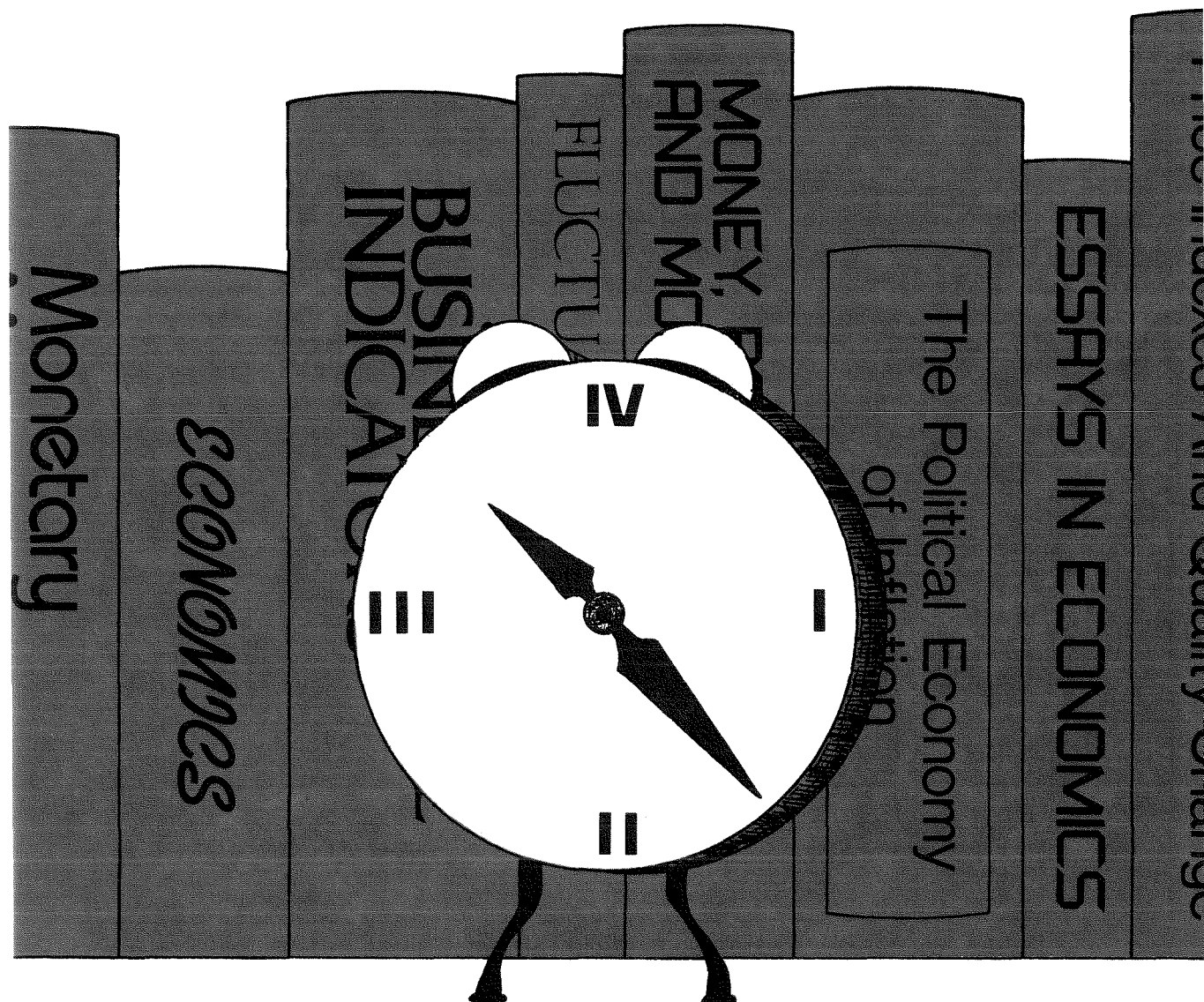


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On Federal Deficits and their Economic Impact

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There is considerable concern these days about the prospect of high and perhaps rising federal deficits and their effects on inflation, private investment and other aspects of our economic lives. In this paper, we will review some considerations regarding the economic impact of deficits and provide some empirical results derived from reduced form equations for real GNP and inflation which we have estimated.

The best known reduced form estimates of fiscal policy effects are those from the St. Louis equation. In that equation, the impact of fiscal actions upon nominal GNP, when unaccompanied by changes in the money supply, essentially disappear within four to five quarters. A recent update by the Federal Reserve Bank of St. Louis reaffirms these results and also finds that fiscal variables exert no statistically significant effect in any quarter.¹ Thus, fiscal policy has no significant short or long-run effect upon nominal GNP according to these results.

Our question is whether the seeming ineffective-

ness of fiscal policy will hold up in an analysis of the impact of fiscal policy upon the components of nominal GNP, that is, real GNP and inflation considered separately. Even should nominal GNP be unaffected by changes in deficits, there may be considerable movements in real output and inflation. Changes in these measures concern policy makers and form the focus of theoretical discussion.

