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TITLE: THE SLOWDOWN IN SOVIET DEFENSE EXPENDITURES

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## I. Introduction

Specialists on the Soviet economy are in general agreement that the expenditures for defense reported in the Soviet Union's budget reflect neither the true volume of, nor the directions of changes in, Soviet outlays for defense. Beyond this, agreement ends. Since the Soviet figures cannot be accepted, western observers have produced independent estimates of Soviet defense expenditures.<sup>1</sup> The estimates provided by the Central Intelligence Agency (CIA) are the most relevant of these estimates for two reasons. First, the CIA has a relatively clear-cut methodology and access to data generally not available to others.<sup>2</sup> Second, and more important for the purposes of this paper, is the fact that it is the CIA estimates of Soviet defense expenditures that play a major role in the United States government's assessment of Soviet defense policies and intentions and consequently in the formulation of the United States' defense and, more broadly, foreign policy.<sup>3</sup>

It is this second aspect of the CIA's estimates of defense expenditures that is the subject of this paper. The interpretation of the behavior of Soviet defense outlays since the mid-1970s has been the subject of considerable debate both in the United States and abroad. The objective of this paper is to test alternative hypotheses regarding the causes of the slowdown in Soviet defense expenditures that occurred in the mid-1970s. These hypotheses are reviewed in Section II. A model of Soviet defense expenditures is set out in Section III. In Section IV we present parameter estimates for this model, and the conclusions that follow from them are discussed in Section V.

## II. Causes of the Slowdown in Soviet Defense Expenditures

The data on Soviet defense expenditures compiled by the CIA indicate that the rate of growth of Soviet defense expenditures has decreased since 1977. Recently there has been a lively debate among both academics and policymakers about the causes of this slowdown.<sup>4</sup> On the one hand, the CIA and a number of other analysts attribute the slowdown to objective factors that constrain the Soviet Union's ability to maintain a higher rate of growth of defense expenditures.<sup>5</sup> The primary factors contributing to the slowdown in the growth of defense expenditures are the slowdown in the growth of the Soviet economy and technological and production bottlenecks that hamper the Soviets' ability to maintain the pace of procurement of new weapons systems. The slowdown in economic growth constrains Soviet arms expenditures because, to the extent that the growth of the latter exceeds that of the former, the burden of defense expenditures increases. Moreover, since capital formation is critical for future Soviet economic growth as well as for specific programs such as energy conservation and production, the modernization of industry and the development of Siberia and its natural resources, the implicit cost of increasing the share of defense expenditures in Soviet national income has increased sharply. Thus an unwillingness to expand rapidly the share of national income devoted to defense implies that the slowdown in aggregate economic growth has constrained the growth of national defense expenditures.

The CIA also believes that the type of technological and physical bottlenecks that plague the civilian economy have also spilled over into the defense sector. Thus, because of technological difficulties

in making new weapons systems function properly and possibly also because of difficulties in organizing the production of new weapons, it has become necessary to stretch out the procurement of such new systems thereby reducing Soviet defense expenditures below what the Soviets would wish to spend even with a slowing economy.

This view of the determinants of Soviet defense expenditures has obvious implications for United States defense policy. To the extent that the Soviet Union is viewed as being constrained from raising the level of its defense expenditures by objective factors, the United States may gain important benefits from increasing its defense expenditures. If United States defense expenditures are increased, the Soviet Union may not be able to follow suit and, therefore, will find itself at a military disadvantage. Alternatively, the Soviet Union may increase its defense outlays but at the cost of neglecting its economy and thus lapse into economic stagnation or even crisis which, in the long run, will leave it even more incapable of meeting its military needs,[7, 77].

