The Impact of Defense Spending on GDP: The Case of North America

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I. Introduction

With the demise of the Soviet Union in the early 1990s, the fall of the Berlin Wall and the end of the Cold War, some saw the need for decreased military spending by the United States and they sought evidence of the peace dividend. But in 2007, six years after 9-11, the U.S. is engaged in an ongoing five-year war in Iraq and a six-year conflict in Afghanistan. Given the current strain on the deployment of the U.S. armed forces, concerns about the readiness of the forces and the possible inability to engage in armed conflict on two separate fronts, some argue that an increase in U.S. defense spending is needed. Debates about whether a military draft should be reinstituted have begun. Given the increased fiscal pressure of defense spending on a fragile federal government budget and a fragile economy, a more current analysis of the impact of defense spending on GDP growth should be worthwhile.

This paper is a pilot study which examines whether increases in military spending have a positive or negative impact on a country's GDP. The study focuses on the three North American economies: Canada, Mexico and the United States. While many others have written on this issue, the approach used in this paper is somewhat unique in that a reduced-form "St. Louis" type model is used to measure the impact of the central government's economic policy tools on the growth rate of GDP. Three policy tools are included in the model. Two different fiscal policy tools are examined. First, the model includes central government expenditures (the standard Keynesian policy tool). However, the model also includes a separate category of central government expenditures—military spending. Finally, the role of monetary policy is captured by including money supply changes in the model. The data set for each of the three countries includes 43 annual observations between 1963 and 2005. The "St. Louis" model was estimated

using current macroeconomic time-series techniques including VAR models, unit root tests, and tests for cointegration. The impact of a change in policy is examined using impulse response functions from the VAR models.

The results produced by the statistical models are asymmetric. Increased military spending in Canada and Mexico leads to increases in GDP while increased military spending in the United States decreases GDP. This result was confirmed with two different statistical tests: pairwise Granger-causality tests and the behavior of impulse response functions generated by each country's VAR model. These results hint of a threshold effect where the impact of defense spending on the economy depends on the size of the country's military spending relative to total central government expenditures and GDP. An increase in nonmilitary spending leads to rising GDP in the United States and Mexico, but leads to falling GDP in Canada. The impulse response functions indicate that innovations in the money supply are associated with rising GDP in Canada and the U.S., but do not affect GDP in Mexico.

The rest of the paper is organized as follows. Following this introduction, the second section of the paper provides a brief review of the past literature regarding the impact of defense spending on a country's economy. A description of the empirical model and the data is found in the third section of the paper. This section also contains a discussion of the unit root tests and an analysis of the pairwise Ganger-causality tests. The empirical results and the impulse response functions are analyzed in the fourth section, while the final section of the paper offers a critique of the results and some ideas for future research.

II. Literature Review

Previous papers on the impact of a nation's defense spending on its economy have concentrated on four areas. Some researchers have stressed the relationship between military

spending and private investment. Others (especially development economists) have investigated the effect that defense spending has on employment. Still others have investigated an economy's demand for defense expenditures. Finally, the most common approach has been to relate military spending directly to the nation's ability to produce output (GDP).[1] The literature review that follows has been divided into these four areas.

The impact of defense spending on private investment

Several studies have concluded that, in the case of developed nations, investment and military expenditures are substitutes (Kennedy 1983, p. 198). Smith (1977, 1978, 1980, and 1983) argues that households are very resistant to cuts in private consumption and public welfare. Given an exchange rate and a level of capacity utilization, the remainder of the nation's output is divided between defense spending and investment. The result is that a higher level of military spending leads to a lower level of investment. In a study of 15 countries between 1960 and 1970, Smith found that investment spending and defense spending were negatively correlated (-0.73). Lindgren (1984) points out that most studies are in agreement on the negative correlation between defense spending and investment spending for industrialized, market economies.

More recently, a study by Laopodis (2001) produced substantially different results. Using Granger causality tests on a time-series of data (1960-1997) for Greece, Ireland, Portugal and Spain no significant relationship (either positive or negative) was found between military spending and gross private domestic investment. To further investigate this relationship, Laopodis tested for cointegration of a number of variables relating to gross private domestic

[1]For a recent study of the relationship between military expenditures and economic growth in developing nations, see Chowdhury (1991).

investment and estimated the associated error correction model. The results again indicated that military spending had no significant effect on investment.

The impact of defense spending on employment

Regarding the impact of military expenditures on employment, the Marxist critique of the 1960s was that defense spending was a necessary, albeit wasteful, policy to stabilize and expand capitalism (Baran and Sweezy 1968). They argued that by raising the level of defense spending a country could solve the problems of under consumption and the unemployment associated with it. Furthermore, capitalism would resort to such spending in an effort to reduce class conflict. The hypothesis that increased military spending indirectly creates employment in the armaments industry and directly creates more jobs in the armed forces does not necessarily need to rely on the tenants of Marxist economics for support. Indeed, one of the primary concerns regarding disarmament at the end of the Cold War was its hypothesized relationship to rising unemployment.

In spite of this intuitive relationship, Chester (1978), Smith (1978), and deGrasse (1983) could not find a statistically significant relationship between military expenditures and unemployment. In his survey article of the literature, Lindgren concludes that "the relationship between military expenditures and employment seems too complex to capture by correlation or regression methods" (Lindgren, 1984, p.381). Recent studies confirm these earlier findings. Dunne and Smith (1990) find no Granger causality between the share of defense spending and the unemployment rate in nine of 11 countries in the OECD. Using data from 1962 to 1988, Paul (1996) tested various economic hypotheses about the relationship between unemployment and defense and non-defense spending in 18 OECD countries. However, Paul was unable to find a uniform relationship between these variables across the various nations.

An interesting approach to this estimation problem was provided by Hooker and Knetter (1997). Using a panel data model for the U.S, they found that defense procurement spending which does vary from state to state had a significant impact on statewide employment. Both the time series and the cross sections were accounted for with fixed effects. Additional evidence was produced that the effects of defense spending on employment are decidedly nonlinear with larger changes in defense spending produce significantly greater changes in employment.

Several other research efforts have been focused on specific countries. Wing (1991), using input-output analysis, found that defense spending had a significant impact on employment in Indonesia. Yildirim and Sezgin (2003) found that increases in defense spending tended to affect employment negatively in Turkey. In a recent paper by Huang and Kao (2005), the relationship between defense spending and employment in Taiwan was investigated. These two used an unusual cointegration technique to demonstrate that defense spending damages employment in the short run but benefits it in the long run.

The Demand for Defense Expenditures

Another interesting facet of research on military expenditures is the question of demand determination. Early researchers in this area tended to estimate demand specifications for defense spending that were closely related to standard household demand theory. Hartley and Sandler (1990) provide a good review of these studies. The results seem to indicate that defense spending is a normal good (positively related to GDP) and that, being a public good, there is significant free riding.

Sandler and Murdoch (1991) add elements of game theory to the formulation of demand models for defense expenditure. Murdoch *et al* (1991) test what is referred to as a median voter demand model against an oligarchy model for members of NATO and get mixed results. Hanson

et al. (1990), Hilton and Vu (1991) and Conybeare *et al.* (1994) all test empirical models of defense demand concentrating on NATO countries. While all of these authors use slightly different approaches they tend to get similar results regarding income or GDP (defense provision is a normal good) and produce mixed results about free riding. They also tend to agree that degree of external threat is an important determinant of demand.

A recent paper by Solomon (2005) uses a kind of cointegration technique (autoregressive distributed lag approach) to investigate the demand for military spending in Canada. The results indicated that the most important determinant of military spending in Canada was European NATO spending. Interestingly, GDP was found to be insignificant.

