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THE RELATIONSHIP BETWEEN INFLATION AND DEFENSE EXPENDITURES

H. O. Stekler

December 1979

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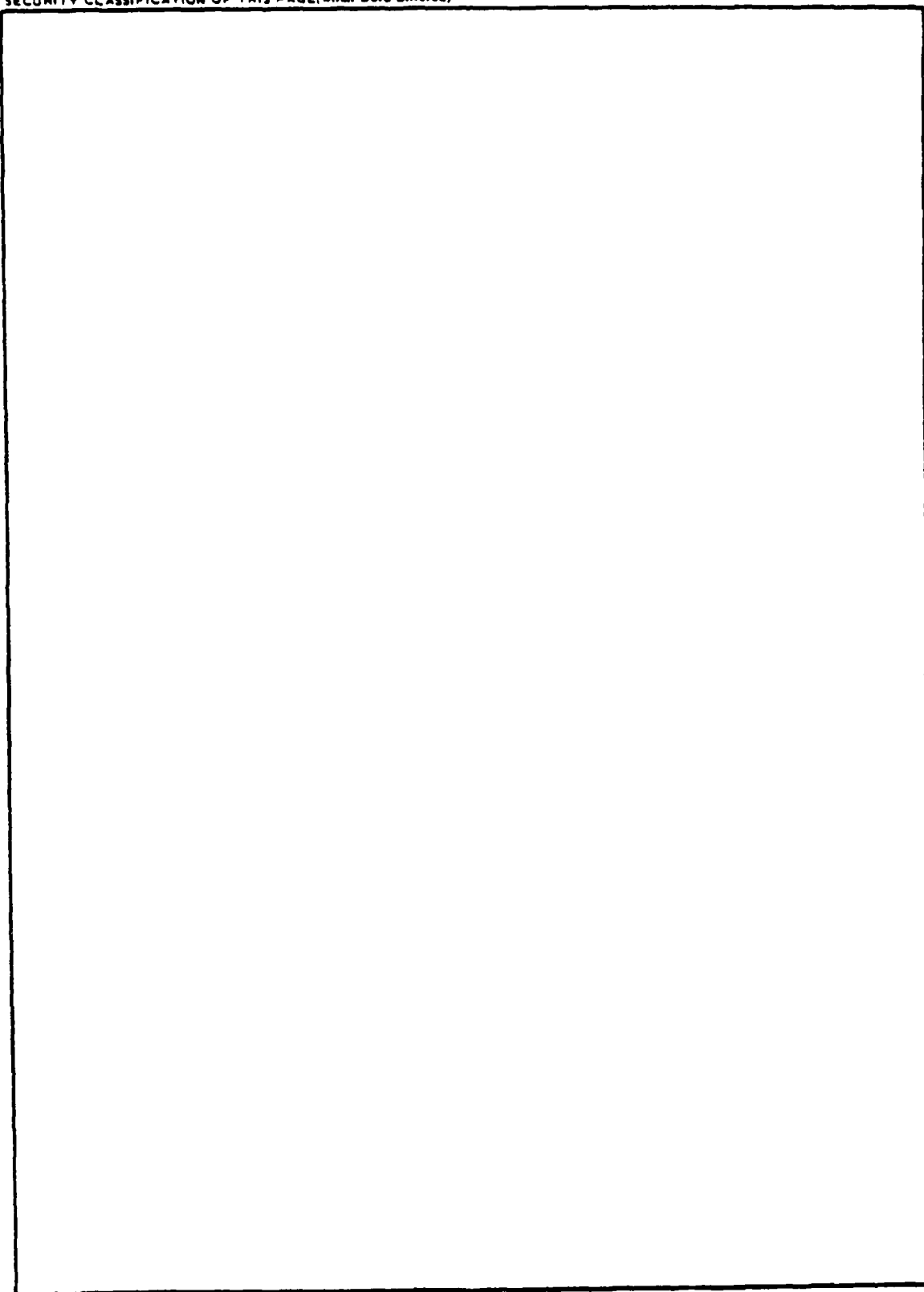
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**THE RELATIONSHIP BETWEEN INFLATION
AND DEFENSE EXPENDITURES**

H. O. Stekler

December 1979



**INSTITUTE FOR DEFENSE ANALYSES
PROGRAM ANALYSIS DIVISION
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CONTENTS

EXECUTIVE SUMMARY	S-1
I. CONTEMPORARY THEORIES OF INFLATION	1
A. Contemporary Theories of Inflation	2
1. Earlier Theories: Demand-Pull vs Cost-Push	2
2. Variants of Demand-Pull Theories	3
3. Monetarist Explanations of Inflation	3
4. An Aside on the Phillips Curve	4
5. Structural (Sectoral) Models of Inflation	5
6. International Transmission of Inflation	6
7. Summary	6
B. The Role of Defense Expenditures in Contemporary Theory	7
1. Demand-Pull	7
2. Cost-Push	7
3. Monetarist Theories	9
4. Sectoral Theories	9
C. Summary	9
II. INFLATION VIEWPOINTS FOCUSING ON DoD EXPENDITURES	11
A. "...sudden swings...."	11
B. "Bombs and missiles...."	13
C. "...The defense sector...."	15
D. Conclusions	16

III.	THE EMPIRICAL EVIDENCE ON FEDERAL AND DoD EXPENDITURES	17
A.	Observed Price Changes, 1972-77	18
B.	Technique for Evaluating Total Economic Impacts	20
C.	Measured Impact of Government Expenditures	22
1.	All Federal Expenditures	22
2.	Defense Expenditures	24
3.	Suggested Research on the Impact of DoD Spending	26
4.	New Orders vs Expenditures	28
D.	Conclusion	29

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EXECUTIVE SUMMARY

This paper examines the question: Are DoD expenditures inherently more inflationary than non-military government or private spending. This question first is analyzed (Chapter I) in the context of existing theories of inflation to determine whether the characteristics associated with military outlays seem related to factors which produce inflation. The contemporary theories primarily emphasize the behavior of monetary and/or fiscal *aggregates*. With the exception of the structural theories, there is little emphasis on the role that *specific* categories of spending, such as defense, might play in the inflationary process. When defense expenditures are integrated into these contemporary theories, the analysis indicates that the inflationary impact attributed to DoD outlays does not differ substantially from that assigned to any other type of non-military spending. Only within a theory which emphasized differences in the performances of specific sectors is it possible to attribute *any* role in the inflationary process to DoD outlays. Even here, the empirical validity of the assumptions underlying the theory has not been demonstrated.

