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WHAT ENDED THE GREAT DEPRESSION?

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ABSTRACT

This paper examines the role of aggregate demand stimulus in ending the Great Depression. A simple calculation indicates that nearly all of the observed recovery of the U.S. economy prior to 1942 was due to monetary expansion. Huge gold inflows in the mid- and late-1930s swelled the U.S. money stock and appear to have stimulated the economy by lowering real interest rates and encouraging investment spending and purchases of durable goods. The finding that monetary developments were crucial to the recovery implies that self-correction played little role in the growth of real output between 1933 and 1942.

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I. INTRODUCTION

Between 1933 and 1937 real GNP in the United States grew at an average rate of over 8 percent per year; between 1938 and 1941 it grew at an average rate of over 10 percent per year. By any prewar or postwar metric these rates of growth are spectacular, even for an economy pulling out of a severe depression. Yet the recovery from the collapse of 1929–1933 has received little of the recent attention that economists have lavished on the Great Depression. Perhaps because the cataclysm of the early 1930s was so severe, modern economists have focused on the causes of the downturn and of the turning point in 1933. Once the end of the precipitous decline in output has been explained, there has been a tendency to let the story drop. The eventual return to full employment is merely characterized as slow and incomplete until the outbreak of World War II.

This paper examines the source of the recovery from the Great Depression in detail. It argues that the rapid rates of growth of real output in the mid- and late-1930s were largely due to conventional aggregate demand stimulus, primarily in the form of monetary expansion. My calculations suggest that in the absence of aggregate demand stimuli the economy would have remained depressed far longer and far more deeply than it actually did. This in turn suggests that any self-corrective response of the U.S. economy to low output was weak or non-existent in the 1930s.

A. Previous Studies

The possibility that aggregate demand stimulus in the form of changes in government spending was the source of recovery from the depression was

analyzed extensively in the 1940s and 1950s. Smithies asserts that "fiscal policy did prove to be an effective and indeed the only effective means to recovery," though his conclusion seems to be more the result of faith than of evidence [1946, p. 12]. Hansen, on the other hand, argues that fiscal policy was not used extensively in the 1930s [1941, p. 84]. Brown uses a conventional Keynesian multiplier model and the concept of discretionary government spending to support Hansen's view. His often-cited conclusion is that "fiscal policy, then, seems to have been an unsuccessful recovery device in the 'thirties — not because it did not work, but because it was not tried" [1956, pp. 863-866].

Friedman and Schwartz [1963] stress that Federal Reserve policy was not the source of the recovery from the Depression either. They state: "In the period under consideration [1933-1941], the Federal Reserve System made essentially no attempt to alter the quantity of high-powered money by using either of the two instruments which had been its major reliance up to 1933" [1963, p. 511]. While they are clearly aware that other developments, in particular New Deal gold policy, led to a rise in the money supply during the mid-1930s, Friedman and Schwartz appear to be so intent on castigating the Federal Reserve for its inaction that this monetary expansion receives relatively little attention.

The emphasis that these early scholars place on policy inaction and ineffectiveness may have led modern economists to assume that conventional aggregate demand stimulus could not have mattered in the recovery from the Great Depression. Bernanke and Parkinson [1989] analyze the apparent trend reversion of employment in the 1930s and are struck by the strength of the recovery. They believe, however, that "the New Deal is better characterized as having 'cleared the way' for a natural recovery ... rather than as being

the engine of recovery itself" [1989, p. 212]. As a result, they argue that the trend reversion of the interwar economy is evidence of a strong self-corrective force. De Long and Summers [1988] sound a similar theme. They state that "the substantial degree of mean reversion by 1941 is evidence that shocks to output are transitory." The only aggregate demand policy that they think might have contributed to the recovery was World War II, and they conclude that "it is hard to attribute any of the pre-1942 catch-up of the economy to the war" [1988, p. 467].

B. Overview

Despite this conventional wisdom, there is reason to suspect that aggregate demand developments, particularly monetary changes, were important in fostering the recovery from the Great Depression. This reason is the simple but often neglected fact that M1 grew at an average rate of nearly 10 percent per year between 1933 and 1937, and at an even higher rate in the early 1940s. Such large and persistent rates of money growth were unprecedented in U.S. economic history and thus would seem to provide a possible explanation for the unprecedented growth of real output in the mid- and late-1930s.

To quantify the importance of these monetary changes and other aggregate demand stimuli in ending the Depression, I perform a simple "back-of-the-envelope" calculation. The recessions of 1921 and 1938 are both episodes in which independent monetary and fiscal policy changes are typically thought to have accounted for nearly all of the movements in real output. Thus, one can use the experience of the economy following these policy changes to derive an estimate of the effect of changes in the government deficit and changes in the money supply in the interwar era. These simple policy multipliers can then be

used to estimate the effects of expansionary monetary and fiscal developments in the period 1933-1937 and 1939-1942.

Such simulations suggest that monetary changes were crucially important to the recovery, while fiscal policy had very little effect. According to the calculations, real GNP would have been approximately 25 percent lower in 1937 and nearly 50 percent lower in 1942 than it actually was had the money supply continued to grow at its historical average rate. I also find that calculations based on policy multipliers from a large macromodel yield similar conclusions.

To see if this huge estimated effect of monetary developments during the recovery phase of the Great Depression is sensible, I then look more closely at the source of the monetary expansion in the mid- and late-1930s and at the possible transmission mechanism for monetary developments. I find that the monetary expansion was primarily due to gold inflows, which were themselves due to devaluation in 1933 and to capital flight from the political instability in Europe after 1935. Estimates of the ex ante real rate suggest that, coincident with these gold inflows, real interest rates fell precipitously in 1933 and remained low or negative throughout most of the second half of the 1930s. These low real interest rates are closely correlated with a strong rebound in interest-sensitive spending. Thus, it seems quite plausible that the expansionary monetary developments were working through a conventional interest-rate transmission mechanism.

The remainder of the paper is organized as follows. Section II presents key facts about the strength and timing of the recovery phase of the Great Depression. Section III discusses the calculation of the effects of aggregate demand stimulus during this period. It discusses why the 1921 and 1938 experiences provide a reasonable way of estimating the effects of policy and

then shows what the resulting policy multipliers imply about the importance of policy in the mid- and late-1930s. Section IV discusses the source of the monetary expansion during the recovery and examines the likely transmission mechanism for monetary developments. Finally, the conclusion summarizes the results and suggests the importance of the findings for other analyses of the Great Depression.

II. THE STRENGTH OF THE RECOVERY

This paper's emphasis on the source of the high rates of real growth during the recovery from the Great Depression may seem strange to those accustomed to thinking of the recovery as slow. The conventional wisdom is that the U.S. economy remained depressed for all of the 1930s and only returned to full employment following the outbreak of World War II. The resolution of these two seemingly disparate views is that the falls in real output in the early 1930s, and again in 1938, were so large that it took many years of unprecedented growth to undo these declines and return real output to normal.

