regression coefficient = 0.631 (t=2.49)

Regression with Huber standard errors.

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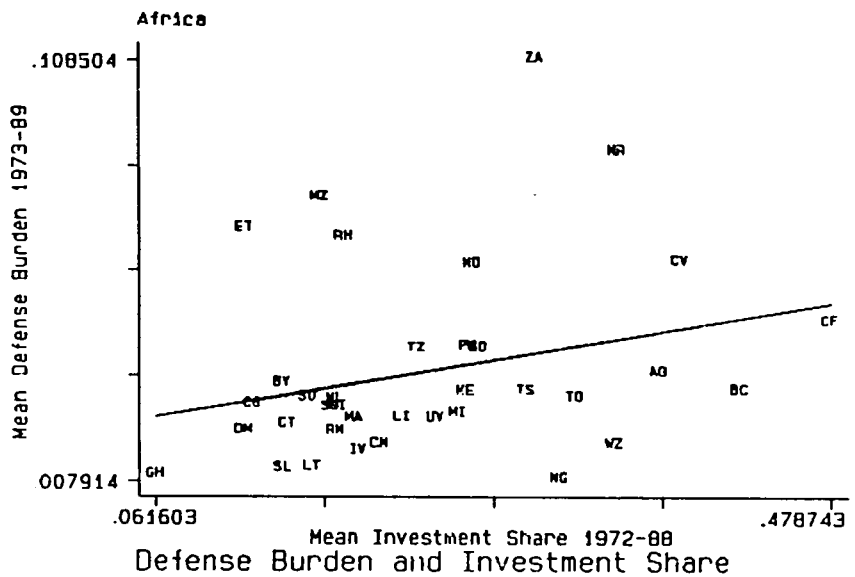
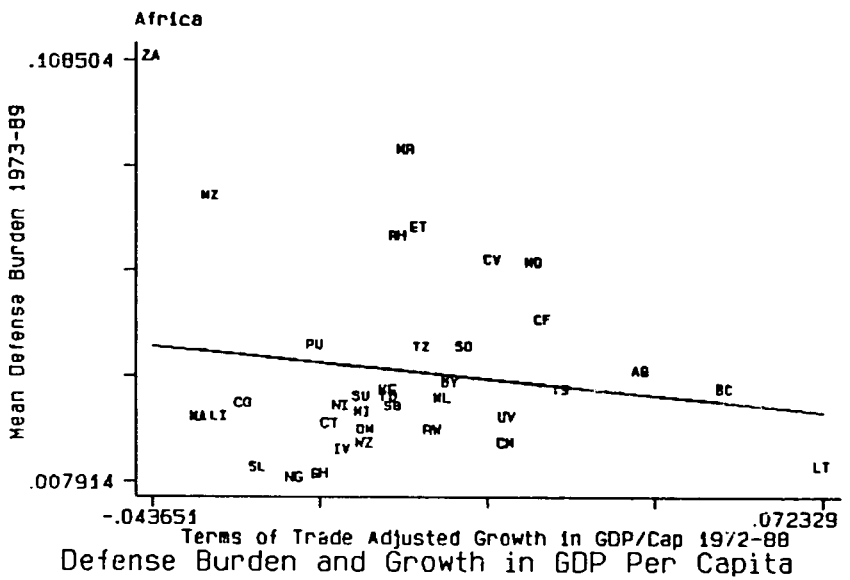
Figure 4 **Africa**





Defense Burden and Investment Share: regression coefficient = 0.065 (t=1.82)
Defense Burden and Growth in GDP/Cap: regression coefficient = -0.134 (t=0.75)

Regression with Huber standard errors.
For list of African countries included, see Appendix One.

investment share: in those cases in which military expenditure crowds out investment, this will induce a negative relationship between GDP growth and defense burden. If in Asia it is difficult to find a negative impact of military expenditure on GDP growth, this may be because the ability to mobilize resources for defense expenditure is correlated with the ability to mobilize resources for domestic investment.

III. Military Expenditure and Investment: Time Series Evidence

Cross-country comparisons cannot control for country specific effects that may induce the relationships observed above. For this reason, we now turn to the time series evidence on military expenditure and investment share. We focus on the relationship between military expenditure and investment for two reasons. Proponents of the capital formation model suggest that military expenditure crowds out investment and that this has a significant negative effect on growth. A closer look at the relationship between investment and military expenditure is in order for this reason. In addition, Levine and Renelt find the only robust relationship with GDP growth was that between investment share and growth in GDP. To the extent that we find a significant relationship between military expenditure and investment, we will be able to speak to the indirect effects of increased military spending.

Vector autoregressions provide a means of assessing the time series relationship between defense burden and investment share over a long time period without placing a great deal of structure on the relationship. We will use Granger causality tests to investigate the

relationship between military expenditure and investment. Variable z will be said to not cause variable y if

$$E\{y_t|y_{t-1},y_{t-2}, \dots y_1, z_{t-1},z_{t-2}, \dots z_1\} = E\{y_t|y_{t-1},y_{t-2}, \dots y_1\}$$

for the linear projection $E\{\cdot|\cdot\}$ of y on lags of y and z. The capital formation model predicts that increases in military expenditure lead to reductions in investment. In this case, we would expect increases in military spending to [Granger] cause reductions in investment. The "military as modernizer" model suggests increases in military spending lead to greater human capital formation and productivity growth. If this were true, we might expect military expenditure to Granger cause increases in investment.