The Impact of Defense Spending On GDP

Given the long-accepted, theoretical direct relationship between investment and economic growth, if defense spending has a negative impact on investment, then it would seem reasonable that defense spending would have an adverse impact on economic growth. This was exactly the findings of two studies published in the seventies, Szymanski (1973) and Lee (1973). Some studies attribute the negative effect of defense spending on economic growth to reduced investment.[2] Another study argues that defense spending restricts export growth and economic growth because military expenditures compete for the same resources used in the production of exports.[3]

However, other studies were unable to find any stable relationship between military spending and economic growth.[4] Chester (1978) found that military spending and economic growth were positively related. A direct relationship between defense spending and economic

[2]See Smith (1977 and 1978), Smith and Georgiou (1983) and Cappelen, *et al* (1984).
[3]See Rotschild (1973).
[4]See Nardinelli and Ackerman (1976), Faini *et al.* (1984), and de Grasse (1983).

growth was found by Ahmed (1986) in a study of the UK. Weede (1983) found evidence that supported his hypothesis that higher rates of participation in the armed services lead to more economic growth. His argument was that service in the military leads to human capital formation that is beneficial to economic growth. In his 1984 review essay that synthesizes past articles analyzing of the impact of military spending on the economies of industrialized nations, Lindgren (1984, p. 380) writes that the studies of the impact of defense spending on economic growth are not as conclusive as those of investment. Nevertheless, the overwhelming conclusion seems to be that military spending is not positively associated with economic growth but that additional research is needed to clarify the issue. In terms of past modeling attempts, Lindgren (1984, p. 376) notes that many studies used statistical techniques whose methods varied and whose steps were not clearly described. These articles usually lacked the development of a formal theoretical model on which to base econometric estimations. In examining the relationship between defense spending and economic growth, Blackaby and Ohlson (1982, p. 291) noted that instead of "trying to provide a reasonable statistical structure" most of these past attempts were "armchair theorists who conduct statistical exercises."

Perhaps because of the above criticisms, models based on seemingly sounder theoretical development have come into common use by researchers of this relationship. One of these models is generally referred to as the Feder-Ram model because it was adapted by Biswas and Ram (1986) from an export model developed by Feder (1983). Cuaresma and Reitschuler (2003) used a version of this model for the U.S. economy. They found that at low levels of spending (below an estimated threshold) defense spending has a positive impact on growth, but at high levels the impact is either negative or insignificant. Yildirim *et al*. (2005) use a Feder-Ram

derivation to find that military spending has a positive overall effect on the economies of the Middle East.

A number of recent papers have attacked the problem through application of a type of Granger causality estimation. Because they use Granger causality these papers generally limit their analysis to examination of only two variables, defense spending and GDP. Dakurah *et a*l. (2001) examined 62 less developed countries (LDCs) with data from 1975 to 1995. A type of two-way Granger causality was estimated for all of the countries. Only 23 countries exhibited unidirectional causality, and in 16 of those 23 the relationship between defense spending and GDP was positive. For the remaining 7, the relationship was negative. But, for most of the countries, there was no relationship. Karagol and Palaz (2004) applied a similar technique to Turkey for the years 1955 to 2000. However, they used impulse response functions to indicate long-run causality. The result was that defense expenditures had a negative impact on GDP in Turkey. Using a similar technique, Kollias *et al*. (2004) found that defense spending had a positive impact on GDP in Cyprus. Their reasoning for this outcome was that the increase in defense spending led to a greater feeling of security in Cyprus and, therefore, a better climate for economic growth.

Atesoglu (2002) formulates a multivariable reduced-form Keynesian model patterned after Romer (2000). Using cointegration estimation techniques for the years 1947 to 2000, Atesoglu finds a positive long-run relationship between military spending and output for the U.S. economy. Galvin (2003) also uses a multiequation, multivariable approach to investigate the problem. Using a model similar to that of Deger (1986) three equations are postulated, one each for growth, saving and defense expenditure. This model is somewhat unusual in that the data used for estimation is strictly cross-sectional (64 developing countries). The author uses OLS,

2SLS and 3SLS to derive overall estimates and separate estimates for middle and lower income countries. The results indicate that military spending has a negative impact on growth for the middle income countries but is insignificant for the low income countries. Klein (2004) also used a Deger type model to estimate the effects of military spending in Peru. After some unit root testing and difficulties with estimation results from the differenced system, adjustments were made and the three equation model was estimated with OLS, 2SLS and 3SLS. The resulting estimates reveal a negative relationship between defense spending and economic growth in Peru. Finally, Dunne *et al*. (2005) provides a very good overview of the various models used to estimate the relationship between defense spending and growth.

Obviously, the results from many different models estimated in several different ways have been mixed. Consequently, the search is still on for a model and an estimation technique that will provide consistent results. Our attempt begins by looking at the entire process in a slightly different way. Economists are always concerned about policy making and, therefore, policy variables. Governments have at their disposal several tools with which to affect the macro economy. These tools are usually divided into two classes: monetary and fiscal policy tools. Obviously, control over military spending is a "fiscal" policy tool. So, our approach is to use military spending within a model that was originally set forth to distinguish the effectiveness of these tools—the St. Louis model.

III. The Model, the Data, Unit Root Tests, and Granger-Causality Tests

To determine the relative impacts of defense spending, other central government spending and monetary policy on a country's output, a "St. Louis" or reduced-form expenditure model is used. Let $\dot{Y}_t$ equal the annual percentage change in nominal GDP that was observed in year t. To distinguish between the change in defense spending and other central government

expenditures, let $\dot{D}_t$ denotes the annual percentage change in nominal military expenditures in year t, while $\dot{O}_t$ equals the percentage change in nominal nonmilitary expenditures in year t. Finally, to control for the differences between fiscal and monetary policy, $\dot{M}_t$ is the annual percentage change in the nominal money supply in year t.

Specifying the VAR model

The vector autoregression (VAR) model is a seemingly unrelated system of four regressions where each of the current dependent variables is a function of lagged dependent variables. The VAR model below assumes that each regression has the same lag structure or

$$\dot{Y}_t = \beta_0 + \sum_{i=1}^{T}\beta_i \dot{Y}_{t-i} + \sum_{i=1}^{T}\beta_{T+i}\dot{D}_{t-i} + \sum_{i=1}^{T}\beta_{2T+i}\dot{O}_{t-i} + \sum_{i=1}^{T}\beta_{3T+i}\dot{M}_{t-i} + \varepsilon_{1t} \tag{1}$$

$$\dot{D}_t = \alpha_0 + \sum_{i=1}^{T}\alpha_i \dot{Y}_{t-i} + \sum_{i=1}^{T}\alpha_{T+i}\dot{D}_{t-i} + \sum_{i=1}^{T}\alpha_{2T+i}\dot{O}_{t-i} + \sum_{i=1}^{T}\alpha_{3T+i}\dot{M}_{t-i} + \varepsilon_{2t} \tag{2}$$

$$\dot{O}_t = \delta_0 + \sum_{i=1}^{T}\delta_i \dot{Y}_{t-i} + \sum_{i=1}^{T}\delta_{T+i}\dot{D}_{t-i} + \sum_{i=1}^{T}\delta_{2T+i}\dot{O}_{t-i} + \sum_{i=1}^{T}\delta_{3T+i}\dot{M}_{t-i} + \varepsilon_{3t} \tag{3}$$

and

$$\dot{M}_t = \gamma_0 + \sum_{i=1}^{T}\gamma_i \dot{Y}_{t-i} + \sum_{i=1}^{T}\gamma_{T+i}\dot{D}_{t-i} + \sum_{i=1}^{T}\gamma_{2T+i}\dot{O}_{t-i} + \sum_{i=1}^{T}\gamma_{3T+i}\dot{M}_{t-i} + \varepsilon_{4t} \ . \tag{4}$$

On the right-hand side of each equation, T lags of each dependent variable are used as explanatory variables. Also notice that the right-had sides of Equations (1)-(4) contain no other exogenous explanatory variables.

The data

To initially test the impact of military spending on the growth rate of GDP, this paper used a pilot case of the three North American countries: Canada, Mexico, and the United States. This sample has two G7 countries, Canada and the United States, the only superpower. The

results of these two developed countries can be compared with Mexico, the sample's only developing country. Annual data for all four variables were obtained for each of the three countries for 43 years, from 1963 to 2005. The data can be found in Tables A1, A2, and A3 of the appendix.[5]

Table 1 shows that the military expenditures in the United States, as a percentage of central government expenditures, fell from a high of 49.15 percent in 1963 to a low of 15.70 percent in 1999. The U.S. wars in Afghanistan and Iraq increased this percentage to 19.84% in 2005. In the case of Canada, military expenditures as a percentage of central government expenditures fell from 24.03 percent in 1963 to 5.86 percent in 2005. While this percentage fluctuates over time, the general trend for Canada was for this percentage was to fall over the data sample. Military spending as a percentage of central government expenditures was 10 percent in Mexico during 1965. While this percentage fell over time , it hit 1.5 percent in 1982, increased to 4.7 percent in 1994, and was 2.41 percent in 2005.