For most of the analysis in this paper I examine annual estimates of real GNP from the Bureau of Economic Analysis [1986]. Because this series only begins in 1929, I extend it, when necessary, with my revised version of the Kendrick-Kuznets GNP series (see Romer, [1988]). The percentage changes in real GNP shown in Figure 1 clearly demonstrate both the enormity of the collapse of real output between 1929 and 1933 and the strength of the subsequent recovery. Between 1929 and 1933, real GNP declined 35 percent. Between 1933 and 1937, it rose 33 percent. In 1938 the economy suffered another 5 percent fall in real GNP, but this was followed by an even more

spectacular rise in real GNP of 49 percent between 1938 and 1942. Clearly, by almost any standard, the growth of real GNP in the four-year periods before and after 1938 was spectacular.

On the other hand, it is also the case that despite this rapid growth, output remained substantially below normal until about 1942. A simple way to estimate trend output for the 1930s is to extrapolate the average annual growth rate of real GNP over the period 1923–1927 forward from 1927. The period 1923–1927 is chosen for estimating normal growth because these are the four most normal years of the 1920s: this period excludes the recession and recovery of the early 1920s and the boom of the late 1920s. It is also a period of price stability, suggesting that output was neither abnormally high nor abnormally low. The resulting figure for normal annual real GNP growth is 3.15 percent. Figure 2 shows the log level of actual real GNP and trend GNP based on this definition of normal growth. The graph shows that GNP was about 38 percent below its trend level in 1935. In 1937, the economy was 26 percent below trend. Only in 1942 did the economy return to its trend path.

The behavior of the unemployment series is perfectly consistent with the behavior of the real GNP series. While many scholars have emphasized that unemployment was still nearly 10 percent as late as 1940, it is also the case that unemployment had dropped substantially from its high of 23 percent in 1932.[1] Indeed, the unemployment rate fell by more than four percentage points in both 1934 and 1936. The fact that unemployment did not return to its full employment level until 1942 simply reflects the fact that real output remained below trend until that time.

III. THE EFFECTS OF AGGREGATE DEMAND STIMULUS IN THE RECOVERY

To examine whether aggregate demand stimulus could explain the high rates of real growth during the recovery phase of the Great Depression, I perform an illustrative calculation. I first derive estimates of the policy multipliers, which show the effects of policy stances of a given size on real output. I then derive measures of the stances of monetary and fiscal policy in the recovery. These two sets of estimates are then combined to measure the effects of aggregate demand policy in the mid- and late-1930s.

A. Application of the Narrative Approach to the Interwar Era

Framework. Of these steps, by far the most difficult one is estimating the multipliers for monetary and fiscal policy. The approach that I use focusses on two policy experiments that bracket the recovery period. In 1920 and 1937 there were major contractionary shifts in both monetary and fiscal policy. Relatively severe recessions followed each of these shifts. Furthermore, there do not appear to have been any other significant changes in the economic environment in these years that could account for the recessions.

As a result, one can decompose the percentage change in real output (relative to normal growth) in each of these two episodes into the part due to lagged monetary changes and the part due to lagged fiscal changes. That is,

$$(1) \quad \text{Output change}_t = \beta_m(\text{Monetary Change})_{t-1} + \beta_f(\text{Fiscal Change})_{t-1},$$

where β_m and β_f are the multipliers for monetary and fiscal policy, and t is either 1921 or 1938. Substituting in actual measures of the change in real output and the changes in the monetary and fiscal stances for both 1921 and 1938 (the calculation of which is described in detail below) yields two

equations in two unknowns. One can then solve this system for the monetary and fiscal policy multipliers.

To believe that 1921 and 1938 are times that provide good evidence on the effects of policy, it is important to show that the policy changes were not responses to movements in real output occurring for other reasons. If the monetary and fiscal changes occurred in response to declines in real output, the procedures would yield excessively large estimates of the effects of policy.[2] It must also be the case that there are no additional factors that account for the severe recessions that followed the shifts in policy. Again, if other factors were important, my procedure would overestimate the impact of the policy changes.

This method of deriving rough estimates of the effects of policy is an example of what David Romer and I have referred to in previous work as the narrative approach [1989 and 1990]. The basic idea is that to estimate the impact of policy, particularly of monetary policy, one often does not want to use a regression of output on the monetary policy variable or even the estimation of a big macroeconomic model of the U.S. economy. The reason for this is that any regression procedure is likely to pick up both the effect of money on output and the endogenous response of money to movements in real output. We argue that by using the historical record, such as information about the motivation of policy makers or important developments in the world economy, one can identify times when policy moved for reasons unrelated to the state of real output and times when other factors were not acting to move real output. Such times, we suggested, provide the clearest evidence of the effects of policy.

Independence of Policy Changes. Turning to the two policy experiments of the interwar era, it is clear that the fiscal policy change in 1920 was not

caused by developments in the real economy: it was the end of World War I that led to an enormous drop in real government spending. The magnitude of this change can be seen in the fact that the surplus to GNP ratio rose from -8.3 percent in 1919 to 0.5 percent in 1920.

The monetary policy change in this episode was also quite pronounced and largely independent. According to Friedman and Schwartz, the Federal Reserve in 1919 became concerned about the lingering inflation from World War I and the postwar boom [1963, pp. 221-239]. In response, the Federal Reserve raised the discount rate 3/4 of a percentage point in December 1919. The diaries and papers of members of the Board of Governors of the Federal Reserve System that Friedman and Schwartz analyze suggest that the Federal Reserve did not understand the lags with which monetary policy operated. As a result, when the economy failed to respond immediately to the increase in interest rates, the Federal Reserve raised the discount rate another 1 1/4 percentage points in January 1920 and 1 percentage point more in June 1920. Because these enormous rises in interest rates appear to be mainly the result of Federal Reserve inexperience, they represent independent monetary developments rather than a conscious response to the current state of the real economy.

In 1937 the tightening of fiscal policy was less dramatic, but still quite severe. In 1936 a large bonus had been paid to veterans of World War I and this resulted in a surge in government spending. In 1937 not only was this surge removed, but social security taxes were collected for the first time. This increase in revenues in 1937 is clearly unrelated to developments in the real economy; it reflects a conscious decision to permanently raise taxes to finance a pension system. The result of these two changes was that the surplus to GNP ratio rose from -4.4 percent in 1936 to -2.2 percent in 1937.

The monetary changes in 1937 were less straightforward than those in 1920, but still largely independent. Friedman and Schwartz view the main monetary shock as the result of the doubling of reserve requirements in three steps between July 1936 and May 1937 [1963, pp. 543-545]. The Federal Reserve raised reserve requirements because they were concerned about the high level of excess reserves in 1936 and wanted to turn excess reserves into required reserves. According to Friedman and Schwartz, this action greatly decreased the money supply because banks wanted to hold excess reserves. As a result, they decreased lending so that reserves were still higher than the new required levels.

Friedman and Schwartz view the resulting change in the money supply as independent because the Federal Reserve was not responding to the real economy; they inadvertently contracted the money supply because they misunderstood the motivation of bankers. Further evidence that the contraction of the money supply was not a conscious decision by the Federal Reserve to respond to the real economy is provided by the Minutes of the Federal Open Market Committee for 1937. At numerous FOMC meetings, the Chairman of the Board of Governors, Mariner Eccles, insisted that the doubling of reserve requirements did not constitute an end to the policy of easy money (see, for example, the Minutes for the meetings of March 13 and 15, 1937). Clearly, the Federal Reserve was not deliberately contracting the money supply in anticipation of future declines in output.