Table One presents vector autoregressions of the log of military expenditure. We regress the log of military expenditure at time t [$\log(ME)_t$] on lags of the log of military expenditure at times t-1, t-2, t-3, t-4, t-5, and t-6,[7] together with lags of the log of investment [log(INV)], lags of the log of GDP [log(GDP)], and lags of the log of private consumption [log(CONS)].[8] The first column presents results for the 107 countries for which we had

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[7]Results presented below are robust to the inclusion of 6, 7 or 8 right hand side lags of log(INV), log(ME), log(CONS) and log(GDP). In the investment equation, the significance of lags 7 and 8 for all four right side variables tested jointly cannot be rejected for the OECD and Africa. In the military expenditure equation, their joint significance cannot be rejected for the OECD, Asia and Africa. However, the qualitative results presented here are robust to presence of 7 or 8 lags. These results are available upon request.

[8]We have 17 years of data for most countries analyzed here, a number of observations insufficient to support an analysis of whether GDP, investment, consumption and military expenditure are cointegrated for each country. Tests for the presence of unit roots and cointegration have very low power in small samples. However, even with 17 years of data,

both economic and military data. The next columns break countries up by regions, in order to test whether military expenditure has differential effects in different parts of the world. The regressions are all run with country specific intercepts and all variables have been detrended using country specific time trends.[9]

We find in Table One that military expenditure is significantly autoregressive, with the first lag in military expenditure positive and significant for all regions. These effects are diminished by negative, significant lags two years out in all country groups. Previous years' GDP and private consumption do not appear to influence military expenditure in the Middle East and Asia, Africa, or Latin America. In the OECD countries, increases in consumption appear to trigger increased military spending, although the effect is negligible six years out.

In order to test whether military expenditure is caused by past increases in investment, these models are run with and without lags of log investment in the conditioning set. F-tests

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we reject the presence of unit roots in consumption, investment, military expenditure, and GDP for a majority of the countries under study here.

[9]Standard causality tests are not valid in models with country specific effects if the number of time periods observed for each country is small; the error terms in small samples are correlated with the lagged endogenous variables. Our time series dimension, with 17 observations for most countries, may be large enough to effectively eliminate correlation between the lagged endogenous variables and errors. As a test for the effect of bias, we ran instrumental variable models, with lags from periods t-5, t-6, t-7 and t-8 used as instruments for the lagged endogenous variables from periods t-1, t-2, t-3, and t-4. We found no qualitative difference in the instrumental variables results and the results reported below. That is, in the OECD countries, increases in military expenditure continue to cause reductions in investment. In the instrumented results, reductions in private consumption precede increases in military expenditure in low and lower middle income dictatorships but appear uncorrelated with increases in military expenditure in low and lower middle income democracies. When lags of length t-1 through t-5 are instrumented using lags of length t-6 through t-10, the significance of all lagged variable groups is reduced for all country groups, due possibly to the reduction in sample size.

for the significance of their presence are reported at the bottom of the table. We find, in all but the Middle East and Asia, where a marginally significant effect is observed, that we cannot reject a null hypothesis that investment does not cause military expenditure.

Table Two presents results of estimating vector autoregressions of log investment on lags in log investment, log military expenditure, log GDP, and log consumption. Here we find evidence that, in the OECD countries, previous years' military expenditures reduce current investment. Lagged military expenditure in the OECD countries, primarily military expenditure two years out, has a negative and significant effect on investment in period t. This finding is robust to the addition of lags t-7 and t-8 or to the exclusion of lags for t-4, t-5, or t-6. The results in Tables One and Two suggest that investment does not Granger cause military spending in the OECD, but that military spending Granger causes reductions in investment.[10]

The negative and significant effect of military expenditure on investment, observed in the OECD, is not found for any other country group. In no other group does military expenditure significantly crowd out investment. This suggests that the capital formation model may provide a better explanation for slow growth in the OECD countries than slow

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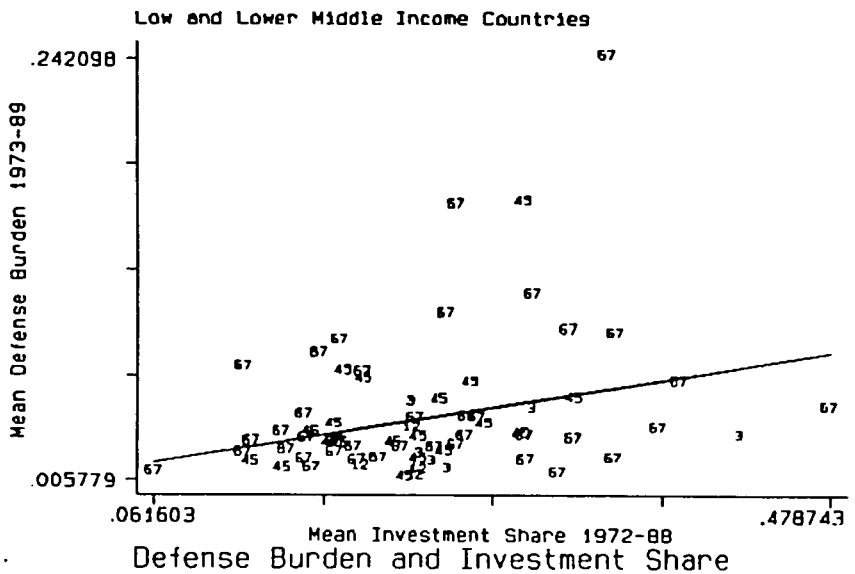
[10]Although it is not possible to adequately study each country individually, with 17 years of data, Granger causality tests were run on OECD countries separately, allowing 2 lags in log investment and log GDP and three lags in military expenditure. We found evidence of military expenditure Granger causing reductions in investment in nearly half of the OECD countries individually: Austria (F-statistic = 4.33, p-value 0.0742); Denmark (4.33, 0.0742); West Germany (3.38, 0.1117); Italy (6.37, 0.0368); Japan (4.24, 0.0770); Luxembourg (3.55, 0.1033); the Netherlands (3.71, 0.0960); and the United Kingdom (2.90, 0.1407). In most of the remaining OECD countries, including Australia, Belgium, Ireland, France, Sweden, Switzerland and the United States, the coefficients on lagged military expenditure are negative but the lags are not jointly significant. Similar results obtain when countries are analyzed individually and two lags of log military expenditure are run on the right hand side.