Chapter II examines a number of arguments which specifically suggest that defense expenditures play a crucial and dominant role in generating inflation. These arguments suggest that (1) swings in defense spending are inflationary, (2) defense spending is inflationary because it creates income but not goods, and (3) defense spending has retarded the growth of some industries. The analysis indicates that appropriate monetary and fiscal policies could be utilized to offset any

possible adverse economic effects which might result. Moreover, it is demonstrated that the arguments advanced for defense spending would also apply to other types of procurement spending. Consequently, the arguments might have some validity, but they are not universally true.

The empirical relationship between defense spending and inflation is examined in Chapter III. A comparison of observed price changes for 1972-77 shows that the prices of DoD and non-defense expenditures rose at about the same rate. This indicates that the *direct* impact of DoD purchases on the overall inflation rate is no different from that of non-defense federal purchases. If DoD spending were inflationary, this impact would have to emanate from secondary effects.

The most commonly used technique for evaluating the *total* impact of any policy is to simulate it with an econometric model. The analyses of previously undertaken simulations show that there is uncertainty associated with the estimates of the impact of all federal expenditures upon the US economy. Given the uncertainty associated with all these estimates, suggestions for further research are advanced. While there has been no study which specifically examined the effects of increased defense spending, the effects might be inferred from analyzing the effects of decreased spending. The only major study specifically simulating changes in military spending implied that defense and non-defense expenditures have identical impacts upon the economy.

Chapter I

CONTEMPORARY THEORIES OF INFLATION

This paper will address the issue--are DoD expenditures inflationary? The analysis will need to be redirected for there are occasions when *any* increase in expenditures, be it by consumers, businesses, or government agencies, could be inflationary. This obviously would be true at a time of full employment when any increase in expenditures would increase demand pressures and thus inflationary tendencies. The question to be examined thus should be: Are DoD expenditures inherently more inflationary than non-military government or private spending?

In this chapter this question will be analyzed in the context of existing theories of inflation to determine whether the characteristics associated with military outlays seem to be associated with factors which produce inflation. There have been a number of recent surveys¹ of contemporary inflation theory; the main arguments of these sometimes conflicting theories of inflation will be presented. This will be followed by an analysis of the inflationary role which, within the context of these theories, might be attributed to DoD outlays.

¹D.E.W. Laidler and J.M. Parkin, "Inflation - A Survey," *Economic Journal*, 85:340, (Dec. 1975), pp. 741-809; Helmut Frisch, "Inflation Theory 1963-75: A 'Second Generation' Survey," *Journal of Economic Literature*, XV:4, (Dec. 1977), pp. 1289-1317.

A. CONTEMPORARY THEORIES OF INFLATION

1. Earlier Theories: Demand-Pull vs Cost-Push

In the 1950s and early 1960s, theories of inflation were divided into two main groupings.¹ One set of arguments was that inflation was caused by excess demand, i.e., demand-pull inflation. It was argued that when aggregate demand exceeds aggregate supply, forces would be set in motion which would cause prices to rise. For instance, individuals who sought resources which were in short supply would bid up the price of those goods. This process, if it permeated the entire economy, would initiate the inflationary process.

The alternative set of theories focused on forces which permitted the price of particular factors to rise independent of demand conditions, i.e., cost-push inflation. Here it was argued, for instance, that labor unions, using their control of the labor supply, forced up the wages of their members. These higher wages became increased costs to firms. The firms in turn, using markup pricing, would pass on these higher costs. Thus the inflationary process would begin.

The problem with this dichotomy between demand-pull and cost-push theories of inflation is that it is empirically impossible to distinguish between them. At any given time, the observed inflationary process may be the result of current cost-push phenomena, or it may be the result of a lagged adjustment to an inflation previously initiated by demand factors.² These questions cannot usually be resolved.³

¹For review of this earlier literature see Martin Bronfenbrenner and Franklyn D. Holzman, "A Survey of Inflation Theory," *American Economic Review*, 53:4, (Sept. 1963), pp. 593-661.

²In this case specific groups might be attempting to recapture their claims on society.

³This is not to say that these phenomena can never be separated. The increase in food prices resulting from crop failures or OPEC-initiated increases in oil prices obviously are supply or cost-push phenomena.

Thus, the current theories do not attempt to explain the inflationary process in terms of the initial source of price increases. Although contemporary theory does not distinguish between the sources of inflation, our understanding of the inflationary process can be broadened by examining some of the earlier arguments.

2. Variants of Earlier Theories

The theories propounded in the 1960s were divided even further. One set of arguments emphasized that non-monetary changes started the inflationary process. This process was then *accommodated* by increases in the money supply. Another set of arguments indicated that changes in the money supply were the direct cause of inflation.

Since the money supply plays a crucial role in both explanations, there is no substantive difference between these variants of the demand-pull theories. The similarity of these approaches is now recognized.¹

3. Monetarist Explanations of Inflation

Given the growing emphasis upon the role of money in explaining the inflationary prices, the theories associated with the monetarist school received wider analysis. These theories were based upon the earlier works of Milton Friedman. The current "...monetarist hypothesis contends that various rates of inflation in different countries can be explained by the respective rates of growth of money supply per unit of national product."²

¹Frisch, *op. cit.*, p. 1311. Robert J. Gordon, "Recent Developments in the Theory of Inflation and Unemployment," *Journal of Monetary Economics*, 2:2, (April 1976), 185-219.