An alternative interpretation of the slowdown is that its sources stem only in part from the objective difficulties described above. In addition, the adherents of this view argue, important changes have taken place in Soviet policymaking and in the leadership's perceptions of Soviet defense needs.<sup>6</sup> These changes have reduced the leadership's demand for defense outlays and thus led to a slowdown in the growth of defense spending. There are a number of factors that are put forward as having a moderating influence on Soviet defense expenditures. One is that the objective of Soviet leaders has been to achieve strategic parity with the United States. Once they had perceived themselves as

having parity, and particularly when such parity appeared to be accepted by the United States through the Salt I negotiations and through the process of detente, Soviet leaders were content to slow down their acquisition of additional strategic weapons. Other analysts argue that the slowdown in Soviet defense expenditures can be attributed to a change in Soviet military doctrine, which, in 1977, switched from an emphasis on winning a nuclear exchange to a policy that regarded nuclear exchanges as unwinnable and thus downplayed the emphasis on strategic parity and placed greater emphasis on conventional warfare.

This view of Soviet defense policy suggests that an effort by the United States to step up the growth of its defense expenditures will have undesirable consequences. First, since Soviet defense expenditures are partly limited by self-restraint rather than being entirely governed by objective factors, it will be possible for the Soviet Union to increase defense expenditures without causing a domestic crisis or bringing about economic stagnation. Second, given an aggressive defense policy by the United States, the Soviet Union will be less likely to practice self-restraint in the future than it has been in the past. Finally, the United States will have shown itself as aiming for military superiority over the Soviet Union, making it more difficult to establish relations based on mutual trust and restraint in the future.

Thus the issue at hand is not whether the rate of expansion of Soviet defense expenditures has decreased, although the CIA continues to revise its dating of the onset of the slowdown, but rather whether the slowdown represents a natural response to changes in the exogenous variables that impinge on the Soviet decisions regarding the level of

defense expenditures or whether the relationship between the exogenous variables, that is to say, the environment faced by Soviet decisionmakers, and the level of defense expenditures changed in some fundamental way in the mid-1970s.

### III. The Model

The model employed in this paper was developed by Paul Gregory [7]. Gregory hypothesized that real Soviet defense outlays, SD, depend on the aggregate level of output in the Soviet Union, SY, as measured by real Soviet GNP, such that

$$SD_t = k * SY_t$$

Gregory also hypothesized that  $k$ , the fraction of GNP devoted to defense, was positively related to the level of defense outlays in the United States. This relationship between United States and Soviet defense expenditures exists because the Soviet leadership is compelled to react to the changes in military capability of the United States. To test his hypothesis Gregory estimated the model

$$\log SD_t = a + b_1 \log USD_t + b_2 \log SY_t + e_t \quad (\text{Eq. 1})$$

where  $USD_t$  = real United States defense expenditures in year  $t$

$e_t$  = error term

for the period 1950-67. He found that Equation 1 explained Soviet defense expenditures quite well, with  $b_1 = 0.593$  and  $b_2 = 0.708$ .

Contemporaneous values of USD performed better than lagged values, suggesting that the Soviets were responding to forecasts of United States defense outlays.

The Gregory model thus incorporates two objective determinants of Soviet defense expenditures, the behavior of the United States and the growth of the Soviet economy. Consequently if the entire slowdown in Soviet defense expenditures, for a given level of defense outlays by the United States, could be explained exclusively by the slowdown in economic growth, then Equation 1 ought to explain both the pre- and post-1977 levels of Soviet expenditures equally well.

A second version of the objective factors hypothesis argues that there has been a spillover of technical and managerial problems from the civilian economy to the defense sector. In the civilian sector the evidence of such difficulties is alleged to be the slowing down of the growth of aggregate factor productivity. To the extent that such difficulties also occur in the defense sector, they reduce the ability of Soviet defense firms to develop and produce new weapons systems, thereby lowering procurement below desired levels. In order to test this hypothesis, we assume that the time-path of factor productivity growth in all industry reflects the time-path, though not necessarily the level, of factor productivity growth in the defense sector. Thus the share of GNP devoted to defense depends on both  $USD_t$  and on  $SFP_t$ , the growth of Soviet factor productivity in industry. Soviet defense expenditures would then be explained by:

$$\log SD_t = a + b_1 \log USD_t + b_2 \log SY_t + b_3 \log SFP_t + e_t \quad (\text{Eq. 2})$$



Recent work by Desai [3] concludes that Soviet industrial output can best be explained by a Cobb-Douglas production function with declining total factor productivity growth. Consequently, total factor productivity was calculated as:

$$SFP_t = Y_t - (L_t + [1 - \alpha]K)$$

where  $Y$  = percent change in Soviet industrial production

$L$  = percent change in Soviet industrial employment

$K$  = percent change in Soviet Industrial capital stock.