The results of our analysis suggest that deficits do have significant effects upon real output and inflation. Deficits, when measured relative to their past average values, appear temporarily to stimulate real output, although they have no permanent real impact. This finding suggests that federal deficits ultimately crowd out some private spending. Increases in deficits also seem to raise inflation in the short run, and the price level in the long run, as convention theory suggests. In our analysis, we measure deficits by their high employment estimates, and consider separately the leverage of expenditures and revenues.

I. Theoretical Considerations

Economists are divided as to whether fiscal actions matter in the determination of aggregate output. Some argue along convention lines that federal deficits, which are the result of changes in spending or tax policies, or some combination of these, will lead to changes in aggregate demand at

least in the near future. Many believe, however, that deficits will have little or no impact upon aggregate output in the long-run. Still others contend that deficits which are matched with increases in the national debt do not increase the nation's net wealth and therefore will not lead to any sizable changes in aggregate output in the short or longer run.

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II. Conventional View

The model from which the conventional argument stems is the aggregate demand-aggregate supply paradigm discussed in standard economic textbooks and the foundation of several forecasting models of the U.S. economy.² Along the supply schedule, greater quantities of output are supplied only at higher prices. This is because the greater quantities of labor and other resources needed to increase output places upward pressure on unit production costs.

The aggregate supply schedule is derived from the assumption of constant money wages and other factor prices and a fixed stock of business plant and equipment. According to conventional models, money wages will increase with tighter labor market conditions and with expectations of future increases in inflation. Any increase in money wages will shift the entire supply schedule upward and to the left so that higher prices are associated with the original supplies of output. Alternatively, an increase in the capital stock will shift the supply curve in the opposite direction, indicating lower prices for the original quantities.

The aggregate demand schedule indicates that total demand for goods and services will be greater at lower price levels. This occurs because lower prices tend to ease monetary conditions and hence

to lower interest rates which in turn stimulate interest-sensitive spending. Similarly, higher prices tend to tighten monetary conditions, raise interest rates and depress aggregate demand.

The demand schedule is derived from the assumption of constant monetary and fiscal policy. A change in either will shift the entire schedule. To clarify terms, a constant monetary policy means the maintenance of a given level (or rates of change) in the supply of money as measured in this paper by M1 (currency and checkable deposits). A constant fiscal policy means no change in federal government expenditure programs or the federal tax structure.

An increase in federal spending or a reduction in taxes, or any combination of these that increases the federal deficit shifts the entire demand schedule upward and to the right. This means that greater quantities of output will be demanded at the original prices. A decrease in the deficit is associated with a downward shift in demand and consequently with smaller quantities of output demanded at the original prices. The same can be said for changes in monetary policy: an increase (decrease) in the money supply is associated with more (less) output demanded at the original prices.

III. Deficit Impact

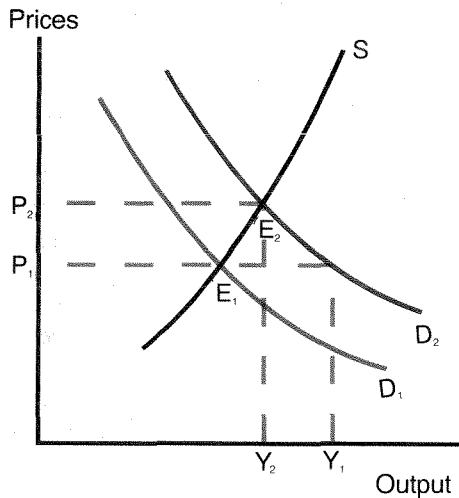
Given the aggregate demand and supply schedules, we may now analyze the effect of an increase in the federal deficit, assuming no accommodating change in the money supply, i.e., holding monetary policy constant. This assumption is equivalent to financing the increase in the deficit through the sale of bonds.

The increased deficit (due to increased expenditures, reduced taxes or some combination) shifts the entire demand schedule upward and to the right. Although demand rises, two important effects limit the stimulative power of the deficit. First, the increased demand tends to drive prices up, since greater quantities of output will be supplied only at higher prices according to the supply schedule. Consequently, part of the expansionary effect of fiscal spending will be dissipated in higher prices.

Second, the increased demand for output increases the need for greater quantities of money balances to cover the increased volume of transactions. With a constant monetary policy, this increased demand for money balances will tend to tighten monetary conditions and raise (real) interest rates. These higher interest costs, in turn, will limit interest-sensitive spending and the expansionary impact of the original deficit. Real GNP, then, will tend to increase after an increase in the federal deficit, but the stimulative effect will be partly mitigated by crowding out of some private spending through higher prices and interest rates.

This behavior is illustrated in part in Figure 1. The increase in the deficit raises aggregate demand from D1 to D2. At the original equilibrium level of prices, P1, more output (Y1) will be demanded.

Figure 1
 Transitory Effect of a Deficit Increase
 ... more output but at higher prices



But, with an upward sloping supply curve, a new short-run equilibrium occurs at E2. As a result, the increase in the deficit leads to higher prices (P_2) and more output (Y_2) than before the change in the deficit. However, output rises less than would have occurred if no change in prices had taken place (Y_1).

This new equilibrium is likely to be short-lived because the changed prices (P_2) and output (Y_2) will set off a chain of reactions in factor costs and investment that lead to further shifts in aggregate demand and supply and which will culminate in any one of three final cases.