²Frisch, *op. cit.*, p. 1298.

Thus financing a government deficit by increasing the money supply would likely be inflationary. On the other hand, issuing bonds to the public to finance the deficit would not tend to be inflationary but would raise interest rates and "crowd-out" private spending.

The monetarist theories also deal with the way inflationary expectations are formed and whether the inflation is fully anticipated or not. However, the relationship between defense expenditures and inflation is not affected by this process of expectation formation. Consequently, we will not analyze this aspect of the monetarist theory in detail.

4. An Aside on the Phillips Curve

Considerable research has been devoted to determining how price and wage inflation is related to conditions of excess demand, regardless of the causes of this excess demand. This research has been associated with the Phillips curve--a concept which was popularized in the late 1960s and early 1970s. Basically, this curve (Figure 1) relates the rate of inflation ($\frac{\Delta p}{p}$) to the level of unemployment (μ). It implies that at equilibrium there is a tradeoff between these two economic variables, and that a society must choose which combination of inflation and unemployment is most desirable.

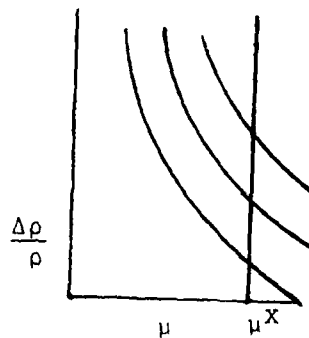


Figure 1. HYPOTHESIZED PHILLIPS CURVE

The acceleration of inflation in the middle and late 1970s first forced economists to emphasize that the tradeoff implied an equilibrium process. This, in turn, produced further analyses of the inflationary process. Research has focused on the differences between disequilibrium and equilibrium inflationary processes; the latter requires that inflation be fully anticipated. Moreover, in order to understand how an inflation became fully anticipated, further research on expectation formation was required. Once it was understood that inflationary expectations could adjust in a number of ways, the debate once again shifted. Now most economists agree that in the short-run, because expectations might not be fully adjusted, there is a tradeoff between inflation and unemployment. The controversy is whether such a tradeoff exists in the long-run (i.e., whether the relationship in Figure 1 is downward sloping or vertical at μ^x , the mutual rate of unemployment).

It should be emphasized that this tradeoff question does not consider how the excess demand was produced. It does not matter whether it originated in the private or government sector, or, if the latter, through monetary or fiscal actions.

5. Structural (Sectoral) Models of Inflation

With one exception, the more recent theories have not emphasized cost factors as causing and propagating inflation. The exception has been the development of models¹ which emphasize the structural or sectoral differences in productivity between the various sectors of the economy. For example, it may be argued that the service sectors of the economy have exhibited a slower growth of productivity than have the industrial sectors. However, it is likely that

¹For a more complete analysis of these models, see Frisch, *op. cit.*, pp. 1304ff.

wage rates will be increasing at approximately the same rate in all sectors. Thus, cost pressures could occur in the service sector.

Several additional assumptions are required to show that this difference in productivity and cost pressure could cause inflation. First, it must be assumed that the demand for services is relatively price inelastic, i.e., higher prices will not substantially reduce the demand for services. Second, the demand for these services must be income elastic, i.e., as income increases the demand for those services will increase, at least proportionately. Finally, it must be assumed that price and wage rigidities exist and prevent downward pressures on any prices or wages.¹

6. International Transmission of Inflation

In recent years, an additional dimension has been added to the theories of inflation. It is now widely recognized that the economies of particular countries do not operate in isolation; that the economies of those countries in fact are interconnected. Thus, the operation of the international finance system and the world-wide creation of money can transmit inflation from one country to another.

7. Summary

A basic characteristic of the inflation theories which have been summarized herein is their focus on monetary and/or

¹Another result of this sectoral approach is that transferring resources from one sector to another, in the presence of wage and price rigidities, might cause an increase in prices and wages. Prices and wages in the declining sector would not fall; whereas to attract new resources they would be bid up in the expanding sector. See Robert Solow, "Evaluation," in *After the Phillips Curve: Persistence of High Inflation and High Unemployment*, Conference Series No. 19, (Federal Reserve Bank of Boston, 1978), p. 209.

fiscal aggregates. Except for structural theories, there generally is no emphasis on the role that specific categories of spending, such as defense, might play in the inflationary process. The next section will determine whether, in the context of these theories, defense spending has an inflationary impact different from that of other government or private expenditures.

B. THE ROLE OF DEFENSE EXPENDITURES IN CONTEMPORARY INFLATION THEORY

No role was specifically assigned to defense expenditures in the aforementioned contemporary theories of inflation. It is important, therefore, to determine whether these expenditures play a crucial role in any of these theories or whether defense outlays might be treated the same as any other type of government spending.

1. Demand-Pull

The origin of excess demand is not specified in the earlier demand-pull theories. Thus, all factors which might increase excess demand must be treated equally. Consequently, no special role should be attributed to defense outlays.¹

2. Cost-Push

It has been argued that the cost-plus contracts used in the procurement of defense might cause inflationary cost

¹A possible exception might occur if DoD expenditures were directed towards industries which had a lower than average level of excess capacity or surplus labor. In this case bottlenecks might be created and the demand for specialized labor would increase. In such a case, the effect of an increase in DoD expenditures would differ from that produced by increases in other types of government spending which would be directed towards sectors where there was excess capacity and unemployment.

pressures.¹ The absence of competition removes the barriers which limit price and wage increases. In addition, the certainty of recovering costs on cost-plus contracts may make firms less efficient. Both factors, it is argued, tend to increase prices.