Two series for SFP were calculated, one using Desai's value of 0.3437 and another using Bergson's [1] value of 0.667. Both values gave qualitatively similar results, with a significant decline in total factor productivity over the sample period. The results reported here use SFP as calculated by means of Bergson's weights, although using Desai's weights yield qualitatively similar results. If the slowdown in Soviet defense outlays were caused entirely by the slowdown in economic growth and by procurement problems, as proxied by SFP, then Equation 2 would satisfactorily explain the time path of Soviet defense outlays in the 1970s.

The competing hypothesis, that the Soviet leadership's demand for defense expenditures has changed, is somewhat more difficult to test, in part because it subsumes several explanations for such a change in preferences. One explanation for such a change is that the Soviets have felt themselves at a disadvantage in their military and political relationship with the United States because they lacked strategic

parity with the United States. The strategic gap between the two countries, measured by nuclear warheads that each side could deliver, is shown in Table I. Although, as Table II shows, the Soviets did not equal the number of warheads that the United States could deliver, in the 1970s a large part of the gap was closed, sufficient, given the different yields and accuracy of delivery systems of the two countries, to satisfy the defense objectives of the Soviet leaders.<sup>7</sup> Thus, after strategic parity was achieved Soviet defense expenditures needed only to be set at levels sufficient to keep pace with the United States and consequently at lower levels than previously when the Soviet Union needed to catch up. This hypothesis can be tested by means of

$$\log SD_t = a + b_1 \log USD_t + b_2 \log SY_t + b_3 \log SP_t + e_t \quad (\text{Eq. 3})$$

where  $SP_t = \text{deliverable Soviet warheads} / \text{deliverable U.S. warheads}$   
or by means of

$$\begin{aligned} \log SD_t = a + b_1 \log USD_t + b_2 \log SY_t + b_3 \log SFP_t \\ + b_4 \log SP_t + e_t \end{aligned} \quad (\text{Eq. 4})$$

In Equation 3 the effect of procurement problems is assumed not to exist, suggesting that only the achievement of strategic parity was instrumental in decreasing the share of GNP devoted to defense. In Equation 4 we allow for the possibility that both procurement problems and the achievement of strategic parity have influenced Soviet decisions on the share of GNP devoted to defense.

It is, of course, possible that changes in military doctrine, in leadership preferences, or in the political strength of the Soviet military have also influenced the share of GNP devoted to defense. Since such changes in preferences have no convenient quantifiable proxies, we test for them by determining whether the parameter estimates for Equations 1-4, which embody the quantitative determinants of Soviet defense expenditures, have changed over time. If it can be shown that such a fundamental change in the relationship between economic, technological and strategic considerations and defense outlays occurred in the mid-1970s, then it is possible that the slowdown in Soviet defense expenditures reflects more than the normal working of exogenous forces and that part of the explanation lies in a change in Soviet attitudes toward defense expenditures.