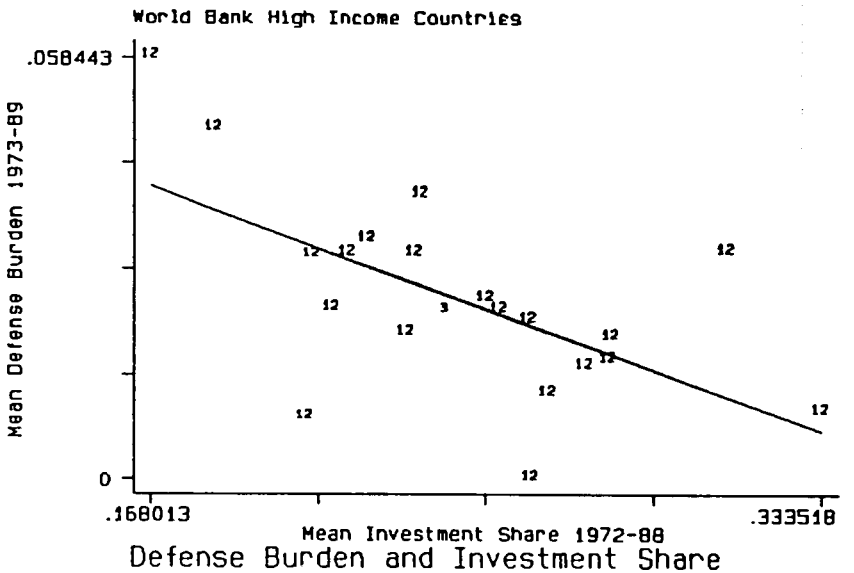
growth in other parts of the world. This difference between high and lower income countries may be due to differences in the way military spending is financed. If military expenditure is tax financed in high income countries in a manner that reduces incentives to invest, we would expect to see military spending crowd out investment.

In high income countries, the effect of military expenditure on investment is similar to the overall effect of general government consumption, of which military spending is but one component. Results presented in Table Three suggest that in the OECD countries both military expenditure and overall increases in government consumption Granger cause reductions in investment. This suggests that the negative relationship between investment and military expenditure observed in developed countries may be due to the means by which all governmental expenditure in financed and may not be special to the fact that the spending is for military purposes.

In developing countries, neither increases in military spending alone nor increases in general government spending Granger cause reductions in investment. Between developing and developed countries, why might there exist differences in the way military expenditure and overall governmental expenditures are financed? One marked difference between the high and lower income countries lies in political representation, which may lead to differences in the way resources are mobilized. We present in Figure 5 the relationship between defense burden and investment share in the high income countries, and contrast it with the relationship found in the low and lower middle income countries. Here, in place of country names, we identify countries by their level of political freedoms, as measured by Freedom House. Within the group of high income countries -- in which there exists a negative

Figure 5 **Defense Burden and Investment Share by Income Group**





Regressions with Huber standard errors.
Low and Lower Middle Income Countries: Defense Burden and Investment Share: regression coefficient = 0.148 (t=2.20)
High Income Countries: Defense Burden and Investment Share: regression coefficient = -0.204 (t=2.85)

Legend: Average Freedom House Rank >=1 & <=2 ="12"; Rank >2 & <=3 ="3"; Rank >3 and <=5 ="45"; Ranking >5 ="67";

correlation between military expenditures and investment share -- all countries are functioning democracies, receiving a rank of between "1" and "2" on average for their political freedoms.[11] Within the group of low and lower middle income countries -- in which there exist a positive correlation between military expenditure and investment share -- a marked number of countries are dictatorships, receiving a rank of "6" or "7" for their political freedoms. The positive correlation between military expenditure and investment share in the developing countries may, in fact, be due to the nature of the state: within dictatorships taken as a group, those leaders strong enough to mobilize resources for investment may also be able to mobilize resources for military expenditure. We turn directly to this issue in Section IV.