In the first case, deficits have *positive supply-side effects* increasing the economy's productive capacity. Public expenditures, for instance, may finance projects such as road construction, rural electrification, research and development which, on balance, may be more productive than equal sums spent by the private sector. Alternatively, deficits may result from a reduction in income taxes which may increase incentives to enter the work force and, on balance, increase the supply of labor and again, the nation's productive resources. In these situations, the supply curve is shifted downward and to the right. Ultimately, more output will be produced, and the change in the price level will be determined by the size of the relative shifts in long-run supply

and demand. An equal increase in both would leave the price level the same as the original equilibrium level while greater (smaller) increases in supply relative to demand would lead to lower (higher) prices than initially.

However, positive supply-side effects are not a certain outcome. For instance, according to the theory of labor supply, while a lower tax rate may encourage some people to enter the work force (an income effect), others may be encouraged by the higher take-home pay to spend less time at work and more at leisure (substitution effect). As a second case, we consider that the fiscal programs underlying the deficit may have no net effect on aggregate supply in the long-run.

In this second case, *complete crowding out* of some private spending by federal deficits occurs. The increased level of output, (Y_2) in the previous chart, leads to increased demands for labor, tighter labor market conditions, higher money wages and higher prices. Furthermore, the higher prices tend to increase expectations of future prices. These increased wage and price expectations produce an upward shift in the supply schedule and a further increase in final product prices. Higher prices, in turn, reduce real money balances, tightening money market conditions, and leading to further increases in interest rates. As a result, real GNP is reduced further as additional private sector spending is crowded out of markets by the combined effects of continuing price and interest rate increases.

Economic adjustments in prices, interest rates, wages and price expectations will continue until the initial increase in the deficit displaces an equal amount of some private sector spending. Ultimately, real output equals the level that would have existed without the change in fiscal policy because, as long as output is greater than it otherwise would have been, employment will be higher and so will money wages and prices. These higher prices, given an unchanged monetary policy, will lead to higher real interest rates which reduce interest-sensitive spending. Only when aggregate output equals the level it would have been had the deficit not occurred will we observe no further adjustments in employment, wages and prices.

Although complete crowding out occurs in real GNP, it will not occur in nominal GNP. Some permanent effect will be left on the level of nominal

GNP because the crowding out process is achieved largely through a rise in prices and interest rates which increases velocity and money income.³

In the final case, deficits may ultimately lead to a decline in aggregate supply and an increase in prices—the case of *super-crowding out*. This occurs when the reduction in private sector spending which the deficit crowds out of markets is replaced with government spending that is less productive. The increased interest costs associated with the initial stimulative impact of deficits may reduce private spending on productive capital and lead to a decline in the nation's productive resources. In this case,

IV. Some Further Considerations

In formulations of the conventional model, individuals are assumed to change their expectations of future prices on the basis of past price behavior. People, however, may be wiser and use all relevant information to form their expectations, not just the past behavior of inflation. Their rational expectations open further possibilities with regard to fiscal policy effectiveness in the short run.

For example, anticipated deficits may quickly crowd out private spending, and have little if any impact upon real GNP in the short run. This occurs because individuals, applying their knowledge of the conventional model, anticipate the initial stimulative effects of an increased deficit. These anticipations are quickly incorporated in market prices and interest rates. The existence of rational expectations suggests that we consider the different leverages of anticipated and unanticipated fiscal deficits.⁴

Another case in which federal deficits may have little real stimulative impact in the short run is one in which the public does not regard the increase in the

deficits will raise the price level, but have an ambiguous impact on nominal GNP.

From these alternatives—positive supply side effects, crowding out and super-crowding out, we observe that the ultimate effect of a deficit will depend materially upon the particular types of spending and/or tax policies associated with the deficit. Deficits due to corporate tax reductions, for instance, are likely to have a more stimulative impact on aggregate supply than an equal-size deficit that results from aid to state and local governments who then incur surpluses in their own budgets. In partial recognition of this, we separate the effects of spending and tax policies in our estimations.

national debt associated with the deficit as an increase in its net wealth. According to this view people will anticipate the compensating future taxes implied by their holdings of government debt. The important implication of this view is that federal deficits which are bond-financed will have the same impact upon aggregate demand as a balanced budget.

Consider a tax cut and the corresponding deficit which is financed by selling bonds to the public. Each dollar of tax reduction is matched with an extra dollar of federal debt that will be repaid and serviced with future taxes with the same present value. Since there is no change in the present value of net tax liabilities, there will be no change in household permanent income, net wealth or spending. The same type of reasoning applies to federal deficits which are the result of increased government spending which is bond-financed.

To the extent that bonds are not net wealth, fiscal policy will have little if any significant impact upon either real or nominal GNP in the short run.⁵

V. Summary

According to conventional reasoning, federal deficits are likely to have short-run stimulative effects on aggregate demand, although the size of these effects is an empirical issue. Ultimately, in the long run, deficits may (a) crowd out an equal amount of private sector spending, (b) crowd out a greater amount of private spending because deficits lower the nation's capital stock, or (c) increase the

nation's productive capacity as in the case of federal investment in the economy's infrastructure.

Fiscal actions may have little, if any, leverage in the near or more distant future when individuals equate federal deficits with future tax liabilities, or anticipate future price and interest rate changes caused by deficits and change market prices quickly to conform to their expectations.