#### IV. Results

Table 1 shows the data employed in this study. The CIA reports two estimates for Soviet defense expenditures; a high estimate, SDH, and a low estimate, SDL. In this study we use both series as the dependent variable. Real United States defense expenditures were calculated by deflating nominal outlays by means of an index linking the price deflator for Federal government purchases of goods and services for 1960-71 with the national defense deflator which is reported only from 1972.<sup>8</sup> The CIA's estimates of Soviet real GNP were used rather than Soviet Net Material Product data principally because the CIA's explanation of the defense slowdown is made on the basis the GNP data. Since the objective of this paper is to test whether the

CIA's view of the slowdown in defense expenditures can be sustained on the basis of a stable relationship between these outlays and the factors that the CIA claims to view as explanatory variables, it is necessary to employ the same explanatory variables that the CIA does. Finally, the data on warheads was compiled from a variety of sources on production, scrappage and MIRVing rates for all delivery systems. This data is summarized in Table 2.<sup>9</sup>

Parameter estimates for Equations 1 through 4 are reported in Table III for the CIA's low estimates of Soviet defense expenditures, SDL, and in Table IV for the high estimates, SDH. In the case of SDL, the parameter estimates for United States defense expenditures, USD, and for Soviet GNP, SY, are significant in all specifications and relatively stable. A one percent increase in United States defense outlays yields an increase of 0.15-0.20 percent in Soviet defense expenditures. The elasticity of defense outlays with respect to Soviet GNP is greater than one in all specifications. Soviet factor productivity, SFP is significant in Equation 4, but with a negative sign, suggesting that the slowdown in industrial productivity has had no negative effect on defense outlays. Indeed, increased defense outlays may be the cause of slowdowns in productivity growth in the civilian economy. Finally the strategic parity variable is also significant in Equation 4. The negative sign means that the closer the Soviet Union comes to strategic parity with the United States, the lower, *ceteris paribus*, Soviet defense outlays.

Also noteworthy in Table III are the Durbin-Watson statistics. For equations 1 and 2 they are quite poor, while for Equations 3 and 4 they are in the uncertain range. One explanation for this pattern of

serial correlation is that Equations 1 and 2 are misspecified since serial correlation can be reduced by adding the SP variable alone or jointly with SFP. In contrast, first differencing the Equations 1 and 2 did not eliminate serial correlation, supporting the view that the low D-W statistics are the result of misspecification.

The results for SDH, reported in Table IV, differ from those for SDL only in the general lack of significance of the USD variable and the lower elasticity of defense outlays with respect to SY. The sign of SFP is negative for SDH as it was for SDL, but the coefficient for SP is positive. This means that the closer the Soviets are to achieving strategic parity with the United States, the more resources they devote to defense. This suggests a more rivalrous and competitive behavior than do the results for SDL. Again, serial correlation appears to reflect misspecification of Equations 1 and 3.

Based on the results of these regressions we conclude that Soviet defense expenditures are clearly related to Soviet GNP and, in the case of SDL, to United States defense expenditures in much the same way as posited by Gregory. However, our results indicate that, at least for our sample period, Soviet factor productivity growth in industry and the strategic balance between the Soviet Union and the United States have also been important determinants of Soviet defense outlays, although in the case of the SP variable the effect on defense outlays differs between SDL and SDH.

If we are to accept the hypothesis that there has been no change in Soviet attitudes toward defense outlays during the sample period and that Soviet behavior can therefore be explained by the parameter estimates reported in Tables III and IV, we must show that these

regression results are indeed appropriate for the entire sample period. To test whether this in fact is true, we employ the Quandt test [14] to determine whether the sample period can be better described by a single regression regime or by two separate regressions, each with the same specification but with different parameter estimates. The procedure requires that we obtain estimates for all possible divisions of the entire sample period into two samples, one running from 1960 to year T and the other from year T + 1 to 1984. The year in which the likelihood ratio reaches a maximum is then the year in which a break in regime, or change in regression coefficients, is most likely to have taken place. By means of a  $\chi^2$  test we can then test the hypothesis that no break has taken place. For those cases where a structural break in the regression regime occurs, we use the Chow test to determine whether the coefficients for the pre-break period are significantly different from those of the post-break period.<sup>10</sup>