IV. Resource Mobilization and Defense Expenditure

To further explore the extent to which regime type influences the financing of military expenditure, we divide the low and lower middle income countries according to their level of political freedoms. We test the relationships between military expenditure, general government consumption and investment separately for these two groups. Table Four presents the results of vector autoregressions of the log of military expenditure on lags of log military expenditure, log private consumption, and log GDP, and tests for the joint significance of past lags of investment in current military expenditure. We find, detrending all variables by country and controlling for country specific fixed effects, that we cannot

[11]The exception is Spain, which has an average Freedom House ranking of 2.47 during this period. See Appendix Two for information on Freedom House rankings.

reject the null hypothesis that lagged investment does not cause current military expenditure, in either democracies or political dictatorships. Similarly, in vector autoregressions of log investment on lags of log investment, log military expenditure, log private consumption and log GDP, we cannot reject the null hypothesis that lagged military expenditure does not cause current investment.

Results in Table Four suggest that the difference between dictatorships and democracies may lie in the ability of dictators to increase military spending through reductions in private consumption. Increases in consumption have a large negative significant effect on future military spending in low and lower middle income dictatorships.[12] The low and lower middle income democracies provide a natural control group with which to compare the results for the dictatorships. We find no reduction in consumption in democracies prior to increases in military spending.[13]

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[12]This finding is robust to the lag length chosen for the vector autoregression. Again, it would be useful analyze each country separately. This is not possible for most countries, given current data constraints, but results of vector autoregressions by country are suggestive. In dictatorships, regressing detrended log military expenditure on lags in log military expenditure in t-1 and t-2 and on lags in log consumption in t-1 and t-2, we find the lags in log consumption have a significant negative effect on military expenditure in Cameroon (F-statistic = 13.82, p-value = 0.0018); Congo (64.85, 0.0152); Niger (7.64, 0.0174); and Tanzania (9.79, 0.0484). Lagged consumption also has a negative effect on military spending in Zaire, Guinea-Bissau, Algeria, Burundi and Malawi, although the effect is not significant in standard confidence intervals. These results are no more than suggestive; more data are necessary to adequately analyze countries individually.

[13]The result that changes in consumption do not cause changes in military expenditure in countries with greater political freedoms continues to hold when we define this group more broadly and include in it those countries who take a Freedom House indicator between "5" and "6" on average. Analysis by country suggests that within low and lower middle income democracies it often the case that *increases* in consumption precede increases in military spending, a result found for the OECD countries (Table One). This is true in country by

Results in Table Four suggest that the negative relationship between lagged private consumption and current military expenditure observed in dictatorships is symptomatic of the relationship between private consumption and government consumption more generally in these countries. Granger causality tests provided at the bottom of Table Four suggest that, in dictatorships, reduced private consumption precedes increases in military spending, increases in general government consumption and increases in gross domestic investment. In contrast, we do not find that reductions in consumption Granger cause increases in any of these variables in democracies.

Overall, these results suggest that increases in military spending in countries with few political freedoms is costly. However, this cost is not manifest in the effect such spending will have on investment and growth, but in the reduced private consumption necessary to pay for the build up.

V. Conclusion

The results presented above do not support the capital formation model's argument that military expenditure reduces growth by crowding out productive investment in developing countries. In developing countries with less political freedom military expenditure, like

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country regressions of log military expenditure on lags of log military expenditure in t-1 and t-2 and on lags of log consumption in t-1 and t-2 for Ecuador (F-statistic = 14.24, p-value= 0.0016); El Salvador (4.02, 0.0567); Mexico (3.39, 0.0799); Malaysia (4.28, 0.0494) and Thailand (2.68, 0.1225). In Argentina, Bolivia, Costa Rica, Dominican Republic, Fiji, Guyana, Morocco and Turkey, increases in lagged consumption lead to increases in military spending although the lags in log consumption are not jointly significant. In only two countries with greater political freedoms do we find the behavior observed in dictatorships, that increases in consumption precede reductions in military spending. This occurs in India and the Philippines.

government consumption more generally, is financed out of reductions in private consumption. Future research would be useful to better understand the mechanism through which this occurs.

We find more support for the capital formation model in higher income countries. Additional research is needed to fully understand why increases in defense spending, and increased general government consumption, leads to the crowding out of private investment in high income countries.

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Table One
VARs: Military Expenditure
Dependent Variable = log(military expenditure)$_t$

(t-statistics in parentheses)