VI. Estimation Model and Data

What has been the impact of federal spending and tax policies upon real GNP and inflation? To answer this question, we turn to reduced form equations in which changes in real GNP and inflation are determined mainly by changes in money growth and changes in real federal high employment expenditures and tax revenues.

These reduced form equations may be derived from a model which was detailed in a previous paper.⁶ Underlying this model is an aggregate demand-supply framework similar to that discussed earlier, with the additional assumption that anticipations of future monetary and fiscal policies are determined by the past history of these policies. The real economy is assumed to be stable in the sense of growing at a steady pace; it will depart from this pace temporarily when either monetary and/or fiscal policies deviate from their anticipated patterns. The economy is also assumed to have the classic long-run neutrality property associated with money growth. This means that a permanent change in the rate of growth of money ultimately results in an equal change in the rate of inflation, but in no change in the rate of growth or level of real GNP. Also, in the long-run, the level of prices will change with the stock of money so that the public's holdings of real money balances are at desired levels, given interest rates and the level of income.

The reduced-form equations (1B) and (2) below follow directly from this model. Equation (1A) is a more general depiction of how fiscal policy might affect real growth for it makes no distinction between anticipated and unanticipated fiscal values.

$$dRGNP = F(c, dMBAR, dHE, dHR) \quad (1A)$$

$$dRGNP = F(c, dMBAR, dHEBAR, dHRBAR)(1B)$$

$$dP = F(c, dM, dHE, dHR) \quad (2)$$

Equation (1A) states that the rate of change in real GNP ($dRGNP$) deviates from a constant rate, c , when money growth differs from its anticipated rate, ($dMBAR$). In addition, the rate of growth in real GNP will change with changes in real high employment federal expenditures (dHE) and changes in real high employment federal receipts

(dHR). In equation (1B) changes in the rate of growth of real GNP occur when monetary or fiscal policies deviate from their anticipated courses. The $dHEBAR$ and $dHRBAR$ represent changes in real high employment expenditures and receipts relative to their respective anticipated rates of change.

Equation (2) states that changes in money growth determine changes in inflation, reflecting earlier considerations that both anticipated and unanticipated monetary changes will have an impact upon inflation. This equation also allows changes in the growth of real high employment expenditures (dHE) and receipts (dHR) to determine changes in the inflation rate. It incorporates the assumption that both anticipated and unanticipated fiscal policies may affect the rate of inflation.

The monetary variable is $M1$, currency in the hands of the public plus checkable deposits. To approximate unanticipated monetary changes, we estimated $dMBAR$ as the current rate of change in $M1$ less its average rate over the past two years, measured in logs.

The high employment budget estimates are provided by the U.S. Commerce Department.⁷ The measures we use here are adjusted to exclude the automatic effects of inflation on revenues and expenditures. There are several reasons why revenues and expenditures respond automatically to price changes. For example, federal interest payments depend on interest rates which tend to change with

Table 1
Regression Results for Real GNP
1966.2-1979.4

$$dRGNP = .0083 + 45.2 d3MBAR + .47 dHE - .60 dHR$$

(3.5) (3.2) (1.0) (-1.1)

R^2 corrected = .35

Durbin Watson = 2.1

Standard Error = .0079

Almon type polynomial distributed lags were estimated for money which was 4th degree with no end point constraints, and 3rd degree for both fiscal variables with far end constrained to zero. The reported coefficient are the sums of the estimated coefficients of the lagged variables. T-statistics are reported in parentheses.

The third difference of the MBAR variable was used in order to place the long-run neutrality constraints, which were accepted by the data, according to a method suggested by John Scadding⁸.

changes in the rate of inflation. If not corrected for such inflation-induced components, the high employment measures would provide biased estimates of the economic effects of fiscal policy. To approxi-

mate changes in unanticipated real high employment expenditures (dHEBAR) and receipts (dHRBAR), we measured the current rate of change in each variable less its average rate of change over the past two years, measured in logs.

VII. Empirical Results

The estimation of equation 1A, in which changes in real GNP are determined by changes in money from its past average (dMBAR) and by changes in real high employment expenditures (dHE) and tax revenues (dHR), indicated that neither of the fiscal variables contributed significantly to the determination of real GNP. The results are summarized in Table I.

This should be interpreted with some caution, however, since there is reason to believe that the

monetary and fiscal policy measures were closely related during the sample period. For instance, we estimated changes in real GNP with the monetary measures alone. These were statistically significant, and adding fiscal policy measures did not matter in the determination of real GNP. Conversely, when estimating changes in real GNP with the fiscal measures alone, they were also significant and adding monetary measures did not matter. Each policy variable did about as well as the other in

Table 2
Regression Results for Real GNP with Monetary and Fiscal Variables
as deviations from their respective two-year averages
1966.2-1979.4

$$dGNP = .0083 + \sum m_i d3MBAR_{t-i} + \sum e_i dHEBAR_{t-i} + \sum r_i dHRBAR_{t-i} \quad (7.8)$$