Between 1963 and 2005, military expenditures as a percentage of GDP fell for each of the three countries. As Table 1 shows, almost during the height of the Vietnam War, military spending was 9.09 percent of GDP in the United States in 1967. After 9-11, military spending as a percentage of GDP increased from 3.09 percent in 2001 to 4.07 percent in 2005. Military spending in Mexico is always a smaller percentage of Mexican GDP. Military spending in Mexico increased from 0.72 percent of GDP in 1963 to 1.18 percent of GDP in 1987 and then it fell to 0.39 percent in 2005. Military spending as a percentage of GDP also fell in Canada. The

[5] Data was obtained from various issues of World Military Expenditures and Arms Transfers, published by the U.S. Arms Control and Disarmament Agency. This source has nominal and real military expenditures and central government expenditures for the years between 1963 and 1999. Data on military expenditures between 2000 and 2005 was obtained from the military expenditure data base of the Stockholm International Peace Research Institute (see www.sipri.org). GDP and money supply data was obtained from the International Monetary Fund as was data on central government expenditures between 200 and 2005 (see www.imf.org).

percentage fell from 3.56 percent in 1963. It flirted with being over two percent in the early Seventies and the mid Eighties, but it was 1.12 percent in 2005.

The unit root tests

Regressions with time series data run the risk of obtaining spurious results. This occurs when regressions estimated with one or more nonstationary data series result in statistically significant results even though there may be no true underlying relationship. To avoid spurious results, augmented Dickey-Fuller tests are performed on each data series to determine whether the data exhibit unit roots and are nonstationary. The results of the augmented Dickey-Fuller tests are reported in Table 2. The four data series are annual percentage changes in GDP, military spending, other expenditures of the central government, and the money supply. Table 2 lists the results of the unit root tests on these series for Canada, Mexico and the United States using both levels data and first differences of the data.

In the case of Canada, for each of the four variables, the augmented Dickey-Fuller tests reject the null hypothesis of unit roots at either the one or five percent level. This result is not surprising as the variables are percentage changes which are essentially functions of the first differences. The Canadian series are stationary and the regressions can be safely estimated in level form and cointegration test aren't necessary.

According to the results in Table 2, the percentage change in Mexican GDP and the percentage change in Mexican military spending are nonstationary in levels, but stationary in first differences. However, in the case of the percentage change in other spending by the Mexican central government, the null hypothesis of a zero root is rejected at the one percent level while the null hypothesis that the percentage change in the Mexican money supply has a zero root can be rejected at the five percent level. The unit root tests indicate that the first

differences of the percentage changes in Mexican money supply and other central government expenditures are stationary. Because statistical data indicate that level data of at least two of the four series data exhibit nonstationarity, the Mexican data will have to be estimated in first differences and cointegration test have to be performed.

Finally, level forms of the United States data appear to be stationary. The null hypothesis of a zero root is rejected at the one percent level in three of the four series. However, the percentage change in American military expenditures appears to be stationary only at the ten percent level. As was the case with Canadian data, the United States data can be estimated in levels form without checking for cointegration.

Pairwise Granger-causality tests

Pairwise Granger-causality test are reported in Table 3. These statistical tests investigate whether changes in GDP causes changes in military spending or does changes in military spending causes changes in GDP. For each of the three countries, these tests involved estimating two simple linear regressions, one having the percentage change in GDP as the dependent variable and the other having the percentage change in military spending as the dependent variable. The explanatory variables of these regressions are lagged values of the percentage changes in military spending and GDP. The number of lags was determined by picking that model specification that minimized the Akaike Information Criterion (AIC).

In the case of Canada and Mexico, Granger-causality tests indicate unidirectional causality in that changes in military spending affect changes in GDP but not the other way around. The Canadian result was found at only the ten percent level while the Mexican result was obtained at the one percent level.

However, the opposite result was found for the United States. In this case, Granger-causality tests indicate that changes in GDP affect military spending but changes in military spending do not affect GDP. The conclusion of unilateral causality from GDP to military spending was found at the five percent level. Because a different result was found for the United States other than Mexico or Canada, this suggest that military spending may have a threshold effect in that the impact of military spending on a country's economy may depend on the relative size of that country's defense spending.

IV. Estimation Results of the VAR Model and Impulse Response Functions

The VAR models are estimated for Canada, Mexico, and the United States. The estimation results for Canada are reported in Table 4, the cointegration tests and the estimation results for Mexico are reported in Tables 5 and 6, and Table 7 lists the estimation results for the United States. The appropriate lag length for each country was determined using standard lag exclusion tests.

Estimation of the Canadian, Mexican and United States VAR models

Tests indicate that only one lag was needed in the Canadian VAR model. The main advantage of using the VAR framework is its a-theoretic, reduced-form framework that doesn't require careful specification of a structural model and its comparative advantage in forecasting. Given the reduced-form structure of the model, interpreting the signs and the statistical significance and the sign of an individual coefficient becomes more problematic. Since the Canadian data was stationary, the results in Table 4 were obtained using levels data. The results in Table 4 indicate that only one of the four regression models have a significant F-statistic. Estimation results indicate that null hypothesis that all the slope coefficients are simultaneously

zero is rejected at the five percent level for the regression model with the GDP growth rate as a dependent variable.

Since the unit root tests indicated that Mexican data was nonstationary, cointegration tests were performed and their results are reported in Table 5. Using the techniques developed by Johansen, both the trace test and the maximum-eigenvalue test indicate the presence of at most one cointegrating equation with an intercept present.[6] Having determined the presence of one cointegrating equation and its underlying structure, an error-corrected VAR model was estimated and the results are listed in Table 6. All four of the regressions reported in Table 6 have significant F-tests implying that none of the models have slope coefficients that are simultaneously zero.

The estimation results for the United States are reported in Table 7. Recall that the United States data series were stationary; therefore, the estimation results in Table 7 were obtained with data in level form. Three of the four regressions have statistically significant F-tests. Only the regression where nonmilitary spending as the dependent variable fails to reject the null hypothesis that all the slope coefficients are simultaneously equal to zero.

The impulse response functions

The impulse functions of the three VAR models are shown in Figures 1, 2, and 3. The Canadian results are shown in Figure 1, the Mexican results are depicted in Figure 2 and Figure 3 shows the United States results. Each figure shows what will happen to the percentage change in GDP given an innovation to either military spending, nonmilitary spending or the money supply. The shock was always an initial, one standard deviation to the residual, orthogonalizing the impulses by the Cholesky factor and adjusting for the degrees of freedom. Each figure shows the accumulated response of the growth rate in GDP.

[6] The specification of the cointegrating equation was determined by choosing that model that minimized the AIC.

The response of the growth rate of Canadian GDP to a shock in the other variables is shown in Figure 1. The estimation results indicate that positive innovations to either the growth rate in military spending and money supply lead to increases in the growth rate of GDP. However, if the Canadian federal government increases the growth rate of other spending Canadian GDP falls.

According to the information in Figure 2, positive innovations to government expenditures, either military or nonmilitary, lead to increases in Mexican GDP. But, Mexican monetary policy almost appears neutral as a positive innovation in the nominal money supply has little long-run effect on the growth rate of Mexican GDP.

While Canadian and Mexican military spending stimulate GDP growth in their respective countries, Figure 3 shows that an increase in the growth rate of military expenditures in the United States leads to a fall in GDP. However, positive innovations to either nonmilitary U.S. government spending or the U.S. money supply leads to increases in U.S. GDP. Like the pairwise Granger-causality tests discussed in the previous section, the conflicting evidence from the impulse response function may again show evidence of a threshold effect where the relatively large military spending of the U.S. may have a different impact on the economy than a country were military spending is a relatively smaller portion of the economy.

V. Conclusion

Both pairwise Granger-causality tests and impulse response functions from VAR models show an asymmetric response of the growth rate in GDP of the North American countries to a change in military spending. Increased military spending increases nominal GDP in Canada and Mexico. But increased military spending in the United States reduces the growth in nominal GDP. Evidence from Mexico and the United States indicates that nominal GDP would grow

faster if the federal government increased the growth rate of nonmilitary spending. Increasing the growth rate of nominal money supply lead to higher growth rates in nominal GDP in Canada and the United States but had little long-run impact on Mexico GDP.