In addition to this change in reserve requirements, the Treasury in 1936 began sterilizing gold inflows. This resulted in a substantial slowing in the growth rate, though not an actual decline, in the stock of high-powered money. This switch to sterilization appears to be part of the same policy mistake that led to the increase in reserve requirements. According to Chandler, the

Treasury undertook the sterilization at the behest of the Federal Reserve which feared that unsterilized gold inflows would exacerbate the excess reserves problem [1970, pp. 177-181]. Evidence that the Treasury did not mean to affect the money supply is provided by the fact that they were greatly concerned by the resulting rise in interest rates in 1937.

The Role of Additional Factors. In addition to this evidence that the monetary and fiscal changes in 1920 and 1937 were independent of the real economy, there is also no direct evidence that any factor other than monetary and fiscal policy were important sources of the falls in output in 1921 and 1938. Scholars who have studied the 1921 and 1938 recessions almost all view the policy changes as crucial. Friedman and Schwartz, for example, attribute both downturns almost entirely to monetary developments. They state: "In ... 1920-21 and 1937-38, the decline in the money stock was a consequence of policy actions of the Federal Reserve System .... In both cases the subsequent decline in the money stock was associated with a severe economic decline" [1963, p. 678]. This emphasis on monetary factors in 1921 and 1938 is echoed by Lewis [1949, pp. 19-20] and Roose [1954, p. 239].

Other authors assign a much more important role to fiscal policy as the source of these two interwar downturns. Hansen [1938], Smithies [1946], and Gordon [1974] all attribute the recession of 1938 to the decline in government spending. Ayres writes of the decline in government expenditures that "it seems wholly probable that we have here the chief explanation of the exceptionally abrupt decline in business activity which took place in the autumn of 1937" [1939, p. 152]. Gordon also argues that the decline in government spending after World War I was an important source of the 1921 downturn. He states: "by the beginning of 1920 government finance had come to exercise a strong deflationary force on the economy" [1974, p. 20].

Perhaps more important evidence that policy changes were the main shocks affecting the U.S. economy in the downturns of 1921 and 1938 is provided by the fact that the few alternative explanations that have been advanced are easily disproved. The policy hypotheses, in contrast, are completely consistent with the behavior of major economic variables. For example, one alternative explanation for the downturn in 1938 is that increases in wages due to increased unionization decreased output and investment; in short, there was an adverse supply shock in 1937 (see, for example, Roose [1954, p. 239]). The main problem with this story is that an adverse supply shock should be accompanied by rising prices and this did not occur: between 1937 and 1938 wholesale prices fell 9.4 percent. The policy hypotheses that stress a fall in aggregate demand are consistent with the observed fall in prices. The monetary explanation is also consistent with the fact that interest rates rose sharply in early 1937 and interest-sensitive spending such as construction expenditures plummeted in late 1937.

The main alternative explanation advanced for the recession of 1921 is that following World War I there was tremendous pent-up demand for consumer goods. By 1920, the story goes, this demand had been satisfied and firms faced a dramatic decline in sales (see, for example, Lewis [1949, p. 19]). The problem with this story is that consumption actually rose quite substantially in both 1920 and 1921. Real consumer expenditures rose 4.8 percent between 1919 and 1920 and 6.2 percent between 1920 and 1921.[3] Any spending story also faces conflict from the fact that interest rates rose substantially in 1920.[4]

B. Policy Multipliers

The independence of policy movements in 1920 and 1937 and the absence

of additional causes of the recessions of 1921 and 1938 suggest that these two episodes can be used to estimate multipliers for monetary and fiscal policy. To actually do this calculation, one merely substitutes the relevant data for 1921 and 1938 into equation (1) and then solves the two equation system for β_f and β_m.

Output and Policy Measures. In applying the framework of equation (1) I use as the measure of output change the deviation of the growth rate of real GNP from its usual growth rate. As described previously, I define usual output growth as the average annual growth rate in the period 1923–1927. For the monetary and fiscal policy variables I then use measures that compare the policy action in a given year to the usual, long-run value of that policy. In essence, I assume that there is some usual policy stance that would keep aggregate demand and real output growing at its trend rate. Only deviations of monetary and fiscal policy from their normal stances would result in a shift in aggregate demand and hence in a deviation of real output growth from normal.

For the monetary policy variable I use the deviation of the annual (December to December) growth rate of M1 from its usual growth rate, where usual is again defined as the average annual growth rate between 1923 and 1927.[5] This definition of the usual growth rate of money is sensible because the period 1923–1927 was characterized by constant prices and steady GNP growth. Thus, monetary policy can be seen as basically holding aggregate demand steady relative to GNP in these years. The average annual growth rate of M1 over this period was 2.88 percent. Looking at monetary growth relative to this norm can provide an indication of whether monetary developments were working to shift the aggregate demand curve in either a positive or negative direction.[6]

For the fiscal policy variable I use the annual change in the real federal surplus to real GNP ratio.[7] This measure of fiscal policy takes as normal essentially no change in the real federal surplus. This makes sense as a measure of normal policy because a constant deficit or surplus should leave aggregate demand unchanged (except for balanced budget multiplier effects).[8]

In describing the framework for calculating multipliers, I assumed that the policy variables affect output with a one-year lag. While this is a crude assumption, for the two episodes in question it is surely reasonable. In annual data the main falls in real output in these episodes occur between 1920 and 1921 and between 1937 and 1938. The main monetary and fiscal policy movements in each episode, however, occur in the year before the large declines in real output. Indeed, the contemporaneous policy movements are typically slightly expansionary in each episode. Thus the only way to derive sensible multipliers is to assume a one-year lag.

Results. Substituting the actual data on the departure of real GNP growth from usual and the lagged policy measures into (1) for both 1921 and 1938 yields an estimated multiplier for monetary policy of 0.823 and an estimated multiplier for fiscal policy of -0.233. The signs of the two multipliers are what one would expect. β_f is negative because the fiscal policy variable is based on the federal surplus; an increase in the fiscal policy measure is contractionary.

The magnitude of the monetary policy multiplier is quite reasonable. It implies that a growth rate of M1 that is 1 percentage point lower than normal results in real output growth that is 0.82 percentage points lower than normal. As described in more detail below, this is quite consistent with the effects of monetary developments found in large macromodels.

The magnitude of the fiscal policy multiplier is quite small. It

implies that a rise in the surplus to GNP ratio of 1 percentage point lowers the growth rate of real output relative to usual by 0.23 percentage points. The source of this small fiscal policy multiplier is the fact that the deviation of real output growth from normal was slightly smaller in 1921 than in 1938, but the fiscal policy shock was nearly four times as large in 1920 as in 1937. As a result, it is very difficult to attribute most of the declines in output in 1921 and 1938 to fiscal policy. I show below, however, that even very large changes in the estimated fiscal policy multiplier would have only small effects on the conclusions that follow.

C. Simulations

Armed with these multipliers, it is possible to calculate the likely effects of monetary and fiscal developments during the mid- and late-1930s. As I have set up the analysis, the multiplier times the policy measure lagged one year shows the effect of policy on the deviation of output growth from normal in a given year. If one subtracts this effect of unusual policy from the actual growth rate of real output, one is left with a series on what the growth rate of output would have been under normal policy. Accumulating these growth rates of real output under normal policy and then adding them to the level of output starting in some base year yields a series on the level of output under normal policy.