The results of these tests are reported in Table V. For all specifications and for both SDL and SDH, Quandt's likelihood ratio test indicates the presence of a structural break in the regression regime. The Chow test generally confirms that significant differences exist between the regression coefficients of the pre- and post-break samples despite the small sample size and high collinearity. Thus we conclude that the use of the regression results reported in Table III and IV to explain Soviet defense expenditures over the entire sample period is not appropriate. More important, the structural breaks occur even when SFP and SP are included as explanatory variables. This means that the achievement of strategic parity with the United

States and the difficulties experienced by the Soviet economy alone cannot explain the slowdown in Soviet defense expenditures. Instead, it is evident that the relationship between Soviet defense expenditures and the explanatory variables changed at some point within the sample period, indicating either a change in military doctrine or a change in the leadership's preferences. In three cases the break occurs in the early 1960s. In these cases, however, not all explanatory variables are included in the specification, and we suspect these breaks reflect the effects of missing variables. This is borne out by the fact that the more complete specifications indicate no breaks in the 1960s because the inclusion of the missing variables effectively explains movements in defense outlays in these years. The more complete specifications do, however, show clear evidence of a structural break in the 1970s, sometime between 1972 and 1976. Thus, even with the productivity slowdown and strategic parity factored in, the decisionmaking pattern of the 1960s does not hold up into the 1970s and 1980s.

Tables VI and VII report parameter estimates obtained by estimating Equations 1-4 over the two sample periods as determined in Table V. For SDL, all specifications show a decrease in the elasticity of Soviet defense expenditures with respect to United States defense outlays and Soviet GNP although both explanatory variables retain their significance in the second period. SFP tends not to play a significant role in determining the level of SDL except for Equation 4 in 1960-76. Strategic parity, on the other hand, is significant in both the pre- and post-break period, but the sign changes. Recall that log SP is negative because the United States has

more warheads than the Soviet Union. Thus in the pre-break period, 1960-76, the Soviet Union reduced defense expenditures as its number of nuclear weapons increased relative to that of the United States. Such behavior suggests that in this period the Soviet leadership was seeking strategic parity with the United States. In the 1977-84 period, however, the higher the ratio of Soviet to United States warheads, the greater Soviet defense expenditures, possibly reflecting a more competitive policy on the part of the Soviet leadership. The results for SDH, reported in Table VII, yield similar conclusions. The one difference is that in the case of SDH the elasticity of Soviet defense expenditures with respect to USD is higher in the post-break period rather than lower.<sup>11</sup>

Soviet attitudes toward defense outlays thus changed sometime in the mid-1970s so as to become less responsive to the growth rate of Soviet GNP. For SDL the responsiveness to United States defense spending also declined, while for SDH it increased. There is no evidence that problems in the procurement process, as proxied by SFP, have had an effect on the level of Soviet defense outlays. To show the implications of these changes in attitude for Soviet defense expenditures we computed the level of Soviet defense outlays for the post-break period, post-1973 for SDL and post-1976 for SDH, using first the pre-break parameters and then the post-break parameters for Equation 4 reported in Tables VI and VII. The results of projections and the actual level of Soviet defense expenditures are reported in Table VIII.

Projections based on the pre-break coefficients show what Soviet defense spending would have been had the leadership's attitudes toward



such outlays not changed. Projections based on the post-break coefficients are our model's predictions of Soviet defense outlays reflecting the altered Soviet decisionmaking process. In addition to the very close fit between the CIA's estimates of SDL and SDH and the projections based on post-break coefficients a noteworthy result is the fact that the estimates based on post-break coefficients represent a much more stable pattern of defense expenditures than do the estimates based on pre-break coefficients. The clearest evidence of this can be found in 1982 where the pre-break parameters posit a very large increase in Soviet defense outlays. For SDL the period 1974-78 is also one of erratic growth. Such results are quite consistent with our findings above regarding the decreased elasticity of SDH and SDL with respect to the explanatory variables.