The results of the paper foreshadow a threshold effect in that military spending in the United States had an opposite effect on GDP growth than in increases in military spending in Canada and Mexico. Since the U.S. spends a relatively larger percentage of its government expenditures and GDP on defense, the existence of a threshold effect will have to be examined with a larger sample of countries.

The use of a "St. Louis" type model in this pilot study shows the promise of future work with this methodology. The "St. Louis" type model avoids constructing a detailed, precise structural model and the reduced-form model measures the impact of a country's policy decisions on the nation's GDP.

Future work will extend this analysis to more countries. The countries will differ in economic development and the size of military spending. Depending on data availability, a tax variable should be added to control for another tool of fiscal policy. Data sets with quarterly data will also be analyzed, but quarterly data on defense spending by developing countries is difficult to obtain.

Economics is the "Dismal Science" and the forecast of the model in this paper is bleak. Military spending in the United States will continue to rise with the fall of the Soviet Union and the emergence of the U.S. as the only superpower with the military to police conflicts deemed politically appropriate. The events of 9-11, the advent of the war on terror, and the ongoing conflicts in Iraq and Afghanistan promise to put upward pressure on military spending. This paper indicates that increased military spending occurs with a tradeoff of less growth in GDP.

References

Ahmed, S. "Temporary and Permanent Government Spending in an Open Economy," Journal of Monetary Economics, 17, 2, 1986, pp. 405-419.

Atesoglu, H. Sonmez, "Defense Spending Promotes Aggregate Output in the United States—Evidence from Cointegration Analysis," *Defence and Peace Economics*, 13, 1, 2002, pp. 55-60.

Baran, Paul and Paul Sweezy. Monopoly Capital. Harmondsworth: Penquin, 1968.

Biswas, B and R. Ram, "Military Expenditure and Economic Growth in Less Developed Countries: An Augmented Model and Further Evidence," *Economic Development and Cultural Change*, 34, 1986, pp. 361-372.

Blackaby, Frank and Thomas Ohlson. "Military Expenditure and Arms Trade: Problems of Data," Bulletin of Peace Proposals, 13, 4, 1982, pp. 291-308.

Bremmer, Dale and Randy Kesselring, "The Opportunity Cost of Super Power Status: The Tradeoff Between Defense Spending and Economic Prosperity," unpublished manuscript, March 1998.

Cappelen, Adne, Nils Petter Gleditsch and Olav Bjerkholt. "Military Spending and Economic Growth in the OECD Countries," Journal of Peace Research, 21, 4, 1984, pp. 375 - 387.

Chester, Eric 1978. "Military Spending and Capitalist Stability," Cambridge Journal of Economics, 2, 3, 1978, pp. 293-298.

Chowdhury, Abdur. "A Causal Analysis of Defense Spending and Economic Growth," Journal of Conflict Resolution, 35, 1, 1991, pp. 80-97.

Conybeare, J.A.C., J.C. Murdoch and T. Sandler, "Alternative Collective-Goods Models of Military Alliances—Theory and Empirics," *Economic Inquiry*, 32, 4, 1994, pp. 525-542.

Cuaresma, Jesus Crespo and Gerhard Reitschuler, "A Non-Linear Defence-Growth Nexus? Evidence from the U.S. Economy," *Defence and Peace Economics*, 15, 1, 2003, pp. 71-82.

Dakurah, A. Henry, Stephen P. Davies and Rahan K. Sampath, "Defense Spending and Economic Growth in Developing Countries: A Causality Analysis," *Journal of Policy Modeling*, 23, 2001, pp. 651-658.

De Grasse Jr., Robert W. Military Expansion Economic Decline: The Impact of Military Spending on U.S. Economic Performance. New York: Council on Economic Priorities/Sharpe, 1983.

Deger, S., "Economic Development and Defence Expenditure," *Economic Development and Cultural Change*, 35, 1, 1986, pp. 179-196.

Dunne, P. and R. Smith. "Military Expenditure and Unemployment in the OECD," Defense Spending, 1, 1990, pp. 57-73.

Dunne, Paul J., Ron P. Smith and Dirk Willenbockel, "Models of Military Expenditure and Growth: A Critical Review," Defence and Peace Economics, 16, 6, 2005, pp. 449-461.

Faini, Riccardo, Patricia Annez, and Lance Taylor. "Defense Spending , Economic Structure and Growth: Evidence Among Countries and Over Time," Economic Development and Cultural Change, 32, 3, 1984, pp. 487-498.

Feder, G., "On Exports and Economic Growth," *Journal of Development Economics*, 12, 1983, pp. 59-73.

Galvin, Hannah, "The Impact of Defence Spending on the Economic Growth of Developing Countries: A Cross-Section Study," *Defence and Peace Economics*, 14, 1, 2003, pp. 51-59.

Hanson, L., J.C. Murdoch and T. Sandler, "On Distinguishing the Behavior of Nuclear and Non-nuclear Allies in NATO," *Defence Economics*, 1, 1, 1990, pp. 37-55.

Hartley, K. and T. Sandler (eds.), *The Economics of Defence Spending: An International Survey*, London: Routledge, 1990.

Hausman, J. "Specification Tests in Econometrics," Econometrica, 46, 1978, pp. 1251-1271.

Hilton, B., and A. Vu, "The McGuire Model and the Economics of the NATO Alliance," *Defence Economics*, 2, 1, 1991, pp. 105-121.

Hooker, Mark A. and Michael M. Knetter, "The Effects of Military Spending on Economic Activity: Evidence from State Procurement Spending," *Journal of Money, Credit, and Banking*, 29, 3, 1997, pp. 400-421.

Huang, Jr-Tsung, and An-Pang Kao, "Does Defence Spending Matter to Employment in Taiwan?" *Defence and Peace Economics*, 16, 2, 2005, pp. 101-115.

Judge, George G., R. Carter Hill, William E. Griffiths, Helmut Lütkepohl, and Tsoung-Chao Lee. Introduction to the Theory and Practice of Econometrics. New York: John Wiley & Sons, 1988.

Karagol, Erdal and Serap Palaz, "Does Defence Expenditure Deter Economic Growth in Turkey? A Conintegration Analysis," *Defence and Peace Economics*, 15, 3, 2004, pp. 289-298.

Kennedy, Gavin. Defense Economics. London: Duckworth, 1983.

Klein, Thilo, "Military Expenditure and Economic Growth: Peru 1970-1996.

Kollias, Christos, Charis Naxakis and Leonidas Zarangas, "Defence Spending and Growth in Cyprus: A Causal Analysis," *Defence and Peace Economics*, 15, 3, 2004, pp. 299-307.

Laopodis, Nikiforos T., "Effects of Government Spending on Private Investment," *Applied Economics*, 33, 2001, pp. 1563-1577.

Lee, Jong Ryol. "Changing National Priorities of the United States," Military Force and American Society, Bruce M. Russett and Alfred Stepan, eds. New York: Harper and Row, 1973, pp. 61-105.

Lindgren, Göran. "Armaments and Economic Performance in Industrialized Market Economies," Journal of Peace Research, 21, 4, 1984, pp. 375-387.

Murdoch, J.C., T. Sandler and L. Hansen, "An Econometric Technique for Comparing Median Voter and Oligarchy Choice Models of Collective Action—the Case of the NATO Alliance," *Review of Economics and Statistics*, 73, 4, 1991, pp. 624-631.

Nardinelli, Clark and Gary B. Ackerman. "Defense Expenditures and the Survival of American Capitalism," Armed Forces and Society, 3, 1, 1976, pp. 13-16.

Paul, Satya. "Defense Spending and Unemployment Rates: An Empirical Analysis for the OECD," Journal of Economic Studies, 23, 2, 1996, pp. 44-54.

Romer, David, "Keynesian Macroeconomics Without the LM Curve," *Journal of Economic Perspectives*, 14, 2, 2000, pp. 149-169.

Rotschild, Kurt W. "Military Expenditure, Exports, and Growth," Kyklos, 26, 4, 1973, pp. 804-813.

Sandler, T., and J.C. Murdoch, "Nash-Cournot or Lindahl Behavior? An Empirical Test for the NATO Allies," *Quarterly Journal of Economics*, 105, 4, 1991, pp. 875-894.