	All	OECD	Middle East and Asia	Africa	Latin America
log(ME) t-1	0.55	0.34	0.59	0.49	0.62
	(14.50)	(5.03)	(6.39)	(6.60)	(5.72)
log(ME) t-2	-0.28	-0.25	-0.35	-0.21	-0.44
	(6.53)	(3.39)	(3.18)	(2.52)	(3.54)
log(ME) t-3	-0.08	0.04	-0.17	-0.05	-0.08
	(1.97)	(0.53)	(1.56)	(0.69)	(0.62)
log(ME) t-4	-0.11	-0.16	-0.24	-0.11	0.04
	(2.63)	(2.30)	(2.19)	(1.51)	(0.32)
log(ME) t-5	-0.14	-0.14	-0.08	-0.18	-0.01
	(3.61)	(2.18)	(0.85)	(2.58)	(0.07)
log(ME) t-6	-0.25	-0.19	-0.24	-0.16	-0.43
	(8.15)	(3.83)	(3.19)	(2.85)	(4.97)
log(INV) t-1	-0.00	0.10	0.31	0.01	-0.12
	(0.02)	(1.29)	(2.19)	(0.14)	(0.68)
log(INV) t-2	-0.04	-0.08	-0.60	-0.03	0.08
	(0.72)	(1.06)	(3.49)	(0.37)	(0.46)
log(INV) t-3	0.11	0.02	0.42	0.13	-0.01
	(1.81)	(0.25)	(2.31)	(1.07)	(0.06)
log(INV) t-4	-0.24	-0.11	-0.12	-0.33	0.05
	(3.71)	(1.62)	(0.70)	(2.55)	(0.28)
log(INV) t-5	0.14	0.20	-0.11	0.19	-0.11
	(2.14)	(2.93)	(0.72)	(1.41)	(0.60)
log(INV) t-6	0.05	-0.07	0.10	-0.04	0.39
	(0.88)	(1.02)	(0.80)	(0.30)	(2.40)
log(CONS) t-1	0.04	0.31	0.00	-0.14	0.84
	(0.24)	(1.25)	(0.01)	(0.33)	(1.39)
log(CONS) t-2	-0.28	-0.02	0.38	-0.29	-0.83
	(1.46)	(0.09)	(1.19)	(0.67)	(1.20)
log(CONS) t-3	-0.01	0.23	-0.17	-0.21	0.39
	(0.06)	(0.85)	(0.50)	(0.45)	(0.52)
log(CONS) t-4	0.12	-0.37	0.30	-0.22	0.40
	(0.65)	(1.47)	(0.91)	(0.56)	(0.59)
log(CONS) t-5	-0.09	-0.10	0.20	-0.17	-0.29
	(0.58)	(0.48)	(0.62)	(0.44)	(0.49)
log(CONS) t-6	0.18	-0.08	-0.03	-0.10	0.31
	(1.30)	(0.44)	(0.11)	(0.27)	(0.64)

Table One					
	All	OECD	Middle East and Asia	Africa	Latin America
F-test: lags INV (p-value)	3.00 (0.0067)	1.73 (0.1165)	2.23 (0.0446)	1.26 (0.2779)	1.23 (0.2966)
F-test: lags ME (p-value)	131.78 (0.0000)	16.62 (0.0000)	28.81 (0.0000)	27.71 (0.0000)	13.76 (0.0000)
F-test: lags GDP (p-value)	1.56 (0.1572)	2.63 (0.0188)	0.44 (0.8520)	0.82 (0.5580)	0.34 (0.9157)
F-test:lags CONS (p-value)	0.90 (0.4911)	1.99 (0.0697)	0.41 (0.8690)	0.35 (0.9114)	0.47 (0.8331)
Number of Obs	861	200	160	229	179

Notes to Table One

1. Included but not reported: 6 lags in log(GDP), country indicator variables, and country specific time trends.

2. Data sources: ACDA and World Bank World Tables. See Appendix One for a list of countries by region.

3."F-test: lags INV" is an F-statistic for the joint significance of all lags of log(investment) included in the regression. Other F-tests analogously defined.

Table Two
VARs: Private Investment
Dependent Variable = log(Gross Domestic Investment)$_t$

(t-statistics in parentheses)

	All	OECD	Middle East and Asia	Africa	Latin America
log(ME) t-1	-0.01	0.24	0.03	-0.05	-0.03
	(0.22)	(1.99)	(0.35)	(0.64)	(0.21)
log(ME) t-2	-0.00	-0.62	-0.08	0.09	-0.06
	(0.09)	(4.79)	(0.66)	(0.96)	(0.41)
log(ME) t-3	0.00	0.16	0.00	-0.04	0.01
	(0.05)	(1.23)	(0.01)	(0.49)	(0.08)
log(ME) t-4	0.06	-0.08	-0.16	0.08	0.18
	(1.23)	(0.67)	(1.46)	(1.07)	(1.16)
log(ME) t-5	-0.01	0.09	-0.04	-0.01	-0.12
	(0.24)	(0.78)	(0.37)	(0.15)	(0.80)
log(ME) t-6	-0.03	0.04	0.13	-0.03	-0.16
	(0.94)	(0.44)	(1.58)	(0.54)	(1.53)
log(INV) t-1	0.22	0.34	0.88	0.08	0.11
	(3.83)	(2.45)	(5.90)	(0.85)	(0.49)
log(INV) t-2	-0.09	0.06	-0.29	-0.18	-0.10
	(1.48)	(0.45)	(1.66)	(1.86)	(0.41)
log(INV) t-3	-0.09	0.06	-0.25	-0.08	-0.10
	(1.16)	(0.46)	(1.28)	(0.63)	(0.41)
log(INV) t-4	-0.23	-0.28	0.33	-0.24	-0.06
	(3.02)	(2.25)	(1.80)	(1.77)	(0.26)
log(INV) t-5	-0.05	-0.02	-0.28	0.12	-0.16
	(0.68)	(0.15)	(1.71)	(0.78)	(0.69)
log(INV) t-6	-0.23	0.01	-0.16	-0.37	-0.06
	(3.69)	(0.05)	(1.27)	(2.85)	(0.32)
log(CONS) t-1	-0.21	0.63	-0.35	-0.10	-0.28
	(1.00)	(1.42)	(1.09)	(0.21)	(0.37)
log(CONS) t-2	-0.70	-0.79	-0.54	-1.31	0.09
	(3.05)	(1.63)	(1.62)	(2.80)	(0.11)
log(CONS) t-3	0.43	1.13	-0.13	0.44	0.71
	(1.86)	(2.38)	(0.38)	(0.89)	(0.75)
log(CONS) t-4	-0.52	0.28	-0.12	-0.60	0.42
	(2.38)	(0.62)	(0.36)	(1.38)	(0.50)
log(CONS) t-5	0.18	-0.10	-0.24	0.55	0.47
	(0.95)	(0.28)	(0.72)	(1.43)	(0.63)
log(CONS) t-6	0.16	-0.68	-0.18	0.19	0.71
	(1.03)	(1.99)	(0.57)	(0.47)	(1.15)