More surprising and germane to this study is the comparison of the level of defense expenditures under pre- and post-break regimes. SDL is marginally lower under the post-break regime than it would have been under the pre-break one. Nevertheless, the difference between the two series in 1984 is quite small. Thus on the basis of the results for SDL we can conclude that the slowdown in Soviet defense expenditures is partly due to economic factors and partly to a change in Soviet behavior which caused a *ceteris paribus* decline in defense outlays. For SDH the results are more complex in that defense outlays are generally higher because of the change in regime, except for the years 1979-80 and 1982. Thus for SDH the change in regime actually resulted in higher defense outlays than would have occurred under the pre-break regime. Thus, in contrast to the conclusions drawn in the case of SDL the comparison of the two sets of SDH projections

indicates that the 1977 change in Soviet attitudes did not reduce the growth rate of defense expenditures, but in fact increased it relative to what it would have been had Soviet attitudes remained unchanged.

#### V. Conclusions

Soviet defense expenditures have been shown to depend on Soviet GNP, the level of United States defense expenditures and the strategic balance between the two countries. Difficulties in Soviet defense industries, as proxied by SFP, do not appear to be a cause of the slowdown in the growth of Soviet defense expenditures. Nor can the 1960-84 levels of Soviet defense outlays be explained entirely by the economic factors proposed by the CIA or by the evolution of the strategic balance. Also influencing the growth of Soviet expenditures has been a change in the way in which the Soviet leadership takes economic and political factors into account when setting defense expenditures. The result of this change in the leadership's attitudes has been to stabilize defense expenditures in the post-1977 period. In the case of the CIA's low estimates of Soviet outlays, the change in attitude has resulted in a lower level of defense spending since 1974, but for the high estimates, it has resulted in greater expenditures. Thus it is impossible to judge whether Soviet attitudes have become more conciliatory or more competitive.

#### VI. Postscript

We caution readers that our results should not be extended beyond the sample period. The ascension of Mikhail Gorbachev to the leadership of the Soviet Union has clearly created a new set of

attitudes toward economic problems and defense outlays. The 1986-1990 Five Year Plan calls for sharply increased growth of output, to be brought about largely by stepped up investment in machinery and equipment and by a faster pace of technological progress. These measures surely have raised the opportunity cost of defensive outlays. These higher opportunity costs are clearly reflected in Soviet bargaining for the elimination of nuclear missiles from Europe and for the reduction of strategic arsenals, and, to the extent that these negotiations prove successful, they should also be reflected in an altered relationship between Soviet defense expenditures and the explanatory variables employed in this paper.



## References

1. Bergson, Abram, "Notes on the Production Function in Soviet Postwar Industrial Growth." Journal of Comparative Economics, June 1979, 116-26.
2. Central Intelligence Agency. Estimated Soviet Defense Spending: Trends and Prospects. Washington: USGPO, 1978.
3. Desai, Padma, "Total Factor Productivity in Postwar Soviet Industry and Its Branches." Journal of Comparative Economics, March 1985, 1-23.
4. Economic Report of the President. Washington: United States Government Printing Office, 1986.
5. Farley, Jill and Hinich, M.J., "A Test for a Shifting Slope Coefficient in a Linear Model." Journal of the American Statistical Association. 1970, 1320-29.
6. Graves, Ronald L. "Soviet Defense Spending Policy Analysis. M.S. Thesis, Arizona State University, 1985.
7. Gregory, Paul R., "Economic Growth, U.S. Defense Expenditures and the Soviet Defense Budget: A Suggested Model." Soviet Studies. January 1974, 72-80.

8. Holloway, David. "Comments on Richard Kaufman's Article." Soviet Economy, January - March 1985, 37-41.
9. Holzman, Franklyn D. "Are the Soviets Really Outspending the U.S. on Defense?" International Security. Spring 1980, 86-104.
10. -- "Soviet Military Spending: Assessing the Numbers Game." International Security. Spring 1982, 78-101.
11. Kaufman, Richard F. "Causes of the Slowdown in Soviet Defense." Soviet Economy. January - March 1985, 9-31.
12. Lee, William T. The Estimation of Soviet Defense Spending Expenditures, 1955-1975: An Unconventional Approach. New York: Praeger, 1977.
13. Pitzer, John. "Gross National Product of the USSR, 1950-80." United States Congress, Joint Economic Committee, USSR: Measures of Economic Growth and Development, 1950-80. Washington, U.S. Government Printing Office, 1982.
14. Quandt, Richard E. "Tests of the Hypothesis That a Linear Regression Obeys Two Separate Regimes." Journal of the American Statistical Association, 1960, 324-30.
15. Steinbrunner, John. "Comments on Richard Kaufman's Article." Soviet Economy, January - March 1985, 32-6.