Lag	m_i	t	e_i	t	r_i	t
0	.18	1.1	.014	1.7	-.027	2.1
1	.45	1.4	.027	1.7	-.051	2.1
2	.79	1.7	.038	1.7	-.071	2.1
3	1.15	1.8	.048	1.7	-.088	2.1
4	1.51	1.9	.057	1.7	-.101	2.1
5	1.84	1.9	.064	1.7	-.111	2.1
6	2.14	2.0	.071	1.7	-.118	2.1
7	2.36	2.0	.076	1.7	-.120	2.1
8	2.52	2.0	.079	1.7	-.120	2.1
9	2.60	2.0	.082	1.7	-.116	2.1
10	2.59	2.0	.083	1.7	-.108	2.1
11	2.50	2.0	.082	1.6	-.097	2.1
12	2.34	1.9	.081	1.6	-.082	2.0
13	2.10	1.9	.078	1.5	-.064	1.9
14	1.81	1.9	.074	1.4	-.043	1.5
15	1.49	1.8	.069	1.3	-.017	.7
16	1.15	1.6	.062	1.2	.011	.4
17	.82	1.5				
18	.53	1.3				
19	.32	1.1				
20	.22	1.2				
		2.0				
Sums:	31.4	2.0	1.08	1.7	-1.3	2.1

R² corrected = .39 Standard Error = .00749 DW = 2.2

Polynomial Distribution Lags are all near-end constrained to zero — a 4th degree on MBAR and 2nd degree for the fiscal variables. The estimation with the third differences on MBAR were used in order to place the long-run neutrality conditions, which were accepted by the data, according to a method suggested by John Scadding⁸.

forecasting changes with real GNP both in and outside the sample. These results, along with the estimation in Table 1, suggest that one type of policy served as a fairly good proxy for the other.

The close relationship among the variables implied by these results presents an estimation problem in that their covariance prevents us from obtaining a very precise estimate of any independent effects. In the case of monetary measures, this was not as important and the results were still statistically significant. But the case of fiscal policy is, at best, inconclusive.

We may approach this estimation problem by respecifying the fiscal policy measures. Fiscal variables may have significant real output effects when fiscal policy deviates from anticipated patterns, as suggested earlier. This appears to be the case in the results shown in Table 2. Both fiscal measures are statistically significant (revenues at the 5 percent level and expenditures at the 10 percent level) and, together with money, account for 39 percent of the variation in real GNP growth rates. According to these results, fiscal policy has an independent and temporary influence upon real GNP.

Table 3
Regression Results for Inflation Rate
1966.2-1979.4

$$d \ln P_t = .0032 + .0047D + .160 d_2 M_t + S m_t d_3 M_{t-1}$$

$$+ S e_t d H E_{t-1} + S r_t d H R_{t-1} - .003 W P O N + .008 W P O F F$$

Lag	m_t	$ t $	e_t	$ t $	r_t	$ t $
0	-1.03	10.8	-.069	3.4	-.034	2.3
1	-1.89	11.8	-.050	2.9	-.045	3.1
2	-2.58	12.4	-.032	2.1	-.055	3.6
3	-3.12	12.6	-.016	1.1	-.063	3.9
4	-3.50	12.3	-.001	.1	-.070	4.0
5	-3.75	11.7	.011	.8	-.076	4.0
6	-3.87	10.9	.022	1.5	-.080	4.1
7	-3.87	10.1	.032	2.0	-.083	4.0
8	-3.76	9.3	.039	2.4	-.085	4.0
9	-3.57	8.5	.045	2.7	-.085	4.0
10	-3.29	7.9	.050	2.9	-.084	4.0
11	-2.95	7.3	.052	3.0	-.082	3.9
12	-2.57	6.7	.053	3.2	-.078	3.9
13	-2.16	6.1	.053	3.3	-.073	3.9
14	-1.73	5.5	.050	3.3	-.066	3.9
15	-1.31	4.8	.046	3.4	-.059	3.9
16	-.92	4.0	.040	3.5	-.050	3.8
17	-.57	3.2	.033	3.5	-.039	3.8
18	-.29	2.4	.023	3.5	-.027	3.8
19	-.10	1.4	.013	3.6	-.014	3.8
Sums:	-46.86	9.3	.394	1.7	-1.25	4.0

R^2 corrected = .78 Standard Error = .0026 Durbin Watson = 2.24

Almon polynomial lags were estimated for each lagged variable. For money, the lag is 4th degree, near end constraints to zero. For each fiscal variable, the degree is 2 with far end constraint to zero.

WPON and WPOFF signify wage and price controls on and off, respectively.

WPON = 1, 1971.3 — 1974.1 and 0 elsewhere

WPOFF = 1, 1974.2 — 1975.1 and 0 elsewhere

D is a dummy which is equal to 1 in 1974.2 — 1979.4 and 0 elsewhere, indicating a shift in the intercept term at that time.

The estimation with the second and third differences of money were used in order to place the long-run neutrality constraints, which were accepted by the data, according to a method suggested by John Scadding⁸.

To illustrate this, Chart 1A shows the response of the real GNP growth rate to a 1 percentage point reduction in tax revenues in the initial quarter only. This is equivalent to a permanent cut beginning in 1980 in constant dollar tax revenues of approximately \$3.2 billion. This tax cut steadily increases the rate of growth of real GNP from the initial quarter to a maximum response of .3 percentage points (annual rates) by the end of the first year. Thereafter, the effect steadily dies out, following a

cyclical pattern, and ceases to have any impact within 5 to 6 years.