The difference between the path of actual output and the path of output under normal policy shows how much slower the recovery would have been in the absence of expansionary policy. In calculating the path of real output under normal policy I use 1933 as the base year. This path shows what output would have done starting in 1933 under normal policy, without taking into account the fact that the depression was probably caused to a large extent by extreme

policy mistakes. This is appropriate because the purpose of this paper is not to argue that policy did not contribute to the downturn of the early 1930s, but rather that policy was central to the recovery in the mid- and late-1930s. In calculating the effects of unusual policy, I do the analysis separately for monetary and fiscal policy. In one experiment I ask what would output have been if fiscal policy had been held at its usual level, but monetary policy was as it actually was. In another, I hold monetary policy to its normal level, and let fiscal policy be equal to its actual value.

Fiscal Policy. Figure 3 shows the experiment for fiscal policy. The dashed line shows the path of log output under the assumption that fiscal policy was at its usual level throughout the mid- and late-1930s; the solid line shows the path of actual log output. The great similarity of the two lines indicates that unusual fiscal policy contributed almost nothing to the recovery from the Great Depression. Only in 1942 is there a noticeable difference between actual output and output under normal fiscal policy, and even then this difference is small.

The small estimated effect of fiscal policy obviously stems in part from the fact that the calculation based on 1921 and 1938 yields a small estimated multiplier for fiscal policy. However, it is more fundamentally due to the fact that the deviation of fiscal policy from normal was not large during the 1930s. This fact can be seen in Figure 4, which shows the change in the surplus to GNP ratio (lagged one year). The change in the federal surplus to GNP ratio in the mid-1930s was typically less than one percentage point, and was actually positive in some years. Even in 1941, the first year of a substantial wartime increase in spending, the surplus to GNP ratio only increased by 6 percentage points.

Monetary Policy. Figure 5 shows the experiment for monetary policy.

The dashed line now shows the path of log output under the assumption that the money growth rate was held to its usual pre-Depression level throughout the mid- and late-1930s; the solid line shows the path of actual log output. This time the two paths are tremendously different. The difference in the two paths indicates that had the money growth rate been held to its usual level in the mid-1930s, real GNP in 1937 would have been nearly 25 percent lower than it actually was. By 1942, the difference between GNP under normal and actual monetary policy grows to nearly 50 percent. These calculations suggest that monetary developments were critical to the recovery from the Great Depression. Had money growth been held to its normal level, the U.S. economy in 1942 would have been 50 percent below its pre-Depression trend path, rather than back to normal output.[9]

The source of this large estimated effect of monetary developments is not hard to find. As described above, the monetary policy multiplier estimated from 1921 and 1938 is of roughly the magnitude that is found in postwar macromodels. Therefore, the large estimated effect of monetary developments is not due to an implausibly large multiplier for monetary policy. Rather the large estimated effects are due to the extraordinary rates of money growth in the mid- and late-1930s. The monetary policy variable (lagged one year) is graphed in Figure 6. As can be seen, the deviations of the money growth rate from normal were enormous in the mid- and late-1930s. For most years this deviation was over 10 percent. Hence, it is not at all surprising to find that had this deviation from normal been held at zero, the recovery from the Depression would have been dramatically slower.

D. Robustness

The results of these simulations are quite robust. The stance of

monetary policy was so expansionary during the recovery, and the stance of fiscal policy was so non-expansionary, that changing the multipliers even substantially would not make monetary policy unimportant and fiscal policy crucial.

One way to see this is to imagine cutting the monetary policy multiplier in half and doubling the fiscal policy multiplier.[10] This change represents a very extreme change in the monetary policy multiplier. Nevertheless, this reduction in the multiplier only implies that in 1942 real GNP would have been roughly 25 percent lower than it actually was had monetary policy been held to its usual level during the mid- and late-1930s. This result still suggests that aggregate demand stimulus in the form of monetary policy was crucial to the recovery. In the case of fiscal policy, doubling the policy multiplier would lead to the conclusion that real GNP in 1942 would have been 3 percent lower in 1942 had the change in the surplus to GNP ratio been held to zero. This increases the apparent role of fiscal policy, but not dramatically so.[11]

Another way to evaluate the robustness of the calculations is to use policy multipliers derived from the estimation of a postwar macromodel. The MPS model is the main forecasting model currently used by the Federal Reserve Board and is generally thought to be based both on good economic theory and careful data analysis. In this model, the short-run multiplier for monetary policy is 1.2; that is, a one-time increase in M1 above the baseline projection of 1 percentage point results in real GNP growth over the next four quarters that is 1.2 percentage points above the baseline projection. This short-run multiplier for monetary policy is slightly larger than the multiplier derived from the 1921 and 1938 episodes. The short-run multiplier for fiscal policy in the MPS model is roughly -2.13; a decrease in the surplus to GNP ratio of 1 percentage point results in real GNP growth over the next

four quarters that is 2.13 percentage points above the baseline projection. This multiplier for fiscal policy is roughly 10 times larger than that derived from the 1921 and 1938 episodes.[12]

Using the multipliers from the MPS model in place of those derived from my calculation does not change the conclusions appreciably. Substituting in the short-run MPS multiplier for monetary policy increases the apparent importance of monetary policy: real GNP in 1942 would have been roughly 70 percent lower than it actually was had monetary policy been held to its usual course. Using the much larger MPS multiplier for fiscal policy clearly increases the role for fiscal policy, but not dramatically so. According to this simulation, if fiscal policy had been held to its usual level, real GNP in 1942 would have been 14 percent lower than it actually was. However, essentially all of this effect comes from the last year of the simulation: real GNP in 1941 would have only been 1 percent lower than it actually was if fiscal policy had been held to its usual level. Even with the much larger multiplier, fiscal policy accounts for essentially none of the recovery prior to 1942. Thus, using policy multipliers derived from a much different procedure than I used in my calculation leads to the same conclusion that monetary policy was crucial to the recovery from the Great Depression and fiscal policy was of little importance.[13]

One characteristic of most multipliers derived from large macromodels is that the effects of aggregate demand policy on the level of real output are constrained to be zero in the long run. This is certainly the case in the MPS model in which the long-run behavior of the economy is assumed to follow the predictions of a Solow growth model. In the simulations that I have done, both with my own multipliers and with those from the MPS model, I have not followed this practice. I have only considered the short-run multipliers and

have not forced the positive effects of an expansionary aggregate demand shock on the level of real output to be undone eventually. I do this because the constraint that the long-run effects of policy are zero is simply imposed a priori in most models; what evidence there is in fact indicates that the real effects of policy shifts are highly persistent (see, for example, Romer and Romer [1989]).