In order to analyze this issue, it is necessary to distinguish between a higher *level* of prices and an increase in the *rate* at which prices are rising. While it is possible that procurement costs might be lower if more competition prevailed in the defense industry,² the absence of competition is not necessarily a cause of inflation. This debate on the absence of competition relates to the *level* of prices and not to the *rate* at which these prices are increasing. Even if prices were increasing faster (through quicker pass throughs, for example), the structure of the defense industry would add to inflationary pressure only if several additional conditions existed. Either the higher prices of goods would have to become costs to some other industry, or the higher rate of wage increases accruing to employees in the defense industry would cause employees in other industries to demand and obtain similar increases.³

- Since defense goods are final and not intermediate products, higher prices associated with these items are not passed on in the production process.

¹Kenneth Boulding, "The Impact of the Defense Industry on the Structure of the American Economy," in Bernard Udis, ed., "The Economic Consequences of Reduced Military Spending," (Lexington, Mass., Heath Lexington Books, 1973).

²For an analysis of the effects of competition on the prices of defense systems see James Schuttinga, George Daly and Howard Gates, *The Effect of Price Competition on Weapon System Acquisition Cost*, IDA P-1435, Institute for Defense Analyses, Arlington, VA: Aug. 1979.

³Alternatively, the employees at a given plant may be producing both defense and non-defense goods. If all employees received the higher increases, the same effect would occur.

- Whether wage increases in the defense industry are both higher *and* lead wage increases in the non-defense sector cannot be determined in a theoretical manner. Empirical analyses would be required to obtain an answer to this question.

3. Monetarist Theories

In the monetarist theories, it does not matter whether increases in money are used to finance military or non-military government outlays. Financing either type of expenditure with money will have the same effect. Similarly, "crowding-out" will occur whenever bonds are used to finance *any* type of government deficit. Thus, the inflationary impact of DoD expenditures is no different from that of any other kind of government outlay.

4. Sectoral Theories

It might be possible to explicitly incorporate DoD purchases into the sectoral theory of inflation. It would be necessary to assume that (1) the defense sector has lower productivity (and costs rise faster) than the rest of the economy; (2) the demand for defense products is price inelastic; and (3) the demand for defense products is income elastic.

The validity of this theory would depend upon an empirical verification of the three assumptions. However, it should be noted that in the recent past DoD expenditures have not increased as a percentage of GNP. Therefore, it is unlikely that these outlays can be shown to be income elastic.

C. SUMMARY

In this section, defense expenditures were integrated into contemporary inflation theories, which have not formally considered the impact of DoD outlays on inflation. Within the demand-pull theories, the inflationary impact attributed

to these outlays did not differ from that assigned to any other type of non-military spending. Within the other theories, defense spending also would not play a crucial role in generating inflation. Only within the sectoral theories, by making specific assumptions, was it possible to attribute any role in the inflationary process to DoD outlays. However, the empirical validity of these assumptions has yet to be demonstrated.

In the next chapter, the focus shifts from analyzing the general theories of inflation to a review of a number of arguments which have been advanced to show that defense expenditures play a crucial and dominant role in generating inflation.

Chapter II

INFLATION VIEWPOINTS FOCUSING ON DoD EXPENDITURES

One of the characteristics of the contemporary inflation theories analyzed in Chapter I is that defense expenditures are not assigned a central role in generating inflation. Even when defense spending is incorporated into these theories, it is not possible to rigorously prove that an increase in DoD spending *per se* generates inflation. Now we shall examine three categories of viewpoints which assign a crucial and dominant role to defense spending as a cause of inflation. This analysis will be conducted by examining and evaluating specific statements and/or arguments.

- A. "...sudden swings within the defense sector have contributed to the inflationary trend."¹

Burns argues that when sudden demand pressures are placed upon an economy operating near capacity, as is likely during a wartime situation, it is difficult to implement monetary and fiscal policy quickly enough to prevent some inflation. The argument is probably correct within the context of a wartime situation when military equipment must be produced extremely quickly. Under non-wartime conditions, when speed and urgency are not the dominant factors, the

¹Arthur F. Burns, "The Defense Sector: An Evaluation of Its Economic and Social Impact," in Jacob K. Javits, Charles J. Hitch, and Arthur F. Burns, "The Defense Sector and the American Economy," (New York, New York Univ. Press, 1968), p. 64. Reprinted in Seymour Melman, ed., "The War Economy of the United States," (New York, St. Martin's Press, 1971).

appropriate fiscal and monetary policies *theoretically* can be implemented quickly enough to prevent inflation. Under these latter circumstances, increases in military spending should show effects no different than those attributable to other types of government spending.¹

Gordon² presents a slightly different version of this argument. In discussing the "demand for" and "supply of" inflation, Gordon indicates that "taxpayers...resist tax increases made necessary by increases in expenditures (for example, during wartime)...."³ This would be especially true if a war were unpopular, or if the electorate did not place any value on military outlays.⁴ If these political pressures occurred, it might not be possible to implement the appropriate monetary and fiscal policies, and inflationary pressures would ensue. However, it should be noted that a reluctance to increase taxes would not be limited to situations requiring the financing of defense expenditures. Similar arguments might be presented with respect to social programs, environmental outlays, etc., which perhaps would not be popular with a different segment of the population.

¹Sudden surges in demand of *all* types of government expenditures *might* produce cost-push pressures or create bottlenecks.

²Robert J. Gordon, "The Demand For and Supply of Inflation," *The Journal of Law and Economics*, XVIII:3, (Dec. 1975), pp. 807-836.

³*Ibid*, p. 808.

⁴This is similar to the argument which states that there is a difference between the value that the electorate and the "government" assign to defense. Jacob Paroush and Itzhak Venezia, "Are Defense Budgets Too Large?" *Public Finance*, XXXI:3, (1976), pp. 406-413.

B. "Bombs and missiles add nothing to the nation's capacity to produce, while new equipment serves to augment production in the future."¹

"...military spending tends to be inflationary-it puts money into the hands of workmen without expanding the supply of goods they can buy...."²

"The Pentagon is a perpetual inflation machine...by pumping dollars but not goods and services into the economy...."³

"...the armaments industries employ people who increase demands on privately produced goods, but who do not themselves contribute to the production of...consumable products."⁴

The major thrust of these arguments is that current defense demand will generate income but not investment or consumption goods. Burns focuses on the crowding out of investment. Since less investment will be undertaken, there will be a smaller growth in capacity and less non-defense goods will be supplied in the future. Consequently there would be an excess demand for non-defense goods, and prices would rise.