Smith, Ron P. "Military Expenditure and Capitalism," Cambridge Journal of Economics, 1, 1, 1977, pp. 61-76.

Smith, Ron P. "Military Expenditure and Capitalism: A Reply," Cambridge Journal of Economics, 2, 3, 1978, pp. 299-304.

Smith, Ron P. "Military Expenditure and Investment in OECD Countries, 1954-1973," Journal of Comparative Economics, 4, 1980, pp. 19-32.

Smith Ron P. and George Georgiou. "Assessing the Effect of Military Expenditure on OECD Economies: A Survey," Arms Control, 14, 1, 1983, pp. 3-15.

Solomon, Binyam, "The Demand for Canadian Defence Expenditures," *Defence and Peace Economics*, 16, 3, 2005, pp. 171-189.

Szymanski, Albert. "Military Spending and Economic Stagflation," American Journal of Sociology, 79, 1, 1973, pp. 1-14.

Weede, Erich 1983. "Military Participation rations, Human Capital Formation, and Economic Growth: A Cross-national Analysis," Journal of Political and Military Sociology, 11(Spring), 11-19.

Wing, M.M., "Defense Spending and Employment in Indonesia," *Defence Economics*, 3, 1, 1991, pp 83-92.

Yildirim, J. and S. Sezgin, "A System Estimation of the Defence-Growth Relation in Turkey," in *Arming the South: The Economics of Military Expenditure, Arms Production, and Arms Trade in Developing Countries*, J. Brauer and P.J. Dunne, eds., London: Palgrave, 2002.

Yildirim, J., Selami Sezgin and Nadir Ocal, "Military Expenditure and Economic Growth in Middle Eastern Countries: A Dynamic Panel Data Analysis," *Defence and Peace Economics*, 16, 4, 2005, pp. 283-295.

Table 1: Military Expenditures as a Percent of Central Government Expenditures and GDP: Canada, Mexico, and the United States, 1963 - 2005

Military Expenditures as a Percent of Central Government Expenditures				Military Expenditures as a Percent of GDP			
Year	Canada	Mexico	United States	Year	Canada	Mexico	United States
1963	24.03	9.86	49.15	1963	3.56	0.72	8.47
1964	22.90	9.64	46.22	1964	3.44	0.72	7.72
1965	22.60	10.00	44.05	1965	3.16	0.71	7.20
1966	22.11	9.93	46.87	1966	3.11	0.72	8.07
1967	18.70	8.10	49.40	1967	3.11	0.68	9.09
1968	16.30	8.10	45.20	1968	3.10	0.69	8.87
1969	11.60	6.60	44.10	1969	2.62	0.70	8.27
1970	12.90	6.80	39.80	1970	2.39	0.70	7.50
1971	11.60	7.60	35.20	1971	2.23	0.73	6.64
1972	10.50	4.90	33.40	1972	2.03	0.99	6.27
1973	9.70	4.40	30.10	1973	1.83	0.88	5.67
1974	8.50	4.30	30.30	1974	1.68	0.43	5.73
1975	7.70	4.40	26.20	1975	1.57	0.56	5.55
1976	8.20	3.90	23.60	1976	1.34	0.54	4.99
1977	8.70	3.90	23.80	1977	1.62	0.44	4.97
1978	8.70	2.80	23.00	1978	1.92	0.36	4.76
1979	8.20	2.70	23.30	1979	1.83	0.33	4.77
1980	8.50	2.10	23.10	1980	1.92	0.23	5.16
1981	7.80	2.30	23.60	1981	1.84	0.32	5.43
1982	8.10	1.50	25.00	1982	2.14	0.48	6.03
1983	7.90	2.00	25.50	1983	1.78	0.69	6.16
1984	8.20	2.70	26.40	1984	1.87	0.79	7.14
1985	8.60	2.60	25.70	1985	2.02	0.58	6.12
1986	9.20	2.30	27.10	1986	2.07	0.86	6.29
1987	9.30	2.30	27.20	1987	1.93	1.18	6.08
1988	9.30	2.10	26.20	1988	1.70	0.69	5.74
1989	7.10	2.50	25.50	1989	1.31	0.65	5.54
1990	7.00	2.60	23.50	1990	1.33	0.54	5.27
1991	6.30	4.30	19.60	1991	1.26	0.52	4.67
1992	6.20	4.60	21.10	1992	1.33	0.51	4.81
1993	6.90	4.00	19.90	1993	1.53	0.52	4.48
1994	6.70	4.70	18.80	1994	1.51	0.63	4.07
1995	6.40	3.90	17.40	1995	1.38	0.81	3.77
1996	6.00	3.60	16.50	1996	1.23	0.67	3.47
1997	5.80	3.60	16.30	1997	1.12	0.62	3.32
1998	5.90	3.80	15.80	1998	1.28	0.60	3.13
1999	5.90	3.74	15.70	1999	1.26	0.56	3.03
2000	5.77	3.34	16.18	2000	1.15	0.52	3.07
2001	6.10	3.49	15.88	2001	1.17	0.54	3.09
2002	6.09	3.09	16.98	2002	1.15	0.50	3.41
2003	6.04	2.84	18.44	2003	1.15	0.46	3.79
2004	5.93	2.55	19.50	2004	1.14	0.41	3.97
2005	5.86	2.41	19.84	2005	1.12	0.39	4.07

Table 2
Augmented Dickey-Fuller (ADF) Unit Root Test

	Data Type	Data	Regression Assumptions			Statistic	Critical Values		
			Lags	Constant	Trend	$\lvert\tau\rvert$	$\lvert\tau^*_{99\%}\rvert$	$\lvert\tau^*_{95\%}\rvert$	$\lvert\tau^*_{90\%}\rvert$
Canada									
Growth Rate in Nominal GDP	Levels	′65-′05	0	Yes	Yes	4.18**	4.20	3.52	3.19
Growth Rate in Military Spending	Levels	′65-′05	0	Yes	No	4.98*	3.60	2.94	2.61
Growth Rate in Non-Military Spending	Levels	′66-′05	1	Yes	Yes	5.60*	4.21	3.53	3.19
Growth Rate in Money Supply	Levels	′65-′05	0	Yes	No	5.60*	3.60	2.94	2.61
Mexico									
Growth Rate in Nominal GDP	Levels	′67-′05	2	No	No	0.98	2.63	1.95	1.61
Growth Rate in Nominal GDP	1st Differences	′67-′05	1	No	No	6.89*	2.63	1.95	1.61
Growth Rate in Military Spending	Levels	′67-′05	2	No	No	1.58	2.63	1.95	1.61
Growth Rate in Military Spending	1st Differences	′65-′05	1	No	No	7.88*	2.63	1.95	1.61
Growth Rate in Non-Military Spending	Levels	′66-′05	1	Yes	No	4.48*	4.20	3.52	3.19
Growth Rate in Non-Military Spending	1st Differences	′68-′05	2	Yes	No	6.17*	2.63	1.95	1.61
Growth Rate in Money Supply	Levels	′65-′05	0	Yes	No	3.42**	3.60	2.94	2.61
Growth Rate in Money Supply	1st Differences	′65-′05	1	No	No	7.32*	2.63	1.95	1.61
United States									
Growth Rate in Nominal GDP	Levels	′65-′05	0	Yes	Yes	4.48*	4.20	3.52	3.19
Growth Rate in Military Spending	Levels	′66-′05	1	Yes	No	2.89***	3.61	2.94	2.61
Growth Rate in Non-Military Spending	Levels	′65-′05	0	Yes	Yes	6.92*	4.20	3.52	3.19
Growth Rate in Money Supply	Levels	′65-′05	0	Yes	No	4.09*	3.60	2.94	2.61

*, **, and *** indicate the null hypothesis of a unit root is rejected at 1%, 5% and 10% level, respectively. The lag lengths in the ADF regressions were determined by choosing the model with the largest AIC.

Table 3
Granger Causality Tests: Growth Rates in Nominal Military Spending and GDP

	F-Statistic		
Null Hypothesis	***Canada*** **(1966-2005)** *2 lags*	***Mexico*** **(1966-2005)** *2 lags*	***United States*** **(1967-2005)** *3 lags*
Growth Rate in Military Spending Does Not Granger Cause Growth Rate in Nominal GDP	2.857***	12.574*	0.297
Growth Rate in Nominal GDP Does Not Granger Cause Growth Rate in Military Spending	0.020	0.417	3.310**

*, **, and *** indicate the null hypothesis of no Granger causality is rejected at 1%, 5% and 10% level, respectively. The lag length used in each VAR was determined by choosing the model with the largest AIC.