The tax multipliers derived from these estimates are illustrated in Chart 2A. The level of real GNP steadily increases for about two and a half years. By that time, each billion dollars of the tax cut has increased the level of real GNP by \$2.4 billion. Thereafter the impact upon the level of GNP dies out. Within 5 to 6 years, the additional deficit resulting from the tax cut has completely crowded out some types of private expenditures not favored by the tax reduction.

Chart 1

Response of Annual Rates of Growth in Real GNP and Prices to a One Percentage Point Reduction in Real Tax Revenues in the Initial Period Only

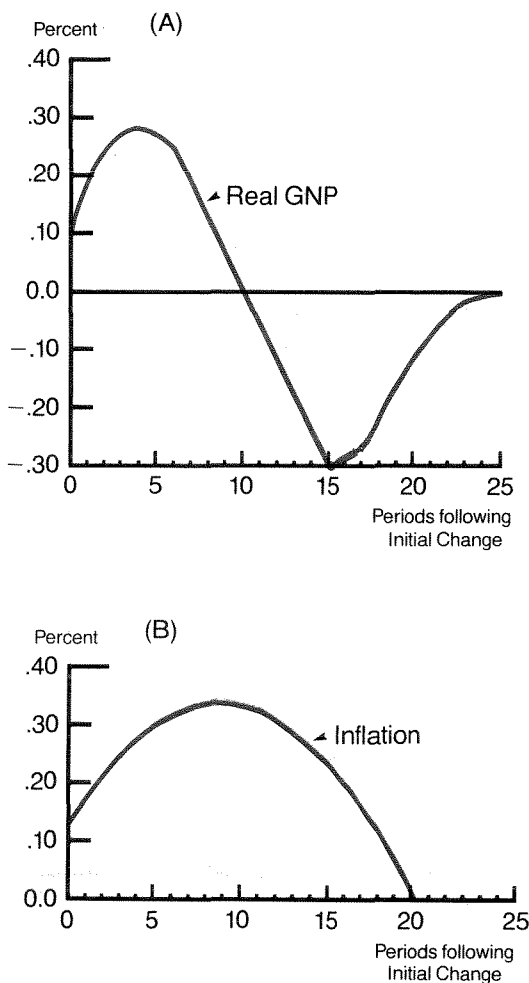
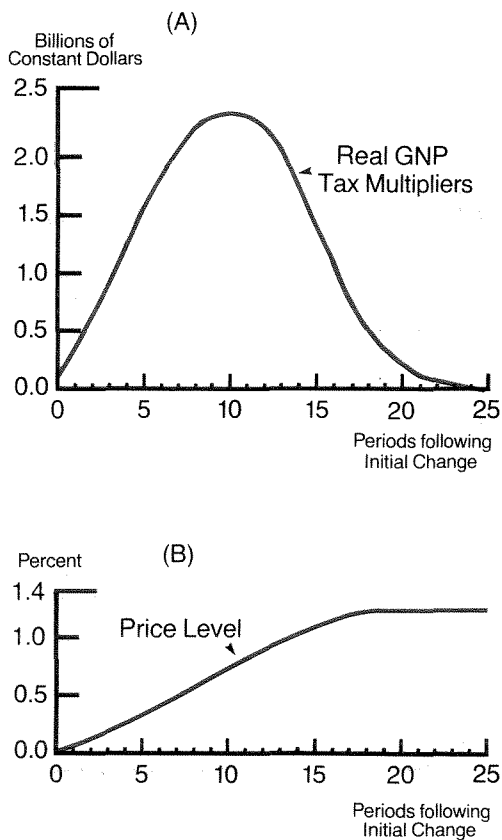


Chart 2

Response of the Level of Real GNP and Prices to a One Percentage Point Reduction in Real Tax Revenues in the Initial Period Only



Charts 3A and 4A illustrate the effects on real GNP of a sustained \$3.2 billion increase in federal high employment real expenditures. (Again, this is the equivalent of a 1 percentage point increase in these expenditures in the initial quarter only.) The real output response is somewhat less in this case than in the case of tax cuts. The real expenditure multiplier reaches a maximum value of \$1.7 billion about 3 years after the initial change, relative to a maximum of \$2.4 billion in the former case. The increase in federal expenditures eventually crowds

out an equivalent amount of some private spending within 5 to 6 years.