It will be shown that similar arguments could be applied to other types of government expenditures. It can also be demonstrated that the long-run adverse effects of increased government expenditures (of any type) can be eliminated by appropriate monetary and fiscal policies.

It is true that increased DoD outlays generate extra income for the American worker, and that no extra *consumption* goods are produced by the military items purchased by these expenditures. However, the same facts hold for increased federal highway and/or pollution-control expenditures. None of these categories of government spending produces consumer

¹Burns, *op. cit.* p. 71.

²Ann Crittenden, quoted in the Congressional Record, Jan. 22, 1979, p.H.199.

³William W. Winpisinger, *The New York Times*, Sec. 4, March 4, 1979, p. 7

⁴Michael Best, "Notes on Inflation," *Review of Radical Political Economy*, 4, (Aug. 1972), p. 108.

goods; all yield services, namely security, less traffic congestion, and a cleaner environment. None of these services is purchased or valued in the open-market¹ and none constitutes consumer purchases.² In *all* of these cases, the consumer retains the income that was generated by these expenditures.

If the economy were operating below its potential capacity, there would be no problem. There would be enough capacity to produce the extra goods demanded as a result of the increase in income. However, if the economy were operating at full employment, when government expenditures increased appropriate macro-economic policies would have to be implemented to prevent inflation. Obviously, these expenditures could not be financed through the creation of money. Moreover, if bonds were issued to pay for these expenditures, investment might be crowded out, thus hindering potential supply over the longer run and increasing inflationary pressures.³

It is possible, however, to devise monetary and fiscal policies which would offset the lower rate of growth of capacity and not produce inflation. For example, there is no economic (although there may be a political) reason why personal income taxes cannot be raised. Then the excess demand for private consumption goods would be eliminated, and there would be no inflationary pressures. However, in that case, the standard of living, as measured by per capita

¹The lower traffic congestion of a toll road may be an exception.

²Since these services are not valued in the open market, political considerations involving the relative desirability of the various outputs of these public goods may determine the allocation of spending among the alternative expenditure categories.

³This effect need not occur if the public uses all of its increased income to purchase the government bonds. However, this is unlikely to occur.

real consumption, would be lower than it otherwise would have been.¹ The aforementioned example demonstrates that monetary and fiscal policies can, if desired, be implemented to prevent inflationary pressures.

It is obvious, therefore, that the aforementioned viewpoints which assign a crucial role to DoD expenditures are not unique to that type of spending. The same facts apply to other types of government spending.² It should be recognized, however, that the productive potential or supply side of our society could be impacted by an increase in defense (or other) spending. The inflationary pressures resulting from a decline in investment may only be eliminated, in certain cases, by a reduction in standards of living.

C. "...The defense sector has stimulated economic development in some directions, it has retarded growth in others."³

While this argument has not been explicitly stated in terms of inflationary impacts, it may be translated into this framework. In the long run, one of the key determinants of potential output is the rate of growth of productivity. This factor enables the economy to supply more goods with existing inputs and lessens the magnitude of inflationary pressures. If increased purchases of high technology defense items divert research and development funds away from the private sector, the growth of productivity in the private sector might reduce the growth of the economy's potential capacity and increase inflationary pressures.

¹It should, however, be noted that increased personal taxes may have an inflationary impact. Higher taxes might reduce peoples' incentives to work and thus cause a reduction in the labor supply and/or productivity. This effect, if it occurred, could produce some inflationary pressures.

²Moreover, the cost of producing existing goods and services might increase with other types of government outlays. Pollution control expenditures are an obvious example.

³Burns, *op. cit.*, p. 70.

If resources were not diverted from private R&D,¹ there would be no impact on productivity. Moreover, there is the possibility that new technologies developed for military applications will "spill over" into the private sector and thus enhance (rather than retard) its productive growth.

D. CONCLUSIONS

This chapter examined a number of arguments which specifically indicated that defense expenditures play a crucial role in the inflationary process. The analysis indicated that under certain conditions the arguments might have some validity, but that the theories are not universally true. Given the nature of these theories, which might be true in some but not other circumstances, it is an empirical question whether defense expenditures and the rate of inflation are related.

¹This would depend upon the supply elasticities of the various inputs to the R&D process.

Chapter III

THE EMPIRICAL EVIDENCE ON FEDERAL AND DoD EXPENDITURES

The preceeding chapters have presented theoretical analyses of the relationship between defense spending and the overall rate of inflation. Some of the empirical evidence that relates to this question will be examined in this chapter.

In previous studies¹ a number of different aspects of the economic impacts of Department of Defense expenditures have been analyzed. Economists have considered the budgetary impact of a given level of DoD outlays and the share of GNP devoted to military spending. The regional implications of defense spending, as well as the effect upon the employment and output of specific industries producing defense goods, have all been examined. In the past, these empirical analyses

¹Examples of these studies include the Committee on the Economic Impact of Defense and Disarmament, *Report*, (U.S. Government Printing Office, July 1965); Murray L. Weidenbaum, "Impact of Vietnam War on American Economy," (U.S. Congress, Joint Economic Committee, Hearings, April 24-27, 1967), *The Economic Effect of Vietnam Spending*, pp. 193-226; Edward Greenberg, "Employment Impacts of Defense Expenditures and Obligations," *Review of Economics and Statistics*, 49, (May 1967), pp. 186-98; Wassily W. Leontief and Marvin Hoffenberg, "The Economic Effects of Disarmament," *Scientific American*, 204:4, (April 1961), pp. 47-55; Wassily Leontief, Allison Morgan, Karen Polenske, David Simpson, and Edward Tower, "The Economic Impact--Industrial and Regional--of an Arms Cut," *Review of Economics and Statistics*, XLVII:3, (Aug. 1965), pp. 217-241; Department of Defense (Comptroller), *The Economics of Defense Spending--A Look at the Realities*, (July 1972). For a different mode of analyses see Marion Anderson, "The Empty Pork Barrel, Unemployment and the Pentagon Budget," (Lansing Mich., Pirgin Press, 1978). For a critique of the Anderson study see William F. Morgan, *Unemployment and the Pentagon Budget: Is There Anything in the 'Empty Pork Barrel'?*, Center for Naval Analyses, Professional Paper No. 157, August 1976.

usually have not been focused on the possible inflationary impact of DoD expenditures.