However, provided that one does not assume that the positive effects of expansionary policy are undone very quickly (that is, within a year or two), allowing for negative feedback effects from a policy stimulus would not negate the crucial role of policy in generating the high real growth rates observed in the mid- and late-1930s. This is true both because in the first few years of the expansion there would be no negative feedback effects from previous policy expansions and because there are progressively larger monetary growth rates toward the end of the recovery. Furthermore, there is no support for the view that the effects of policy shifts are counteracted rapidly. In the MPS model, for example, the effects of both fiscal and monetary shocks do not start to be counteracted substantially until 12 quarters after the shock. Thus, even under the assumption that policy does not matter in the long run, one would still find that policy was important for the 8 to 10 years that encompass the recovery phase of the Great Depression.

IV. THE SOURCE OF THE MONETARY EXPANSION AND THE TRANSMISSION MECHANISM

That economic developments would have been very different in the mid- and late-1930s had money growth been held to its usual level is obvious from the calculations above. However, to say that it would have been a disaster to hold money growth rates at their usual level in the second half of the 1930s

is different from saying that monetary policy developments caused the recovery we observe. The evidence presented thus far does not rule out the possibility that money growth rates were high relative to usual because of an endogenous response of money growth to the rapid recovery of real output. Hence, in order to argue that it was aggregate demand stimulus that caused the recovery rather than self-correction, one must check that the rapid rates of monetary growth were due to policy actions or historical accidents, and were not the result of higher output bringing forth money creation.[14]

Furthermore, before one believes that even a huge independent monetary expansion had the enormous effect that my simulations suggest that it had, it is reasonable to consider the possible transmission mechanism. Therefore, I also check whether there is an identifiable way in which the rapid growth rates in the money supply in the mid- and late-1930s could have stimulated the real economy.

A. Monetary Expansion

Money Multiplier. It is fairly easy to find evidence that the monetary expansion of the mid- and late-1930s could not have been endogenous. The main way that the money supply might grow endogenously is through changes in the lending activities of banks. It is usually argued that in response to a boom, banks may raise the deposit to reserve ratio and customers may accept a higher deposit to currency ratio. Both of these changes imply that a given supply of high-powered money can then support a larger stock of M1. However, neither of these conditions were satisfied during the recovery from the Great Depression. The deposit to reserve ratio fell steadily in the mid- and late 1930s, from 8.86 in January 1933 to 4.67 in December 1942. The deposit to currency ratio rose initially in the recovery as the banking system regained credibility, but

then remained fairly constant from 1935 until 1941. In late 1941 and 1942, this ratio then fell quite sharply.[15] The behavior of both these ratios suggests that it could not be the case that the money supply rose in the mid- and late-1930s because of demand-induced changes in the money multiplier.

The Rise in High-Powered Money. Since the money multiplier, if anything, fell during the recovery from the Great Depression, it is clear that any rise observed in M1 must have been due to a rise in the stock of high-powered money. And indeed, the stock of high-powered money rose substantially more than the stock of M1. It is theoretically possible that this rise in high-powered money was endogenous, occurring because the monetary authority increased the money supply to accommodate the higher transactions demand caused by higher output. In truth, however, Federal Reserve monetary policy was far from accommodating. Essentially none of the increases in the stock of high-powered money during the second half of the Great Depression were due to active Federal Reserve policy. The Federal Reserve maintained a policy of caution throughout the recovery and even stopped increasing Federal Reserve credit to meet seasonal demands in the mid- and late-1930s (see Friedman and Schwartz [1963, pp. 511-514]). Thus, there is no evidence that high-powered money increased in response to the increase in real output.

The source of the huge increases in the U.S. money supply during the recovery were the tremendous gold inflows that began in 1933. Friedman and Schwartz state: "the money stock grew at a rapid rate in the three successive years from June 1933 to June 1936 .... The rapid rise was a consequence of the gold inflow produced by the revaluation of gold plus the flight of capital to the United States. It was in no way a consequence of the contemporaneous business expansion" [1963, p. 544]. The monetary gold stock nearly doubled between December 1933 and July 1934 and then increased at an average annual

rate of nearly 15 percent between December 1934 and December 1941.[16]

The above quotation indicates that Friedman and Schwartz believe quite reasonably that the tremendous initial rise in gold inflows in 1934 was the result of the significant revaluation of gold that became official on January 31, 1934 [1963, p. 508-509]. In this way a large part of the rise was the result of an active policy decision on the part of the Roosevelt administration. Bloomfield reiterates this conclusion saying that "the devaluation of the dollar, for technical reasons, was also the direct cause of much of the heavy net gold imports of $758 million in February-March, 1934; for it created a marked 'gap' ... between the prices of gold in the United States and in foreign countries and thereby induced large-scale gold imports on an arbitrage basis until that 'gap' was finally wiped out" [1950, p. 142].

Both Bloomfield and Friedman and Schwartz attribute most of the continuing increases in gold throughout the later 1930s to political developments in Europe. Bloomfield points out that the gold inflows were primarily caused by huge net imports of foreign capital to the U.S; the U.S. ran persistent and large capital account surpluses in the mid- and late-1930s.[17] He then states: "Probably the most important single cause of the massive movement of funds to the United States in 1934-39 as a whole was the rapid deterioration in the international political situation. The growing threat of a European war created fears of seizure or destruction of wealth by the enemy, imposition of exchange restrictions, oppressive war taxation .... Huge volumes of funds were consequently transferred in panic to the United States from Western European countries likely to be involved in such a conflict" [1950, pp. 24-25]. Friedman and Schwartz are more succinct when they conclude: "Munich and the outbreak of war in Europe were the main factors determining the U.S. money stock in those years [1938-1941], as Hitler and the

gold miners had been in 1934 to 1936" [1963, p. 545].

Roosevelt's Gold Policy. Given that unsterilized gold inflows were the source of the monetary expansion of the mid- and late-1930s, it is important to analyze why the Roosevelt administration devalued in 1933 and why the Treasury did not sterilize the gold inflows during most of the recovery period. If these decisions were prompted by the recovery itself, then the monetary expansion could, at some level, be considered endogenous. This, however, is almost surely not true.

Johnson's [1939] analysis of the Roosevelt administration's gold policy suggests that to the extent that the Treasury was responding to the real economy, it was trying to counteract the Depression through easy money, rather than trying to accommodate the recovery. That is, the administration was, if anything, seeking to increase the money supply because output was low, not because output was high or growing. Johnson stresses that Roosevelt's desire to encourage a gold inflow was not based on a conventional view of the monetary transmission mechanism, but rather on the view that an increase in the gold supply would directly raise prices and reflation would directly stimulate recovery [1939, pp. 9-28].

The fact that the continuing gold inflows of the mid-1930s were not sterilized appears to be partly the result of technical problems with the sterilization process. The Gold Reserve Act of 1934 set up a stabilization fund and made explicit the role of the Treasury in intervening in the foreign exchange market. However, because the stabilization fund was endowed only with gold, it was technically able to only counteract gold outflows, not gold inflows (see Johnson [1939, pp. 92-114]). As a result, sterilization would have required an active decision to change the new operating procedures. Such a decision was not made because Roosevelt believed that unsterilized gold

inflows would stimulate the economy through reflation.

This discussion of gold policy during the recovery suggests that the devaluation and the absence of sterilization were the result of active policy decisions and a lack of understanding about the process of exchange market intervention. To the degree that active policy was involved, it was clearly policy aimed at encouraging recovery, not policy responding to a recovery that was already under way. Together with the discussion of the role of political instability in causing gold flows, these findings make it clear that the increase in the money supply in the recovery phase of the Great Depression was not endogenous. Since the simulation results of Section III showed that the large deviations of money growth rates from normal appear to account for much of the recovery of real output between 1933 and 1937 and between 1938 and 1942, it is possible to conclude that independent monetary developments account for the bulk of the recovery from the Great Depression.