Table 4
VAR Model for Canada: Annual Data, 1965 – 2005

	Dependent Variables			
Independent Variables	GDP Growth Rate	Military Spending Growth Rate	Non-Military Spending Growth Rate	Money Supply Growth Rate
Intercept	11.264*** (5.955)	6.227 (4.235)	14.776* (4.436)	5.711*** (3.505)
GDP Growth Rate$_{-1}$	0.703* (0.122)	-0.025 (0.087)	-0.150 (0.091)	0.142 (0.072)
Military Spending Growth Rate$_{-1}$	0.576** (0.265)	0.270 (0.188)	0.262 (0.197)	0.106 (0.156)
Non-Military Spending Growth Rate$_{-1}$	-0.383 (0.247)	-0.092 (0.176)	0.012 (0.184)	-0.078 (0.146)
Money Supply Growth Rate$_{-1}$	0.004 (0.269)	-0.027 (0.192)	-0.179 (0.201)	0.063 (0.159)
R-squared	0.570	0.058	0.159	0.142
F-statistic	11.916†	0.551	1.704	1.485

Standard errors are in parentheses. *, **, and *** indicate the null hypothesis that the coefficient is equal to zero is rejected at the 1, 5, or 10 percent level, respectively, using a 1-tail t test. † indicates the null hypothesis that all the slope coefficients are simultaneous equal to zero is rejected using an F test at the 5 percent level.

Table 5
Johansen Cointegration Test - - Mexico

Null Hypothesis	Eigenvalue	Trace Test	Max-Eigenvalue Test	Lags
H_0: At Most 1 Cointegtrating Equation	0.376	39.300*	18.313*	1

* indicates one cointegrating vector at the 1% level.

Table 6
Vector Error Correction Model for Mexico: Annual Data, 1968 – 2005

Estimates for the One Cointegrating Equation

GDP Growth Rate-1	Military Spending Growth Rate$_{-1}$	Non-Military Spending Growth Rate$_{-1}$	Money Supply Growth Rate$_{-1}$	Intercept
1.000	-0.238** (0.118)	0.447* (0.110)	-1.338* (0.089)	-0.566 (2.470)

Error-Corrected VAR Models

Independent Variables (First Differences)	Dependent Variables (First Differences)			
	GDP Growth Rate	Military Spending Growth Rate	Non-Military Spending Growth Rate	Money Supply Growth Rate
The Cointegrating Equation	0.076 (0.209)	0.336 (0.614)	-0.640 (0.800)	1.271* (0.162)
GDP Growth Rate$_{-1}$	-0.227 (0.314)	0.280 (0.920)	1.247 (1.199)	-0.812* (0.242)
GDP Growth Rate$_{-2}$	-0.051 (0.298)	0.659 (0.875)	2.232*** (1.140)	-0.734* (0.230)
GDP Growth Rate$_{-3}$	-0.057 (0.264)	-0.977 (0.774)	-0.194 (1.009)	-0.762* (0.204)
Military Spending Growth Rate$_{-1}$	0.076 (0.118)	-0.759** (0.345)	0.188 (0.450)	0.276* (0.091)
Military Spending Growth Rate$_{-2}$	-0.211 (0.148)	-0.903** (0.434)	-0.486 (0.565)	-0.010 (0.114)
Military Spending Growth Rate$_{-3}$	-0.113 (0.122)	-0.137 (0.357)	0.101 (0.465)	-0.138 (0.094)
Non-Military Spending Growth Rate$_{-1}$	0.126 (0.097)	0.333 (0.285)	-0.304 (0.372)	-0.405* (0.075)
Non-Military Spending Growth Rate$_{-2}$	0.108 (0.108)	0.031 (0.318)	-0.539 (0.414)	-0.253* (0.084)
Non-Military Spending Growth Rate$_{-3}$	0.070 (0.078)	-0.102 (0.228)	-0.451 (0.297)	-0.090 (0.060)
Money Supply Growth Rate$_{-1}$	0.095 (0.180)	-0.318 (0.526)	-1.296*** (0.685)	0.212 (0.138)
Money Supply Growth Rate$_{-2}$	-0.008 (0.167)	-0.209 (0.491)	-0.954 (0.640)	0.198 (0.129)
Money Supply Growth Rate$_{-3}$	-0.032 (0.139)	-0.305 (0.407)	-1.049*** (0.530)	0.148 (0.107)
R^2	0.622	0.507	0.553	0.863
F-Statistic	3.425†	2.140†	2.572†	13.135†

Standard errors are in parentheses. *, **, and *** indicate the null hypothesis that the coefficient is equal to zero is rejected at the 1, 5, or 10 percent level, respectively, using a 1-tail t test. † indicates the null hypothesis that all the slope coefficients are simultaneous equal to zero is rejected using an F test at the 5 percent level

Table 7
VAR Model for the United States: Annual Data, 1967 – 2005

Independent Variables	Dependent Variables: GDP Growth Rate	Military Spending Growth Rate	Non-Military Spending Growth Rate	Money Supply Growth Rate
Intercept	2.1066 (1.2960)	-4.3115 (3.9598)	-1.6134 (4.1165)	0.6017 (2.3595)
GDP Growth Rate$_{-1}$	0.2321 (0.2132)	0.5636 (0.6513)	-0.1963 (0.6771)	-0.4158 (0.3881)
GDP Growth Rate$_{-2}$	0.0098 (0.2187)	-0.9731 (0.6681)	-0.0636 (0.6946)	-0.0069 (0.3981)
GDP Growth Rate$_{-3}$	0.1877 (0.1901)	2.2460* (0.5807)	1.3036** (0.6037)	0.2156 (0.3460)
Military Spending Growth Rate$_{-1}$	-0.0003 (0.0494)	0.3065*** (0.1509)	0.1225 (0.1569)	0.0934 (0.0899)
Military Spending Growth Rate$_{-2}$	0.0203 (0.0494)	0.2469 (0.1509)	0.0243 (0.1569)	0.0760 (0.0899)
Military Spending Growth Rate$_{-3}$	-0.0670 (0.0507)	-0.1129 (0.1550)	-0.1781 (0.1611)	-0.1165 (0.0923)
Non-Military Spending Growth Rate$_{-1}$	0.0725 (0.0618)	-0.4641** (0.1887)	-0.0721 (0.1962)	0.0585 (0.1125)
Non-Military Spending Growth Rate$_{-2}$	0.0165 (0.0657)	0.1397 (0.2009)	0.2587 (0.2088)	0.4182* (0.1197)
Non-Military Spending Growth Rate$_{-3}$	0.1092 (0.0771)	-0.0053 (0.2354)	0.2503 (0.2448)	-0.0539 (0.1403)
Money Supply Growth Rate$_{-1}$	0.0504 (0.1097)	-0.1557 (0.3352)	-0.3919 (0.3485)	0.3690*** (0.1997)
Money Supply Growth Rate$_{-2}$	0.0405 (0.0930)	-0.2768 (0.2843)	-0.0484 (0.2955)	0.0294 (0.1694)
Money Supply Growth Rate$_{-3}$	-0.0132 (0.0896)	-0.2232 (0.2739)	0.2174 (0.2847)	-0.0547 (0.1632)
R^2	0.5480	0.5564	0.3883	0.5314
F-statistic	2.6266†	2.7172†	1.3754	2.4571†

Standard errors are in parentheses. *, **, and *** indicate the null hypothesis that the coefficient is equal to zero is rejected at the 1, 5, or 10 percent level, respectively, using a 1-tail t test. † indicates the null hypothesis that all the slope coefficients are simultaneous equal to zero is rejected using an F test at the 5 percent level.