In the first part of this chapter the historical data comparing the price changes of DoD expenditures with those of all federal government expenditures will be presented. This will be followed by analyses of those studies which measure the impact of government expenditures on the US economy.

A. OBSERVED PRICE CHANGES, 1972-77

In March 1979, the Bureau of Economic Analysis of the Department of Commerce published the first indices measuring the price changes associated with Department of Defense expenditures.¹ A comparison of these indices with other indices would indicate whether the prices associated with DoD purchases have risen more or less rapidly than the prices associated with non-defense purchases or with private expenditures. The indices which were compared with the DoD deflators were the deflator for all federal government purchases and the private GNP deflator.

The data (Table 1) show that the deflator for defense purchases and the deflator for *all* federal government purchases rose at about the same rate between 1972 and 1977. Over that period the deflator for all federal purchases rose 42.7 percent, while the rise for the DoD deflator was 41.9 percent. Moreover, the price deflators for all federal expenditures and for DoD purchases were identical for the fourth quarter of 1977, the last date for which DoD data were available.

It should not be surprising that the DoD and total federal deflators move together, for DoD purchases constitute nearly two-thirds of federal purchases of goods and services.

¹US Department of Commerce, Bureau of Economic Analyses, *Price Changes of Defense Purchases of the United States*, (March 1979).

Table 1. IMPLICIT PRICE DEFLATOR FOR DEPARTMENT OF DEFENSE
PURCHASES, ALL FEDERAL PURCHASES OF GOODS AND
SERVICES, AND FOR PRIVATE GROSS NATIONAL PRODUCT
(1972=100)

	DoD Purchases	All Federal Purchases	Private Gross National Product
1972	100.00	100.00	100.00
1973	106.56	105.8	105.57
1974	115.07	115.9	115.63
1975	124.56	127.5	126.67
1976	132.36	134.4	132.97
1977	141.92	142.7	140.40
1972 I	98.23	98.3	98.97
II	99.24	99.3	99.54
III	99.91	99.7	100.26
IV	102.70	102.7	101.18
1973 I	104.28	103.5	102.55
II	105.34	103.9	104.43
III	107.38	105.2	106.47
IV	109.45	110.7	108.75
1974 I	111.09	110.3	111.06
II	112.65	114.1	114.00
III	116.76	117.2	117.08
IV	119.93	122.1	120.54
1975 I	122.03	124.6	123.74
II	122.70	126.1	125.43
III	125.11	127.8	127.78
IV	128.51	131.4	129.55
1976 I	130.48	132.1	130.72
II	130.89	133.3	132.19
III	132.69	134.2	133.65
IV	135.39	138.0	135.28
1977 I	137.88	140.1	137.16
II	141.17	141.1	139.77
III	141.81	142.7	141.51
IV	146.90	146.9	143.11

Sources: US Department of Commerce, *Price Changes of Defense Purchases...*,
op. cit., pp. 13-14; *Survey of Current Business*.

Moreover, both the civilian and military deflators have a very important common element--salaries paid to employees and to the armed services.¹ However, what is surprising is that movements in both price deflators over the 1972-77 period have been virtually identical. Moreover, the deflator for *durable* defense goods was 140.4 in 1977 IV, which was less than the total defense deflator. Thus this evidence provides no support to the hypothesis that defense purchases are more inflationary than other types of federal expenditures.²

This evidence suggests that the prices of DoD and non-defense expenditures have risen at about the same rate, indicating that the *direct* impact of DoD purchases on the overall inflation rate is no different than that of non-defense federal purchases. If, in fact, DoD spending were inflationary, the inflationary impact would have to emanate from secondary effects, i.e., the differential inflationary impacts that DoD and federal non-defense purchases might have on the private economy. The next section will describe the techniques which are used to analyze these secondary effects.

B. TECHNIQUE FOR EVALUATING TOTAL ECONOMIC IMPACTS.

The most commonly used technique for evaluating the *total* impact of any policy is to simulate it with an econometric model. Through mathematically specified and statistically estimated equations, these models relate the behavior of

¹The pay increases given to the employees of the non-defense agencies and the military services and civilian employees of DoD are identical. By convention, all pay increases to all government employees are considered to be pure cost increases. Since government services in the GNP accounts are valued at cost, any cost increases would be directly reflected in an increase in both of the deflators.

²It should be noted that over these six years the DoD inflator only rose by 1.5 percent more than the private gross national product deflator. The DoD deflator has the upward bias attributable to pay increases attributable to measuring these services at input cost. Private gross national product is measured at output prices and does not have an upward bias.

specific economic variables to the behavior or changes of other variables. Thus, by tracing out the effects as they are transmitted through various sectors over time, an intertemporal solution of the model would yield estimates of the total impact of any given policy.

For example, an increase in aircraft orders would cause an increase in employment in the aerospace industry, which in turn might affect the wage rate in that industry. Over time, these wage increases might spread to other industries and thus, by increasing production costs, would prompt manufacturing firms to raise prices. Price increases in turn would tend to increase the pressure for further wage increases, etc.

However, this is not the entire picture, for aerospace firms would also increase their purchases of goods and services from other industries. In turn, the effects emanating from these industries would be qualitatively (but not quantitatively) the same as those resulting from the aerospace industry. Eventually the entire economy might be affected by the effects of the increase in aircraft orders.