Table Two					
	All	OECD	Middle East and Asia	Africa	Latin America
F-test: lags INV (p-value)	12.17 (0.0000)	3.69 (0.0018)	15.23 (0.0000)	2.40 (0.0297)	0.44 (0.8493)
F-test: lags ME (p-value)	0.67 (0.6716)	4.85 (0.0001)	1.51 (0.1822)	0.47 (0.8265)	1.09 (0.3696)
F-test: lags GDP (p-value)	7.27 (0.0000)	2.93 (0.0097)	1.08 (0.3771)	2.43 (0.0281)	1.32 (0.2532)
F-test:lags CONS (p-value)	3.58 (0.0016)	3.82 (0.0014)	0.87 (0.5177)	2.37 (0.0318)	0.55 (0.7674)
Number of Obs	861	200	160	229	179

Notes to Table Two

1. Included but not reported: 6 lags in log(GDP), country indicator variables, and country specific time trends.

2. Data sources: ACDA and World Bank World Tables. See Appendix One for a list of countries by region.

3."F-test: lags INV" is an F-statistic for the joint significance of all lags of log(investment) included in the regression. Other F-tests analogously defined.

Table Three

VARs: Government Expenditure and Investment in OECD Countries

(t-statistics in parentheses)

Dependent Variable: Log (Gross Domestic Investment)$_t$			
Explanatory Variables:			
log(ME) t-1	0.36 (2.94)	log(GOV) t-1	-1.35 (2.64)
log(ME) t-2	-0.61 (4.77)	log(GOV) t-2	0.15 (0.25)
log(ME) t-3	0.15 (1.16)	log(GOV) t-3	0.00 (0.00)
log(ME) t-4	-0.09 (0.79)	log(GOV) t-4	1.02 (1.75)
log(ME) t-5	0.19 (1.07)	log(GOV) t-5	-0.54 (1.06)
log(ME) t-6	0.11 (1.09)	log(GOV) t-6	-1.51 (3.66)
log(INV) t-1	0.21 (1.51)	log(CON) t-1	1.29 (2.63)
log(INV) t-2	0.10 (0.59)	log(CON) t-2	-1.00 (1.98)
log(INV) t-3	-0.01 (0.05)	log(CON) t-3	1.02 (2.15)
log(INV) t-4	-0.08 (0.51)	log(CON) t-4	-0.02 (0.04)
log(INV) t-5	-0.14 (1.05)	log(CON) t-5	0.03 (0.06)
log(INV) t-6	-0.22 (1.78)	log(CON) t-6	0.39 (0.86)
F-test: lags INV (p-value)	3.11 (0.0067)	F-test: lags GOV (p-value)	4.12 (0.0007)
F-test: lags ME (p-value)	6.01 (0.0000)	F-test: lags CON (p-value)	1.97 (0.0731)
F-test: lags GDP (p-value)	3.53 (0.0027)		

Notes to Table Three

1. Included but not reported: six lags in log(GDP), indicator variables and country specific time trends.

2. Data sources: ACDA and World Bank World Tables.

3. F-test: lags INV" is an F-statistic for the joint significance of all lags of log(investment) included in the regression. Other F-tests analogously defined. Number of observations = 200.

Table Four
VARs: Military Expenditure and Investment In Low and Lower Middle Income Countries
By Level of Political Freedom

(t-statistics in parentheses)