Figure 1: Canadian Impulse Response Functions

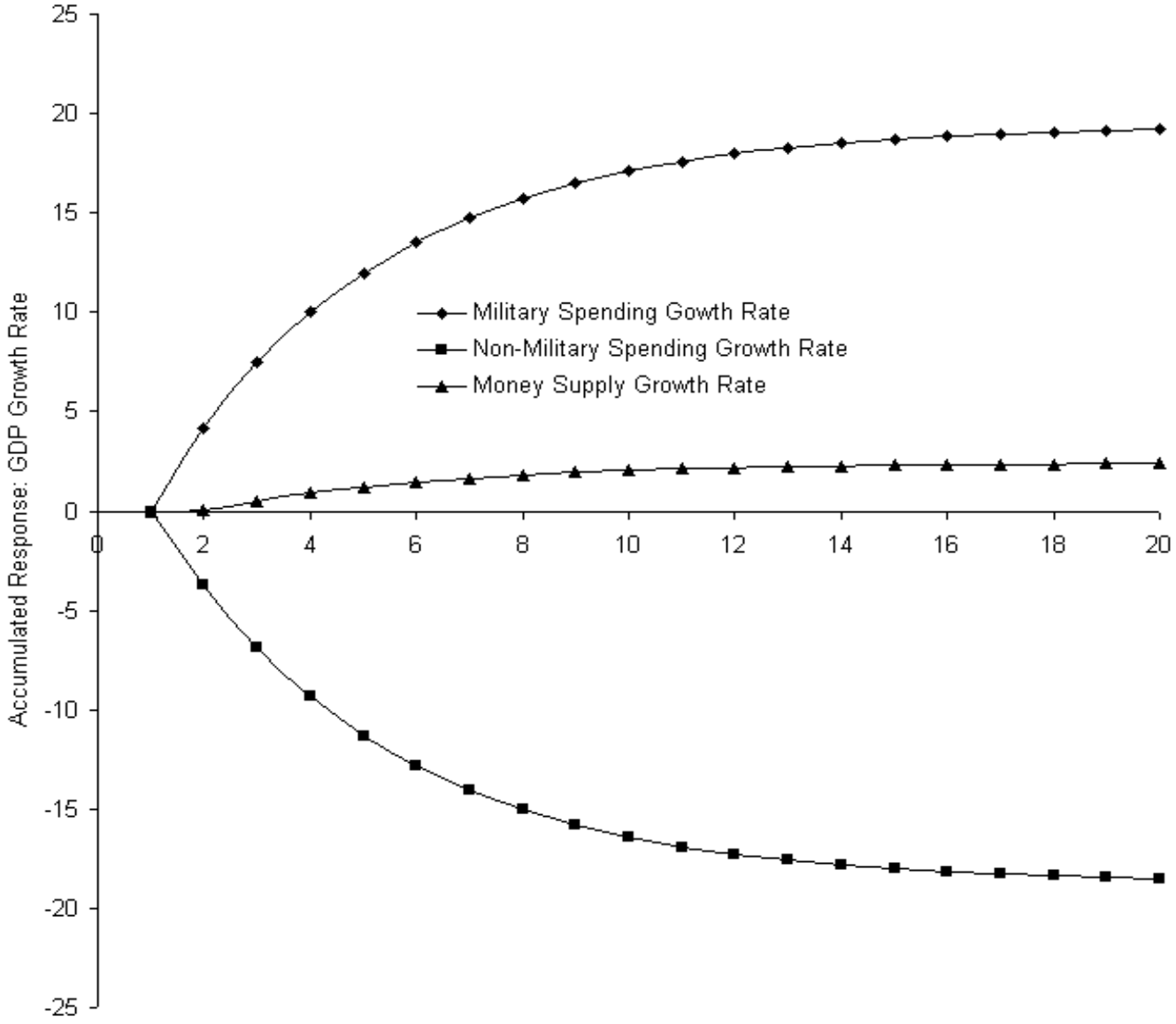


Figure 2: Mexican Impulse Response Function

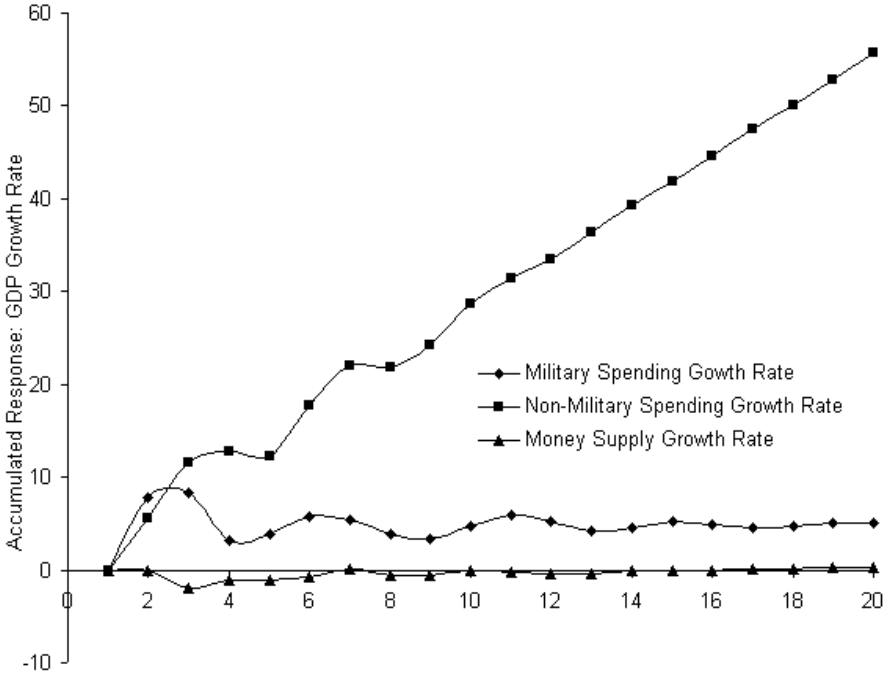
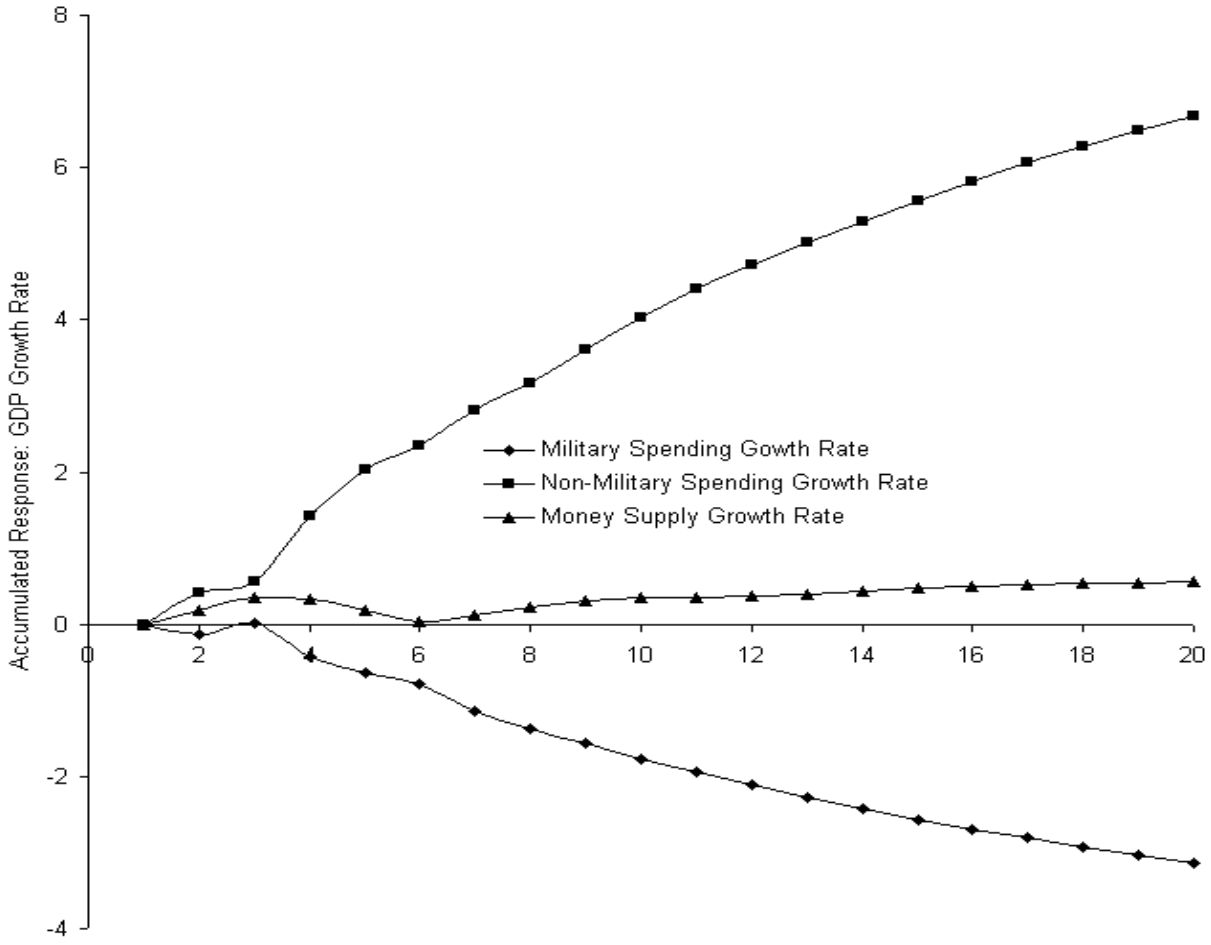