While these theoretical effects are easily described, quantitative estimates of the size of these effects and the time period over which they occur can only be obtained by solving specific econometric models.¹ A preferred approach to simulating these econometric models (which are frequently highly non-linear) is to obtain a *baseline* solution using one set of specific assumptions. The effects of a specific policy are then calculated by changing the assumptions relating to that policy, rerunning the model, and comparing

¹These effects may not be obtainable from all existing econometric models. In many instances the aggregation is such that results are not available at this level of detail.

this *alternative* solution to the *baseline* case. The differences between the two solutions are the estimates of the effects attributable to the policy. Comparisons of such solutions generally analyze the effects that a policy change would have on critical variables such as real GNP and the price level.

Our analysis would be greatly simplified if most models were similar, and the policy effects generated by the models were comparable. Unfortunately, the existing econometric models are very dissimilar. Some are highly aggregated, while others provide greater detail. For instance, the effect of policy changes upon the output and prices of specific industries is specifically included in some cases. In other instances, only the behavior of aggregate output and prices is specified. Some models place greater emphasis on the relationships between money and other variables than do other models. In some models, specific variables might be explained by the model while in other models the values of the same variables are assumed and are, therefore, exogenous. It would thus be very surprising if the disparate models did yield similar results.

C. MEASURED IMPACT OF GOVERNMENT EXPENDITURES

Our analysis of the impact of government expenditures on the economy is divided into two parts. The first deals with government expenditures in general; the second investigates defense expenditures in particular.

1. All Federal Expenditures

There have been a number of studies¹ of the effects that an increase in federal government expenditures would have upon

¹These studies include Carl F. Christ, "Judging the Performance of Econometric Models of the US Economy," *International* (continued on next page)

GNP, real GNP, and prices. These studies indicate that the range of possible impacts varies widely among twelve econometric models. The results of the models show the greatest agreement for the first two years after the policy change. But even at the end of this time frame, the measured total impact on nominal GNP was between 1.9 and 2.8 times the increase in government expenditures.¹ For real GNP the effect was between 1.4 and 2.4. Moreover, after two years, the measured impacts of the models displayed even greater variability.² The measured impacts of government expenditures upon prices also yielded a large divergence. However, in no case did the government expenditures have a large impact upon the price level or rate of inflation.

Most of the earlier studies examined periods which involved the late 1960s and early 1970s when inflation was a smaller problem than it is today. Consequently, the results of a more recent, though less comprehensive, study are more indicative of the impacts that currently might be expected from an increase in government spending.

The Congressional Budget Office used simulations from four different models³ to determine the impact of a \$10 billion increase of federal non-defense purchases on the US economy,

(contd) *Economic Review*, 16:1, (February 1975), pp. 54-74; Gary Fromm and Lawrence R. Klein, "The NBER/NSF Model Comparison Seminar: An Analysis of Results," *Annals of Economic and Social Measurement*, 5:1, (Winter 1976), pp. 1-28; Congress of the United States, Congressional Budget Office, *Understanding Fiscal Policy*, (April 1978).

¹Christ, *op. cit.*, p. 65.

²*Ibid.* Other studies showed similar results, but part of this divergence might be attributable to differences in the time periods over which the simulations were run.

³Congressional Budget Office, *op. cit.*, pp. 17-18. The models are (1) Data Resource, Inc.; (2) Wharton Econometric Forecasting Associates, Inc.; (3) MPS (M.I.T., University of Pennsylvania, and Social Science Research Council); and (4) Chase Econometric Associates, Inc.

assuming mid-1977 conditions. The estimated three year increase in nominal GNP ranged from under \$14 billion to \$29 billion, yielding multipliers of around 1.4 to 2.9.¹ The uncertainty associated with the impact on real GNP is even larger. In addition, the price impacts predicted by these models also varied widely. According to these models, after three years the GNP deflator may have risen anywhere from an insignificant amount to 1.2 points. At the upper extreme, this increase in government expenditure would have raised the price level by about one percent over a three-year period.

There is obviously great uncertainty associated with these estimates of the impact of all federal expenditures upon the US economy. It would be inappropriate therefore to draw inferences from these studies about the impacts of defense purchases upon the economy.

2. Defense Expenditures

There is one study which used a large econometric model to investigate specifically the impact of defense expenditures on the US economy. Klein and Mori² used a simulation analysis to determine the effects that alternative defense budgets might have on the post-Vietnam War US economy. The results showed that reduced military outlays would reduce nominal GNP and real GNP, and increase unemployment. However, the impact on prices in the 1971-72 US economy would have been minimal.

Their study also examined the effects resulting from an increase in federal non-defense expenditures equal to the decline in defense expenditures. The results suggest that

¹*Idem.* pp. 14-15.

²Lawrence R. Klein and Ken Mori, "The Impact of Disarmament on Aggregate Economic Activity: An Econometric Analysis," in Bernard Udis, ed., "The Economic Consequences of Reduced Military Spending," *op. cit.*, pp. 59-77.

this increase in federal non-defense expenditures would offset the impacts produced by the reduced military outlays.¹ This result, if correct, implies that defense and non-defense expenditures have identical impacts upon the economy.

On the other hand, an earlier input/output study indicated that, to hold the wage bill constant, a cut in military spending had to be compensated for by a larger increase in *total non-military* spending.² This result shows that wages and salaries paid labor per dollar of final output is larger than similar payments for all other types of goods, private as well as government non-military.³

Other studies do not focus on the dichotomy between military and non-military spending. Rather, the evidence indicates that it is the *type* of expenditure which determines its impact upon the economy. Any differential impacts on the economy would depend on whether the increase in government expenditure occurred from (1) purchases (durables and non-durables); (2) employment; or (3) construction, rather than whether a particular agency increased its outlays.⁴

¹Unfortunately, a caveat must be presented. Some of the data published in one table of the paper do not correspond to data—which were supposed to be identical—presented in other tables. This is particularly true with respect to the key variables under investigation, changes in defense and non-defense purchases. Our analysis presumed that the Klein-Mori study was performed correctly, and that only the published information is in error.