Table 3 provides the inflation equation estimates. Both fiscal measures are statistically significant in these estimates. Chart 1B illustrates the impact upon the rate of inflation of a sustained decrease in real tax revenues of \$3.2 billion. The inflation rate steadily increases and reaches its maximum of .34 percentage points (annual rate) about 2 years after the initial tax cut. Thereafter, the inflationary response dies out, with no further impact after

Chart 3

Response of Annual Rates of Growth in Real GNP and Prices to a One Percentage Point Increase in Real Expenditures in the Initial Period Only

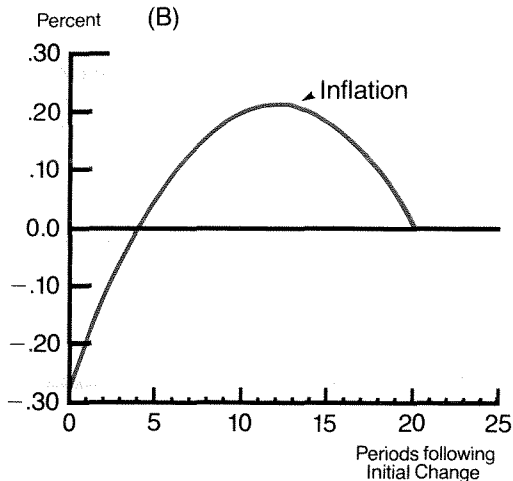
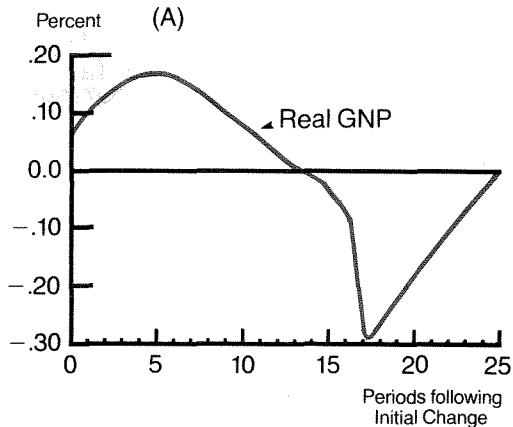
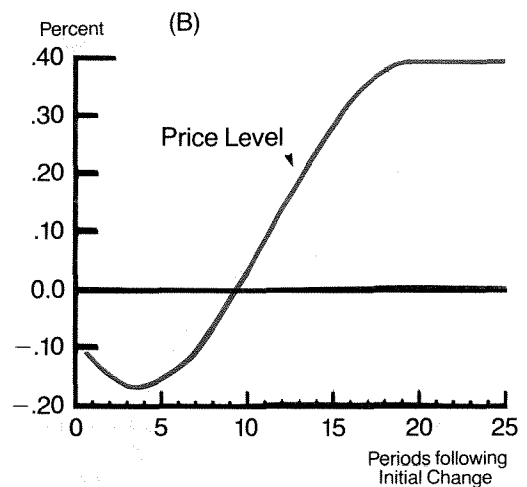
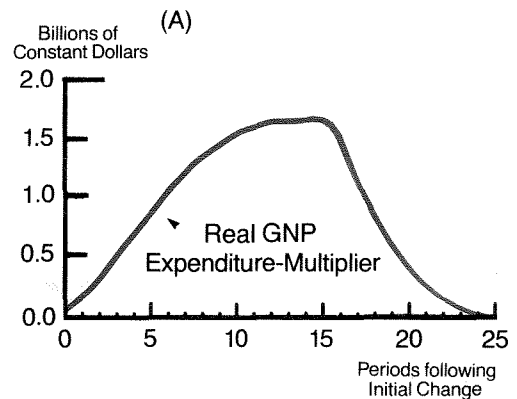


Chart 4

Response of the Level in Real GNP and Prices to a One Percentage Point Increase in Real Federal Expenditures in the Initial Period Only

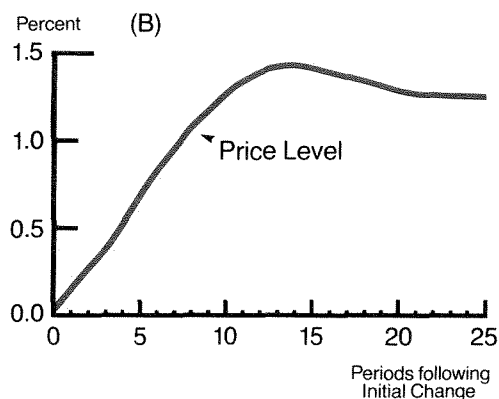
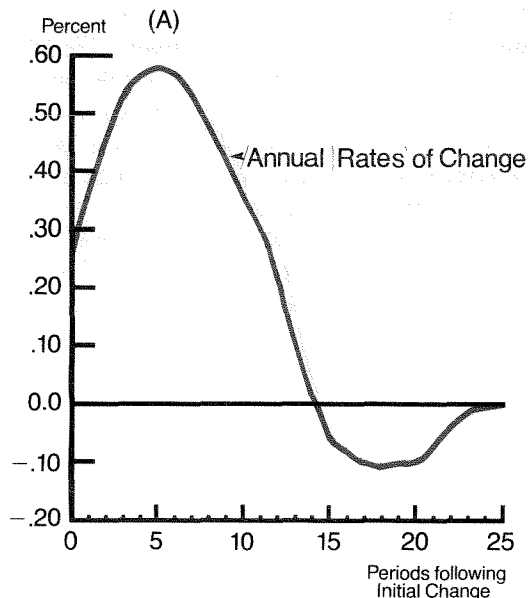


approximately 5 years. However, the sustained tax cut does have a permanent effect upon the price level, as shown in Chart 2B. The tax cut increases the price level by 1.2 percentage points from its initial level.