	Fewer Political Freedoms			Greater Political Freedoms		
	Dep Var: $\log(ME)_t$	Dep Var: $\log(GOV)_t$	Dep Var: $\log(INV)_t$	Dep Var: $\log(ME)_t$	Dep Var: $\log(GOV)_t$	Dep Var: $\log(INV)_t$
log(ME) t-1	0.37	--	-0.03	0.60	--	-0.07
	(3.08)		(0.14)	(6.97)		(0.64)
log(ME) t-2	-0.15	--	0.03	-0.33	--	-0.10
	(1.38)		(0.14)	(3.31)		(0.88)
log(ME) t-3	-0.24	--	0.01	-0.25	--	-0.08
	(2.28)		(0.10)	(2.33)		(0.67)
log(ME) t-4	-0.17	--	0.01	0.05	--	0.15
	(1.81)		(0.06)	(0.44)		(1.27)
log(ME) t-5	-0.20	--	-0.03	0.04	--	-0.06
	(2.29)		(0.19)	(0.39)		(0.52)
log(ME) t-6	-0.19	--	-0.14	-0.29	--	-0.09
	(2.09)		(0.95)	(4.92)		(1.22)
log(GOV) t-1	--	0.15	-0.06	--	0.59	-0.21
		(1.43)	(0.20)		(2.93)	(0.69)
log(GOV) t-2	--	-0.06	0.10	--	0.00	0.39
		(0.60)	(0.34)		(0.02)	(1.11)
log(GOV) t-3	--	0.09	0.43	--	-0.17	-0.31
		(0.83)	(1.46)		(0.72)	(0.90)
log(GOV) t-4	--	-0.24	0.13	--	0.05	0.28
		(2.39)	(0.43)		(0.26)	(0.84)
log(GOV) t-5	--	-0.10	0.05	--	-0.11	-0.10
		(0.96)	(0.18)		(0.60)	(0.35)
log(GOV) t-6	--	-0.20	0.04	--	-0.16	0.10
		(1.68)	(0.11)		(1.04)	(0.41)
log(INV) t-1	-0.08	0.04	-0.11	-0.04	-0.04	0.27
	(0.91)	(0.72)	(0.93)	(0.24)	(0.31)	(1.54)
log(INV) t-2	-0.10	-0.04	-0.27	-0.07	0.07	-0.10
	(1.08)	(0.64)	(2.04)	(0.43)	(0.56)	(0.54)
log(INV) t-3	0.26	0.02	-0.21	0.26	-0.10	-0.08
	(1.72)	(0.24)	(1.92)	(1.51)	(0.78)	(0.41)
log(INV) t-4	-0.09	0.02	-0.45	-0.21	0.22	-0.12
	(0.56)	(0.39)	(1.81)	(1.25)	(1.74)	(0.64)
log(INV) t-5	0.23	-0.06	-0.08	0.23	-0.17	-0.09
	(1.46)	(0.75)	(0.32)	(1.50)	(1.40)	(0.53)
log(INV) t-6	0.16	0.01	-0.14	0.23	0.17	-0.09
	(1.21)	(0.16)	(0.70)	(1.72)	(1.66)	(0.56)

Table Four						
	Fewer Political Freedoms			Greater Political Freedoms		
	Dep Var: $\log(ME)_t$	Dep Var: $\log(GOV)_t$	Dep Var: $\log(INV)_t$	Dep Var: $\log(ME)_t$	Dep Var: $\log(GOV)_t$	Dep Var: $\log(INV)_t$
log(CONS) t-1	-0.73	-0.16	-0.39	0.02	-0.36	-0.71
	(1.45)	(0.58)	(0.49)	(0.05)	(0.88)	(1.30)
log(CONS) t-2	-1.05	-0.16	-1.99	0.40	-0.54	-0.56
	(2.04)	(0.57)	(2.62)	(0.79)	(1.29)	(0.94)
log(CONS) t-3	-0.92	-0.65	0.84	-0.13	-0.15	0.59
	(1.66)	(2.16)	(0.99)	(0.25)	(0.38)	(0.94)
log(CONS) t-4	-0.05	0.20	-0.81	-0.23	0.00	-0.57
	(0.10)	(0.72)	(0.95)	(0.48)	(0.00)	(1.01)
log(CONS) t-5	-0.01	-0.55	0.10	0.15	0.18	0.36
	(0.02)	(1.94)	(0.14)	(0.33)	(0.51)	(0.66)
log(CONS) t-6	0.46	0.12	0.97	0.27	0.15	0.16
	(1.00)	(0.48)	(1.41)	(0.68)	(0.47)	(0.33)
F-test: lags INV (p-value)	1.86 (0.0970)	0.26 (0.9541)	1.45 (0.2071)	1.82 (0.0980)	0.97 (0.4497)	1.26 (0.2804)
F-test: lags ME (p-value)	13.64 (0.0000)	not incl.	0.29 (0.9412)	17.82 (0.0000)	not incl.	0.95 (0.4618)
F-test: lags GOV (p-value)	not incl.	3.65 (0.0022)	0.49 (0.8144)	not incl.	4.10 (0.0006)	0.36 (0.9053)
F-test: lags GDP (p-value)	2.83 (0.0144)	1.93 (0.0811)	1.58 (0.1645)	0.70 (0.6531)	1.88 (0.0843)	2.09 (0.0560)
F-test: lags CONS (p-value)	2.50 (0.0279)	2.74 (0.0152)	1.86 (0.0972)	0.33 (0.9221)	1.30 (0.2583)	1.17 (0.3239)
Number of Obs	129	177	129	241	280	241

Notes to Table Four

1. Included but not reported: 6 lags in log(GDP), country indicator variables, and country specific time trends.

2. Data sources: ACDA and World Bank World Tables. See Appendix Two for information on political freedoms.

3."F-test: lags INV" is an F-statistic for the joint significance of all lags of log(investment) included in the regression. Other F-tests analogously defined.

Appendix One: Countries Used in VAR Analysis

OECD Countries

AS	Australia
AU	Austria
BE	Belgium
CA	Canada
DA	Denmark
EI	Ireland
FI	Finland
FR	France
GW	West Germany
IT	Italy
JA	Japan
LU	Luxembourg
NE	Netherlands
NO	Norway
NZ	New Zealand
SP	Spain
SW	Sweden
SZ	Switzerland
UK	United Kingdom
US	United States

Latin American Countries

AR	Argentina
BL	Bolivia
BR	Brazil
CI	Chile
CO	Colombia
CS	Costa Rica
DR	Dominican Republic
EC	Ecuador
ES	El Salvador
GT	Guatemala
GY	Guyana
HA	Haiti
HO	Honduras
JM	Jamaica
MX	Mexico
NU	Nicaragua
PA	Paraguay
PE	Peru
PN	Panama
TD	Trinidad and Tobago
UY	Uruguay
VE	Venezuela