B. Transmission Mechanism

The usual way that loose monetary policy is thought to affect real output is through real interest rates: an increase in the money growth rate lowers real interest rates, and this in turn stimulates interest-sensitive spending by lowering the cost of borrowing or by reducing the opportunity cost of spending. To see if this usual mechanism could have been operating in the second half of the 1930s, it is necessary to look at the behavior of interest rates and interest-sensitive spending.

Interest Rates. Nominal interest rates declined around the same time that money growth expanded rapidly. For example, the commercial paper rate dropped from 2.63 percent to 1.25 percent between the second and fourth quarters of 1933.[18] However, in an environment where prices are changing

rapidly, nominal interest rates are clearly not the best indicator of the cost of borrowing. Rather, one wants to consider the behavior of real interest rates. This is especially true given the fact that nominal interest rates were close to zero by 1934. Clearly if monetary developments affected real rates substantially in this period, it must have been through expected inflation, not through further declines in nominal rates.

The simplest way to estimate real interest rates is to consider the ex post real rate. To calculate ex post real rates I use quarterly data on the 4 to 6 month commercial paper rate and subtract off the actual change in the producer price index over the following quarter (at an annual rate).[19] The nominal commercial paper rate and the ex post real rate are graphed in Figure 7. The figure shows that ex post real rates dropped precipitously at the start of the monetary expansion in 1933 and remained low or negative for the rest of the decade (except for the rise during the monetary contraction of 1937–1938). Indeed, the drop in ex post real rates between the contractionary and expansionary phases of the Great Depression is remarkable. Ex post real rates fell from values over 15 percent in the early 1930s to values typically around −10 percent in the mid–1930s and early 1940s. That nominal interest rates were close to zero during most of this period emphasizes the fact that inflation was quite significant starting in 1933.[20]

While the behavior of the ex post real rate is suggestive that the interest–rate transmission mechanism could have been working in the recovery phase of the Great Depression, it is the ex ante real rate that is actually relevant for decision making. To estimate ex ante real interest rates I employ the simple regression procedure suggested by Mishkin [1981]. Manipulation of the Fisher identity shows that the difference between the ex ante real rate that we want to know and the ex post real rate that we observe

is unanticipated inflation. Under the assumption of rational expectations, the expectation of unanticipated inflation using information available at the time the forecast is made is zero. Therefore, if one regresses the ex post real rate on current and lagged information, the fitted values provide estimates of the ex ante real rate. This is true because the expectation of both the OLS error term and unanticipated inflation are zero.

To apply this procedure I regress the ex post real rates calculated above on a variety of contemporaneous and lagged variables. In particular, I include in the regression the current value and four quarterly lags of the monetary policy variable described in the multiplier calculations (but disaggregated to quarterly values), the percentage change in industrial production, actual inflation, and the level of the nominal commercial paper rate. To account for possible seasonal variation I also include a constant term and three quarterly dummy variables. This regression is run over the sample period 1923 to 1942.[21]

The results of this regression are shown in Table 1. The included explanatory variables explain a substantial fraction of the total variation in the ex post real interest rate; the R^2 of the regression is 0.52. Of the individual explanatory variables, the one of most interest is the monetary policy variable. Obviously, if the conventional transmission mechanism is operating, the monetary policy variable should enter with a significant negative coefficient. As can be seen, this is clearly the case. The first lag of the monetary policy variable enters the regression with a coefficient of -0.463 and has a t-statistic of -3.02. This suggests that on average in the interwar sample period monetary developments had a substantial negative correlation with real interest rates.

The fitted values of this regression are graphed in Figure 8. As

described before, these fitted values provide an estimate of the ex ante real rate. These estimates of the real rate show the same marked drop that the ex post real rate showed, and the drop is again nearly contemporaneous with the switch to expansionary monetary policy in 1933.[22] While one cannot be sure that actual real rates dropped the same amount as these estimates or that the drop was caused by monetary developments, the regression results certainly suggest that the expansionary monetary developments of the mid- and late-1930s did have a substantial impact on real interest rates. Thus, this aspect of the conventional monetary transmission mechanism appears to be operating in the recovery phase of the Great Depression.

Response of Interest-Sensitive Spending. For expansionary monetary developments to have stimulated the economy in the mid- and late-1930s, it must be the case that real interest rates not only fell, but that investment and other types of interest-sensitive spending also responded positively to this drop in real interest rates. While a detailed investigation of the determinants of investment and consumption is clearly outside the scope of this paper, it is important to see if the gross movements in these series suggest that the conventional monetary transmission mechanism could have been operating in the mid- and late-1930s.

Figures 9 and 10 graph the annual percentage change in real total fixed investment and in real consumer expenditures on durable goods.[23] In both figures the annual average of the estimates of the ex ante real interest rate are also graphed. These graphs suggest that there is a very strong negative relationship between real interest rates and the percentage change in interest-sensitive spending in the mid- and late-1930s. Fixed investment and the consumption of durable goods both turned up shortly after the plunge in real rates in 1933. Over the next several years real rates remained negative

and spending grew rapidly. In 1938 the recovery was interrupted as real rates turned substantially positive and spending fell sharply. Starting in 1939 real rates fell again and the rapid growth of spending resumed.

The relationship between spending and interest rates can be quantified by computing the correlations between the percentage change in fixed investment or consumer spending on durables and the level of the ex ante real rate. Table 2 shows these correlations, which are estimated over the period 1934–1942. The table shows that there is a very strong contemporaneous correlation between interest rates and the growth rates of investment and consumer spending on durable goods in the recovery phase of the Great Depression. There is also a reasonably strong correlation between the percentage change in spending and interest rates lagged one year.

This same relationship also holds with the available quarterly series on construction contracts. These data show the floor space of new buildings for which construction contracts have been drawn up during the quarter.[24] This is a series that one might reasonably expect to respond quickly to movements in interest rates because it refers to planned rather than actual expenditures. And indeed, over the period 1933–1942, the contemporaneous correlation between the percentage change in construction contracts and the ex ante real rate is −0.4.[25] The low interest rates of the mid-1930s and the early-1940s correspond to periods of rapid increase in construction contracts.

These correlations obviously do not prove that the fall in interest rates caused the surge in investment and durable goods expenditures. However, they do at least suggest that there is no evidence that the conventional transmission mechanism for monetary developments failed to operate during the mid- and late-1930s. One piece of evidence that suggests more of a causal link between the fall in interest rates and the recovery is the difference in

the timing of the rebound in consumer expenditures on durables and on services. Whereas consumer expenditures on durables increased between 1933 and 1934, real consumer expenditures on services did not turn around until 1935. This suggests that it was not a surge of optimism that was pulling up all types of consumer expenditures in 1934, but rather some force, such as a fall in interest rates, that was operating primarily on durable goods.[26]

V. CONCLUSION

The main finding of this study is that monetary developments were a crucial source of the recovery of the U.S. economy from the Great Depression. The very rapid growth of the money supply beginning in 1933 appears to have lowered real interest rates and stimulated investment spending just as conventional models of the transmission mechanism would predict.