Figure 3: United States Impulse Response Function



Appendix

Table A1: Canada Data

(in billions of Canadian dollars)

Year	Military Spending	NonMilitary Spending	Money Supply	GDP	Year	Military Spending	NonMilitary Spending	Money Supply	GDP
1963	1.708	7.110	7.392	47.961	1985	9.789	113.827	76.380	485.714
1964	1.809	7.900	7.872	52.549	1986	10.610	115.329	87.284	512.541
1965	1.833	8.110	8.395	57.930	1987	10.780	115.917	92.557	558.949
1966	2.015	9.110	8.933	64.818	1988	10.424	112.087	98.433	613.094
1967	2.168	11.595	9.497	69.698	1989	8.584	120.900	104.969	657.728
1968	2.361	14.483	10.632	76.131	1990	9.042	129.178	106.000	679.921
1969	2.197	18.936	10.852	83.825	1991	8.650	137.305	110.424	685.367
1970	2.158	16.727	11.096	90.179	1992	9.295	149.922	117.408	700.480
1971	2.198	18.951	12.862	98.429	1993	11.146	161.539	124.448	727.184
1972	2.235	21.288	14.760	109.913	1994	11.649	173.864	131.553	770.873
1973	2.356	24.291	16.491	128.956	1995	11.185	174.772	143.629	810.426
1974	2.582	30.377	17.655	154.038	1996	10.294	171.570	160.836	836.864
1975	2.732	35.482	21.572	173.621	1997	9.900	170.690	174.282	882.733
1976	2.678	32.659	21.455	199.994	1998	11.734	198.884	183.995	914.973
1977	3.586	41.218	23.901	220.973	1999	12.361	209.513	203.488	982.441
1978	4.708	54.110	25.953	244.877	2000	12.326	213.480	221.319	1075.570
1979	5.127	62.528	26.842	279.577	2001	12.972	212.610	326.757	1107.460
1980	6.052	71.199	30.683	314.390	2002	13.332	218.895	347.829	1154.950
1981	6.630	85.000	37.669	360.471	2003	13.952	231.003	365.912	1214.600
1982	8.115	100.191	41.275	379.859	2004	14.749	248.534	395.706	1290.180
1983	7.313	92.572	46.411	411.386	2005	15.379	262.369	416.351	1368.730
1984	8.399	102.421	56.727	449.582					

Table A2: Mexico Data
(in billions of nominal pesos)

Year	Military Spending	NonMilitary Spending	Money Supply	GDP	Year	Military Spending	NonMilitary Spending	Money Supply	GDP
1963	0.0014	0.0142	0.0235	0.1948	1985	0.2731	10.5021	3.4270	47.1675
1964	0.0016	0.0166	0.0275	0.2214	1986	0.6748	29.3385	5.6220	78.7870
1965	0.0018	0.0180	0.0291	0.2520	1987	2.2878	99.4686	12.4360	193.1620
1966	0.0020	0.0204	0.0323	0.2828	1988	2.8868	137.4690	20.5860	416.3050
1967	0.0021	0.0258	0.0348	0.3063	1989	3.5445	141.7807	28.6570	548.8580
1968	0.0024	0.0290	0.0404	0.3391	1990	4.0220	154.6930	46.9730	738.8980
1969	0.0026	0.0400	0.0459	0.3749	1991	4.9200	114.4196	106.3730	949.1480
1970	0.0031	0.0458	0.0506	0.4443	1992	5.7565	125.1416	122.0800	1125.3300
1971	0.0036	0.0469	0.0545	0.4901	1993	6.5116	162.7911	143.9000	1256.2000
1972	0.0056	0.1143	0.0648	0.5647	1994	8.8766	188.8631	145.1150	1420.1600
1973	0.0061	0.1386	0.0800	0.6909	1995	14.8931	381.8732	148.5340	1837.0200
1974	0.0039	0.0910	0.0992	0.8997	1996	17.0228	472.8547	206.0700	2525.5800
1975	0.0061	0.1395	0.1211	1.1001	1997	19.7962	549.8931	267.2110	3174.2800
1976	0.0074	0.1899	0.1571	1.3710	1998	22.9315	603.4595	323.9120	3846.3500
1977	0.0081	0.2072	0.1984	1.8493	1999	25.8131	689.9210	407.6010	4594.7200
1978	0.0084	0.3017	0.2629	2.3374	2000	28.3345	848.5020	465.4850	5491.7100
1979	0.0103	0.3801	0.3539	3.0675	2001	31.2980	897.0490	526.3460	5809.6900
1980	0.0105	0.4984	0.4633	4.4700	2002	31.2239	1009.7300	600.8390	6263.1400
1981	0.0198	0.8623	0.6140	6.1368	2003	31.7300	1118.0300	684.6900	6891.9900
1982	0.0466	3.1059	0.9810	9.7695	2004	31.8210	1248.1100	743.2210	7709.1000
1983	0.1230	6.1488	1.3850	17.8823	2005	32.6380	1356.4200	865.8910	8374.3500
1984	0.2326	8.6152	2.2580	29.4020					

Table A3: United States Data
(in billions of nominal dollars)

Year	Military Spending	NonMilitary Spending	Money Supply	GDP	Year	Military Spending	NonMilitary Spending	Money Supply	GDP
1963	52.30	106.40	168.740	617.750	1985	258.20	1004.67	691.352	4220.250
1964	51.21	110.80	177.539	663.625	1986	280.90	1036.53	814.087	4462.820
1965	51.80	117.60	184.447	719.125	1987	288.00	1058.82	815.898	4739.470
1966	63.60	135.70	187.931	787.800	1988	293.00	1118.32	855.445	5103.750
1967	75.70	153.24	202.161	832.575	1989	304.00	1192.16	863.436	5484.350
1968	80.73	178.61	219.015	909.950	1990	306.00	1302.13	907.119	5803.070
1969	81.44	184.68	226.926	984.600	1991	280.00	1428.57	985.804	5995.920
1970	77.85	195.61	241.016	1038.520	1992	305.00	1445.50	1104.030	6337.750
1971	74.86	212.68	257.462	1127.100	1993	298.00	1497.49	1210.250	6657.400
1972	77.64	232.45	280.832	1238.770	1994	288.00	1531.91	1206.610	7072.230
1973	78.36	260.33	297.690	1382.730	1995	279.00	1603.45	1179.210	7397.650
1974	85.91	283.53	302.956	1499.980	1996	271.00	1642.42	1172.300	7816.820
1975	90.95	347.14	323.747	1638.330	1997	276.00	1693.25	1178.600	8304.330
1976	91.01	385.64	335.639	1825.280	1998	274.00	1734.18	1187.170	8746.980
1977	100.90	423.95	369.722	2030.920	1999	281.00	1789.81	1281.510	9268.430
1978	109.20	474.78	408.052	2294.700	2000	301.70	1864.40	1211.510	9816.970
1979	122.30	524.89	446.184	2563.300	2001	312.74	1969.50	1204.600	10127.900
1980	144.00	623.38	464.535	2789.520	2002	356.72	2101.10	1215.960	10469.600
1981	169.90	719.92	484.822	3128.430	2003	415.22	2252.10	1283.750	10960.700
1982	196.40	785.60	522.694	3255.020	2004	464.68	2383.00	1356.000	11712.500
1983	218.00	854.90	562.481	3536.670	2005	507.09	2555.90	1343.800	12455.800
1984	280.90	1064.02	609.688	3933.170					