Africa:
Low and Lower Middle Income African Countries

AG	Algeria
BC	Botswana
BY	Burundi
CF	Congo
CG	Zaire
CM	Cameroon
CT	Central African Republic
CV	Cape Verde
DM	Benin
ET	Ethiopia
GH	Ghana
IV	Cote D'Ivoire
KE	Kenya
LI	Liberia
LT	Lesotho
MA	Madagascar
MI	Malawi
ML	Mali
MO	Morocco
MR	Mauritania
MZ	Mozambique
NG	Niger
NI	Nigeria
PU	Guinea-Bissau
RH	Zimbabwe
RW	Rwanda
SG	Senegal
SL	Sierra Leone
SO	Somalia
SU	Sudan
TO	Togo
TS	Tunisia
TZ	Tanzania
UV	Burkina Faso
WZ	Swaziland
ZA	Zambia

Middle East and Asia

CE	Sri Lanka
CH	People's Republic of China
EG	Egypt
ID	Indonesia
IN	India
IS	Israel
JO	Jordan
KS	South Korea
KU	Kuwait
MY	Malaysia
PK	Pakistan
RP	Philippines
SY	Syria
TC	United Arab Emirates
TH	Thailand
TU	Turkey
YE	Yemen (Sanaa)

All countries listed above were included in the "All Countries" group, to which was also added: Cyprus, Fiji, Greece, Hungary, Libya, Mauritius, Malta, Papua New Guinea, Poland, Portugal, South Africa, and Yugoslavia.

Appendix Two: Low and Lower Middle Income Countries Political Freedoms

Greater Political Freedoms:

Countries in the analysis are said to have greater political freedoms if they received a rank of 5 or less, on average, from Freedom House.

Rank 1: Freedom to participate in the electoral process. Political parties form freely.

Rank 2: Political process is open, but some obstacles may exists to a well functioning democracy. Leaders may be voted out of office.

Rank 3: Leaders are elected, but marked interference with the political process (e.g. coups) may occur.

Rank 4: Democratic elections do not occur, or have little meaning.

Rank 5: Elections are of limited importance. Results may be controlled from outside the system.

Fewer Political Freedoms:

Countries in the analysis are said to have less political freedoms if they received a rank of 6 or more, on average, from Freedom House.

Rank 6: Elections do not take place, or take place with only one slate of candidates.

Rank 7: Dictatorship.

Low and Lower Middle Income Countries with Greater Political Freedoms:

Argentina (average rank = 3.7), Botswana(2.1), Bolivia (4.1), Sri Lanka (2.4), Colombia (2.0), Costa Rica (1.0), Dominican Republic (2.2), Ecuador (3.8), El Salvador (3.2), Fiji (2.4), Guatemala (3.8), Guyana (4.2), Honduras (4.2), India (2.0), Indonesia (5.0), Jamaica (1.7), Morocco (4.2), Mexico (3.7), Malaysia (2.9), Paraguay (5.0), Peru (3.9), Pakistan (4.9), Zimbabwe (4.8), Philippines (4.4), Senegal (4.3), Thailand (4.1), Turkey (2.7).

Low and Lower Middle Income Countries with Less Political Freedoms:

Algeria (6.0), Burundi (6.9), Congo (6.5), Zaire (6.6), China (6.3), Cameroon (6.1), Central African Republic (6.9), Benin (7.0), Ethiopia (6.5), Haiti (6.5), Malawi (6.4), Mali (6.9), Mauritania (6.4), Mozambique (6.5), Niger (6.8), Guinea-Bissau (6.1), Rwanda (6.4), Somalia (7.0), Togo (6.3), Tanzania (6.0).

Appendix Three: Variable Creation

Defense Burden
From 1973-78: using 1980 ACDA data variables MXD and GXD, defense burden = (MXD/GXD).
From 1979-89: using 1989 ACDA data variables M89DR and G89DR, defense burden = (M89DR/G89DR).

Investment Share
From World Tables of Economic and Social Indicators,
investment share = (constant 1980 price gross domestic investment/constant 1980 price gross national product)
= (kp.l.inv.gdi/kp.l.gnp.mp)

Growth in GDP/Capita
Log difference in Real Gross Domestic Product per capita, with terms of trade adjustment from Summers and Heston, Penn World Tables (Mark 5).
(Supplied by John McMillan, Institute for Policy Reform.)

For vector autoregressions:

Investment
From World Tables of Economic and Social Indicators, gross domestic investment in 1980$
= constant gross domestic investment in 1980 local currency/annual average conversion factor (LC/$)
= (kp.l.inv.gdi/pr.exrate)

Gross Domestic Product
From World Tables of Economic and Social Indicators, gross domestic product in 1980$
= (kp.l.gdp.mp/pr.exrate)

Military Expenditure
Military expenditures are recorded as part of central government expenditures; they are not included in gross domestic investment.
From ACDA military expenditure in 1980$, with GDP price deflator from the World Tables
= (MCD/defl.gdp)

Private Consumption
From World Tables of Economic and Social Indicators, private consumption in 1980$
= (kp.l.con.prv/pr.exrate)

Government Expenditure
From World Tables of Economic and Social Indicators, general government consumption in 1980$
= (kp.l.con.gov/pr.exrate)