Together, Charts 2A and 2B illustrate the crowding out features of the initial federal deficit. The tax cut first increases aggregate output and prices. These price increases, in turn, act as a major vehicle by which other types of spending not favored by the tax cut are crowded out of markets. Eventually, the initial deficit crowds out an equal amount of some private sector spending and has no long-run effect on the level of real GNP. It does, however, have a permanent effect on the price level, and consequently, on nominal GNP. The results for nominal GNP are shown in Chart 5.

The inflationary impact of a \$3.2 billion increase in real expenditures is shown in Chart 3B. At first, the inflationary response is negative, but it steadily increases to a maximum of .2 percentage points within approximately 3 years of the initial spending increase. Eventually, the inflation rate response dies out, leaving the price level .4 percentage points higher, as shown in Chart 4B. Together, Charts 4A and 4B illustrate that the increased deficit crowds out some private spending, but will permanently raise the price level.

Chart 5
Response of Nominal GNP
to a One Percentage Point Reduction in
Real Tax Revenues in the Initial Period Only



VIII. Summary and Conclusions

Economists are divided regarding whether changes in the federal deficit will produce any significant effects upon the total level of real GNP and prices. According to conventional reasoning, the impact of deficits in the long-run depends upon the particular expenditure and tax programs which make up the deficit. Certain government tax and expenditure policies may induce positive supply side effects through incentives which increase the supply of labor, for example. Other policies may transfer the nation's resources away from productive private spending towards less efficient government expenditures and reduce the nation's productive capacity. This would be a case of super-crowding out. Another case is that of complete crowding out, when deficits replace private sector spending.

In any case, an increase in federal deficits initially is likely to stimulate aggregate demand. Thereafter, if some degree of crowding out takes place, it occurs as the additional demand related to the deficit places upward pressures on market prices and interest rates which, then, reduce some private sector interest-sensitive spending.

We must make a further distinction, between anticipated and unanticipated deficits. An anticipated deficit may quickly crowd out private spending as the public incorporates the stimulatory effects into higher market prices and interest rates. Anticipated deficit changes, then, may have little effect on real output even though they raise prices. Unanticipated deficits, on the other hand, may have dynamic effects on real output and inflation as explained in the conventional model.

We have found that deficits have significant real output effects when we measure changes in its components, high employment expenditures and receipts, relative to their past average rates of change. These measures may serve as crude estimates of unanticipated changes in the deficit. The real GNP response, then, to changes in federal deficits appears to be transitory, and in the long-run, changes in the deficit appear to crowd out about an equal amount of some private sector spending.

Changes in deficits also appear to change the rate of inflation in the short run and the price level in the longer run, according to our estimates. These results are consistent with the conventional view that federal crowding out of private sector spending is achieved in part through higher prices.

A few final statements are probably in order. It should be clear that the deficits we are addressing in both theoretical discussions and empirical work are those best measured at high employment because these are adjusted for automatic changes in the deficit due to changes in business conditions. Consequently, the high employment measures, more accurately than their corresponding actual deficit measures, depict fiscal policy initiatives which can alter market conditions.

Lastly, we regard our results as tentative, at best a depiction of experience during the sample period from 1966.2-1979.4. The exact timing and size of fiscal economic effects remains uncertain subject to a fairly wide range of estimation error, probably in part because historical movements in fiscal measures have been closely related to monetary growth. This correlation may reflect responses of the respective policy makers to unfolding economics developments of the past.

FOOTNOTES

1. See Hafer, R.W., "The Role of Fiscal Policy in the St. Louis Equation," FRB of St. Louis Review, vol. 64, no. 1, Jan. 1982.

2. As examples of the standard model, see Rudiger Dornbusch and Stanley Fischer, **Macro-Economics**, McGraw Hill Book Company, 1978.

3. For further discussion of how fiscal actions completely crowd out real spending but have a permanent effect on the level of nominal spending see Franco Modigliani and Albert Ando, *Impact of Fiscal Actions on Aggregate Income and the Monetarist Controversy: Theory and Evidence*, Monetarism, editor Jerome Stein.

For empirical results from a large econometric model see, Probyn, Christopher, Properties of the 1981C Edition of the DRI Macro Model, Data Resources U.S. Review, September 1981, especially pages 1.34-1.39.

4. Hall presents a model assuming rational expectations and price stickiness. Hall, Robert E., The Macroeconomic Impact of Changes in Income Taxes in the Short and Medium Runs, *Journal of Political Economy*, vol. 86, no. 2, April 1978.

5. For a discussion of the theoretical and empirical results, see Barro, Robert J., "Are Government Bonds Net Wealth?" *Journal of Political Economy*, Dec. 1974; Arak, Marcelle, Are Tax Cuts Stimulatory?, *The Review of Economics and Statistics*, Feb. 1982, and Feldstein, Martin, Government Deficits and Aggregate Demand, *Journal of Monetary Economics* (9), 1982.

6. McElhattan, Rose, The Response of Real Output and Inflation to Monetary Policy, FRB San Francisco Economic Review, Summer 1981.

7. Frank de Leeuw and Thomas M. Holloway, "The High-Employment Budget: Revised Estimate and Automatic Inflation of Effects, Survey of Current Business, United States Department of Commerce, Bureau of Economic Analysis, April 1982, volume 62, No. 4.

8. For details of this method see Appendix A in McElhattan, Rose, op.cit.