16. Stockholm International Peace Research Institute. World Armaments and Disarmaments: SIPRI Yearbook. London: Taylor and Francis, annual.

17. United Nations Economic Commission for Europe. Economic Survey of Europe in 1984-1985. Geneva: United Nations, 1985.

18. United States Congress, Joint Economic Committee. Allocation of Resources in the Soviet Union and China. Washington: USGPO, 1978, 1979, 1980, 1981, 1982, 1984.

19. United States Department of Defense. Soviet Military Power. Washington: USGPO, yearly.

## Footnotes

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1. Among such estimates are those of Lee [12], the Stockholm International Peace Research Institute [16] and the U.S. Department of Defense [19].

2. Nevertheless, the CIA's methodology has not been without its critics [9; 10].

3. As Holzman puts it, "We don't need an econometric study to prove that U.S. defense expenditures are geared to Soviet expenditures - our Congressional debates are sufficient evidence." [9, 102]. Paradoxically, Gregory [7], whom Holzman cites in the sentence immediately preceding this passage, is unable to find any such relationship in the framework of an econometric model. Nevertheless, Holzman's assessment may well be correct in a broader context.



4. An excellent summary of the debate and some of the evidence bearing on it can be found in Kaufman [11], and in the comments on Kaufman's work by Steinbrunner [15] and Holloway [8].

5. The CIA's views may be found in CIA [2] and in the testimony presented to Congress as reported in [18] which is published yearly.

6. Steinbrunner [15] stresses the importance of these factors.

7. The measurement of strategic parity is, of course, a thorny issue, since it depends on both nuclear and non-nuclear forces. Nevertheless swings in defense expenditures are largely related to changes in procurement, often of nuclear delivery systems; expenditures for the upkeep of military personnel are more stable.

The measure of parity used here, the number of warheads, is also crude, since the power of nuclear weapons depends on the reliability and accuracy of the delivery system, the yield of the warhead and the intended target (cites vs. missiles). Nevertheless, to the extent that the yield of U.S. weapons was smaller while Soviet warheads were larger but less accurate, the use of number of warheads reflects some of these qualitative differences more effectively than would, for example, a comparison of delivery vehicles or yields.

8. The total and defense indices diverge only very slightly for the period 1972-85, and thus the use of the price deflator for total government purchases to deflate the early part of our sample should be the source of only minor error at worst.

9. The detailed calculations and data sources for Table II are available in [6] and from the authors upon request.

10. Farley and Hinich [5] discuss the appropriateness of the Chow test under these conditions.

11. Breaking the sample period into two also makes the coefficient for USD significant, thus further confirming Gregory's findings.

Categories 052, 114, 124

B1-Brada, Josef C. and Graves, Ronald L.

B2-The Slowdown in Soviet Defense Expenditures

C2-Building on a model developed by Paul Gregory, demonstrate the dependence of Soviet defense expenditures on Soviet GNP, United States defense spending and the strategic balance between the two countries. The model is used to explain the slowdown in the growth of Soviet defense outlays that the CIA claims began in the mid-1970s. We find that economic and geopolitical factors contributed to the slowdown and that there was a change in Soviet decisionmaking regarding defense expenditures that served to stabilize the growth of defense expenditures in the 1970s but not necessarily to slow such growth.

B6-Southern Econ. J.

B7-April 1988

B8-54(4),pp.

C4-

B4-Arizona State University, Tempe, AZ 85287-3608, U.S.A.