These expansionary monetary developments were almost surely independent, in the sense that the money supply increased for reasons unrelated to the growth of real output. However, whether the expansion should be attributed to good luck or good policy is more debatable. The money supply grew rapidly in the mid- and late-1930s primarily because huge gold inflows to the U.S. went unsterilized. While the later gold flows were mainly due to political developments in Europe, the largest gold inflows occurred immediately following the revaluation of gold mandated by the Roosevelt administration in 1934. Thus, the gold flows were partly due to historical accident and partly due to policy. The decision to let the gold flows swell the U.S. money supply was also at least partly a policy choice. The Roosevelt administration chose not to sterilize the gold flows because they hoped that such flows would stimulate the depressed U.S. economy.

The finding that monetary developments were very important and fiscal policy was of little consequence in the mid- and late-1930s suggests an interesting twist on the usual view that World War II was important in causing or accelerating the recovery from the Great Depression. As mentioned above, even in 1942, the year that the economy returned to its trend path, the effects of fiscal policy were small. As a result, it is hard to argue that the changes in government spending caused by the war were a major factor in the recovery; the recovery was nearly complete before the war had a noticeable fiscal impact.

However, Bloomfield's and Friedman and Schwartz's analysis of the cause of the gold inflows that raised the U.S. money supply actually suggest a direct link from the war to the money supply. The U.S. money supply started to rise in 1938 because of capital flight from Europe caused by Hitler's increasing belligerence; the resulting gold inflows increased dramatically after war was officially declared in Europe. In this way the war may have been quite important in keeping the U.S. money supply growing rapidly after 1938. This could obviously have contributed substantially to the recovery as early as 1939. Thus, World War II may have helped to end the Great Depression in the U.S., but its expansionary benefits worked initially through monetary developments rather than through fiscal policy.

The finding that monetary developments were crucial to the recovery confirms some other views of the end of the Great Depression. Most obviously, it supports Friedman and Schwartz's view that monetary developments were in general very important during the depression. It suggests, however, that Friedman and Schwartz's emphasis on the inaction of the Federal Reserve after 1933 was misplaced. What mattered was that the money supply grew rapidly; that this rise was orchestrated by the Treasury rather than the Federal

Reserve is of secondary importance.

The paper is also supportive of studies that emphasize the devaluation of 1933-1934 as the engine of recovery. Temin [1989] argues that the devaluation signalled the end of a deflationary monetary regime and that this change in regime was crucial to improving expectations. In this story it was the change in expectations that brought about the turning point in 1933. My work bolsters Temin's argument by showing that the deflationary regime was indeed replaced by a very inflationary monetary policy. Thus, it may explain why the regime shift was viewed as credible. More importantly, it explains why the initial recovery was followed by continued rapid expansion. Without actual inflation and actual declines in real interest rates, the recovery stimulated by a change in expectations would almost surely have been short-lived. In the same way, this paper also bolsters the argument of Eichengreen and Sachs [1985] that devaluation could stimulate recovery by allowing expansionary monetary policy. It shows that in the case of the U.S. devaluation was indeed followed by salutary increases in the money supply.

On the other hand, the results here appear to contradict studies, such as Bernanke and Parkinson [1989] and De Long and Summers [1988], that suggest that the recovery from the Great Depression was due to the self-corrective powers of the U.S. economy in the 1930s. My finding is that aggregate demand stimulus was the main source of the recovery from the Great Depression. The simulations suggest that without the tremendous increases in the money supply, the economy would still have been approximately 50 percent below its pre-Depression trend level in 1942, rather than back to full employment as it actually was. This certainly seems to suggest that the self-corrective power of the U.S. economy in the 1930s was very weak. Thus, the Great Depression does not seem to provide evidence that large shocks are rapidly undone by the

forces of mean reversion. Rather, it suggests that large negative shifts in aggregate demand are sometimes followed by large positive shifts, the combination of which leaves the economy back on trend.

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NOTES

1. In these calculations I use the Darby [1976] unemployment series.

2. If, on the other hand, the policy changes were undertaken in an effort to counteract other factors that were acting to raise output, the procedure will understate the effects of policy.

3. The consumption data are from Kendrick [1962, Table A-IIa, p. 294].

4. One partial explanation for the behavior of the economy in 1921 that is hard to dismiss is a positive supply shock. Romer [1988] argues that the recovery of agricultural production in Europe and a flooding of the market with primary goods that had been stockpiled in peripheral countries during the war caused prices of agricultural goods in the United States to plummet in 1920. This, in turn, stimulated the production of goods that use primary commodities as inputs. The presence of a favorable supply shock in this episode implies that the importance of policy in 1921 will be understated because the fall in prices ameliorated some of the fall in real output caused by the aggregate demand policies.

5. The data on M1 are from Friedman and Schwartz [1963, Table A-1, column 7, pp. 704-734].

6. There are obviously alternative measures of monetary policy that could be used. One alternative that would affect the multiplier calculations would be to use the deviation of the growth rate of high-powered money from usual as the policy variable. This is true because in both 1920 and 1937 high-powered money growth was higher than normal, despite the contractionary monetary policies. Thus, using high-powered money as the policy variable would result in a negative multiplier for monetary policy. The peculiar behavior of high-powered money in these two episodes is due to the fact that the monetary policy actions undertaken in both 1920 and 1937 were ones that tended to decrease the amount of money in circulation relative to the stock of reserves. Since the amount of money in circulation is what is likely to affect interest rates and spending, M1 is clearly a more sensible measure of monetary policy in these two episodes. Another alternative measure of monetary policy that one could use would be some measure of the change in real money growth; that is, the change in M1 relative to the price level. However, this would not be sensible given that this paper seeks to identify the contribution of aggregate demand policy to the recovery. Changes in nominal money are what shift the aggregate demand function; changes in real money result from the interaction of aggregate demand and aggregate supply movements. Thus, to isolate the effects of aggregate demand stimulus, one wants to use a measure of monetary policy that only reflects changes in demand.

7. The surplus data are from the Department of the Treasury [1979, Table 2, pp. 4-11] and are based on the administrative budget. Because these data are for fiscal years, I convert them to a calendar year basis by averaging the observations for a given year and the subsequent year. The data are deflated using the implicit price deflator for GNP. The deflator series and the real GNP series for 1929-1942 are from the National Income and Product Accounts

[1986]; data for 1919-1928 are from Romer [1988]. The administrative budget data are used instead of the NIPA surplus data because they are available on a consistent basis for the entire interwar era. While the two surplus series differ substantially in some years, the gross movements in the two series are generally similar. The surplus is divided by GNP to scale the variable relative to the economy.

8. In place of the actual surplus to GNP ratio one could use the full-employment surplus to GNP ratio. I do not use this variable because it treats a decline in revenues caused by a decline in income as normal rather than activist policy. This is inappropriate for the prewar and interwar eras when raising taxes in recessions was usually preferred to letting the budget slip seriously into deficit. However, the differences between the full-employment surplus and the actual surplus are sufficiently small even in the worst years of the depression that the two measures yield similar results.