²Leontief, *et al.*, *op. cit.*, p. 219. The reduction in military expenditures only includes purchases from other industrial spending. It does not include military construction.

³This could result either from greater labor intensities or from higher compensation per worker.

⁴This is also the breakdown used in Clopper Almon, Jr., "The American Economy to 1975," (New York, Harper & Row, 1966). Each of these sectors might produce different impacts on the economy. For instance, durable purchases, more so than most other demands, would affect industrial production. This would raise utilization rates and have a heavier initial price impact. On the other hand, other categories might be more labor intensive. If wage increases only occurred with a lag, the initial inflationary response would be smaller.

One study showed that government purchase of goods and services has a larger impact on real GNP than does an equal amount of expenditures for increased government employment.¹ Thus, the impact of increasing the armed forces would differ from that associated with procuring additional hardware. An earlier study has also shown that there were some differences among the multipliers associated with the different types of government purchases.² Finally, given the way in which government compensation is treated in the National Income Accounts, government purchases of goods from the private sector would not have the same impact upon the GNP deflator as would increases in employment costs.

3. Suggested Research on the Impact of DoD Spending .

Our knowledge about the relationship between the level of DoD spending and direct and indirect price effects upon the US economy is still limited. Further research is required in this area, and there are different approaches which might be utilized.

First, simulations of existing large scale econometric models might be examined to determine whether military outlays have any impact upon the economy which is substantially different from impacts caused by other federal expenditures. This research would involve a detailed study of the government spending variables which are included in the model. Some minor modifications of the existing specifications might be required prior to running the models.

A different procedure would involve the addition of a government sector sub-model to one of the existing models.

¹Albert A. Hirsch, "Policy Multipliers in the BEA Quarterly Econometric Model," *Survey of Current Business*, 57:6, (June 1977), pp. 60-71.

²Gary Fromm and Paul Taubman, "Policy Simulations with an Econometric Model," Washington, D.C., Brookings Institution, (1968), pp. 81-98.

This would provide more detailed information about the relationship between the private and public sectors and about differences in the impacts resulting from differences in the source of government spending.

It is now possible to study this problem by integrating final and intermediate demands using a stage of process model.¹

Popkin developed the integrated stage of processing model to study the transmission of inflation from sector to sector. The basic assumption of the model is that price changes occur in a sequence moving from crude materials to intermediate products to final goods. This approach involves aggregating industry data according to the stage of production. These aggregations are designed to represent an economy where very few of the shipments from one group of industries go to industries at earlier stages of the production process sequence.²

This stage of processing model can be used to analyze the impact of defense purchases upon the economy; one of the manufacturing sectors in this model consists of industries producing ordnance, ships, aircraft, etc. The effect of new orders to firms in these industries could be traced through to the final impact upon the GNP deflator. The total impacts could be decomposed and the effects attributable to each cause could be analyzed. With further disaggregation, it might be possible to obtain even more detailed information about the impact of government activity upon various sectors of the economy.

¹See Joel Popkin, "An Integrated Model of Final and Intermediate Demand by Stage of Process: A Progress Report," *American Economic Review*, 67:1, (Feb. 1977), pp. 141-147; Joel Popkin, "Consumer and Wholesale Prices in a Model of Price Behavior by Stage of Processing," *Review of Economics and Statistics*, LVI:4, (Nov. 1974), pp. 486-501.

²If a conventional input-output analysis had been used, this would have been identical to assuming that the matrix of coefficients was (approximately) triangular.

4. New Orders vs Expenditures

Although similar types of defense and non-defense government expenditures might have the same impact on the economy, the same results might not hold for increments in appropriations and/or new orders. There may be differences in the speed with which the two categories of appropriations and/or new orders are translated into expenditures.

If the order and the expenditure do not occur simultaneously, different economic impacts may be observed. The expenditure in the National Income and Product Accounts does not appear until the item is delivered,¹ but the economic activity generated by the new order occurs while the system is being produced. Consequently, the economic activity generated by new orders for long lead time systems (such as defense weapons) will occur prior to the time that expenditures for these systems are recorded in the NIPA.² If there is a difference in the way new orders for defense and non-defense goods are translated into activity,³ the economic effect of increasing

¹US Department of Commerce, *Price Changes of Defense Purchases of the United States*, *op. cit.*

²In the meantime, the economic activity will be reflected by an increase in inventories, both finished and in process, held by the private sector. This whole issue would not be a problem if new orders, activities, and expenditures are in a steady state. It would be a problem with a surge or a sudden decline in new orders.

³For analyses of the relationship between defense orders and expenditures see Harvey Galper and Edward Gramlich, "A Statistical Approach for Forecasting Defense Expenditures in the Short-run," in William F. Butler, Robert A. Kavesh, and Robert B. Platt, eds., "Methods and Techniques of Business Forecasting," (Prentice-Hall, 1973), pp. 250-55; Harvey Galper and Edward Gramlich, "A Technique for Forecasting Defense Expenditures," *Review of Economics and Statistics*, 2:2, (May 1968), pp. 143-55; Harvey Galper, "The Impacts of the Vietnam War on Defense Spending: A Simulation Approach," *Journal of Business*, 42:4, (October 1969), pp. 401-15; and Maw Lin Lee, "Impact, Pattern, and Duration of New Orders for Defense Products," *Econometrica*, 38:1, (January 1970), pp. 153-164. The economic activity generated by defense orders may occur over a longer period of time.

appropriations by one billion in either category need not be identical.

D. CONCLUSION

The available empirical evidence suggests that the impact of DoD expenditures on the economy is not very different from the effects that non-military government outlays have on the economy. In the past, the analyses have produced somewhat differing results about the potential inflationary impacts of increases in all government purchases. It is not possible therefore to provide precise quantitative estimates of the inflationary impact of DoD (or, for that matter, any government) expenditures.