9. One could start the simulations in 1929 to estimate the role of monetary developments in causing the depression. While this procedure is not strictly correct because some of the monetary developments in the early 1930s were clearly endogenous, the results confirm the conventional wisdom: monetary forces had little effect during the onset of the Great Depression in 1929 and 1930, but were the crucial cause of the deepening of the depression in 1931 and 1932.

10. These changes in the relative sizes of the monetary and fiscal policy multipliers are an extreme case of what might happen if one took into account the positive supply shock in 1921 discussed in note 4. This is true because netting out the effect of the supply shock would tend to increase the role assigned to the large increase in the surplus to GNP ratio that occurred in 1920 and therefore decrease the role assigned to monetary policy.

11. Any change in the fiscal policy multiplier that increases the role of fiscal policy may alter the narrow finding of this paper that fiscal policy was unimportant, but it will strengthen the more general point that aggregate demand stimulus was important to the recovery.

12. These multipliers are reported in a recent report of the Federal Reserve Board [1987, Tables 1 and 2]. The monetary policy shock used in the MPS simulation is a permanent increase in the level of M1 of 1 percent over the projected baseline. This is equivalent to the shock I consider in my simulations, which is a one-time deviation in the growth rate of M1 from its normal growth rate. I use the MPS multiplier derived from the full-model response (Case 3 of Table 2). The fiscal shock used in the MPS simulation is a permanent increase in the purchases of the federal government by 1 percent of real GNP over the baseline projection. This differs from the shock I consider, which is a change in the surplus to GNP ratio, because tax revenues will rise in response to the induced increase in GNP. To make the MPS multiplier consistent with my measure of fiscal policy, I assume that the marginal tax rate is 0.3 and then calculate the change in the surplus to GNP ratio that corresponds to a 1 percent increase in federal purchases. The MPS multiplier that I adjust in this way is based on the full-model response, with M1 fixed (Case 4 of Table 1).

13. Weinstein [1981] performs a similar calculation for monetary policy using multipliers derived from the Hickman-Cohen model and finds a large potential effect of the monetary expansion in 1934 and 1935. However, he emphasizes that the National Industrial Recovery Act acted as a negative supply shock and counteracted the monetary expansion. While the NIRA may indeed have stunted the recovery somewhat, it does not follow from this that monetary policy was unimportant to the recovery. In the absence of the monetary expansion, the supply shock could have led to continued decline rather than to the rapid growth of real output that actually occurred.

14. At some level it might not matter if money growth rates rose in response to output growth because one could argue that the monetary authorities always had the option of holding money growth rates at their usual level. In this case, policy could be given credit for allowing the money supply to expand relative to normal.

15. The data are from Friedman and Schwartz [1963, Table B-3, pp. 799-808].

16. The data are from Chandler [1970, p. 162].

17. The U.S. also ran a small current account surplus in every year except 1936 (see Bloomfield [1950, p. 269]).

18. The commercial paper rate data are from the Federal Reserve Board [1943, pp. 448-451 and 1976, p. 674]. They cover 4 to 6 month prime commercial paper and are not seasonally adjusted.

19. The historical data on the Producer Price Index are from the Bureau of Labor Statistics. They are not seasonally adjusted.

20. Some of the inflation in 1933 and 1934 could have been due to the NIRA, which encouraged collusion aimed at raising prices, rather than to monetary policy. However, the NIRA was declared unconstitutional in 1935 and its policies were ones that would tend to cause a one-time jump in the price level rather than continued inflation. Thus, while some of the initial fall in real interest rates could have been due to the NIRA, the continued negative real rates in the mid- and late-1930s must have been due to other causes.

21. The monetary policy variable is disaggregated by converting the quarterly growth rates of M1 during the recovery to annual rates and then subtracting off the average annual growth rate of M1 in the mid-1920s. The industrial production series is from the Federal Reserve Board [1986].

22. The estimates are strikingly robust to variations in the specification of the regression. I have tried many variants of the basic regression, such as excluding contemporaneous values of the explanatory variables, extending the sample period to include 1921, and leaving out the seasonal dummy variables. None of these changes alters the estimates of the ex ante real rate noticeably.

23. These data are from the National Income and Product Accounts [1986, Table 1.2, p. 6].

24. The Dodge construction contract series is available in Lipsey and Preston [1966, Series A17, pp. 95-96]. I use the version that shows the floor space of all types of buildings and is not already seasonally adjusted. The data for 27 states is spliced on to data for 37 states in 1925. I seasonally adjust the series by regressing the logarithm of contracts on a trend, a constant, and 3 quarterly dummy variables.

25. For this calculation, I seasonally adjust the ex ante real interest rate series by regressing it on a constant and three quarterly dummy variables.

26. It is perhaps useful to mention that the conventional monetary transmission mechanism may not have been the only way that expansionary monetary developments stimulated real growth during the mid- and late-1930s. Many recent studies have emphasized that debt-deflation could have been an important source of weakness in the banking sector and that banking failures could have hurt real output by reducing the amount of credit intermediation (see, for example, Bernanke [1983]). If this is indeed the case, then the inflation generated by the tremendous increase in the money supply starting in 1933 could have had a beneficial effect on the financial system. By reducing the real value of outstanding debts, the inflation may have strengthened the solvency of banks and hastened the recovery of the financial system.

TABLE 1

REGRESSION USED TO ESTIMATE EX ANTE REAL INTEREST RATES

Sample Period: 1923:1 to 1942:2
Dependent Variable: The Quarterly Ex Post Real Interest Rate
R^2 = 0.52

Explanatory Variable	Coefficient	T-Statistic
Monetary Policy Variable		
Lag 0	0.044	0.29
Lag 1	-0.463	-3.02
Lag 2	0.182	1.09
Lag 3	-0.196	-1.20
Lag 4	0.352	2.30
Nominal Commercial Paper Rate		
Lag 0	0.834	0.25
Lag 1	0.191	0.04
Lag 2	1.181	0.22
Lag 3	0.954	0.18
Lag 4	-1.079	-0.32
Inflation Rate		
Lag 0	-0.396	-2.54
Lag 1	0.129	0.81
Lag 2	-0.014	-0.09
Lag 3	0.111	0.72
Lag 4	-0.031	-0.21
Change in Industrial Production		
Lag 0	-0.026	-0.47
Lag 1	0.045	0.78
Lag 2	-0.120	-2.00
Lag 3	0.012	0.22
Lag 4	-0.036	-0.67
Q2	1.497	0.27
Q3	-6.961	-1.76
Q4	5.271	0.97
Constant	-1.804	-0.44

Sources: See text for a description of the variables and the data sources used in this regression.

TABLE 2

CORRELATION BETWEEN SPENDING AND REAL INTEREST RATES

Sample Period: 1934-1942

	Percentage Change in Real Fixed Investment	Percentage Change in Real Consumer Expenditures on Durable Goods
Ex Ante Real Rate		
Lag 0	-0.687	-0.746
Lag 1	-0.292	-0.238
Lag 2	-0.052	-0.030

Sources: See text for a description of the variables and data sources used to calculate these correlation coefficients.

Figure 1

Percentage Change in Real GNP
(1927-1942)

Figure 2

Actual and Trend Real GNP
(1919-1942)

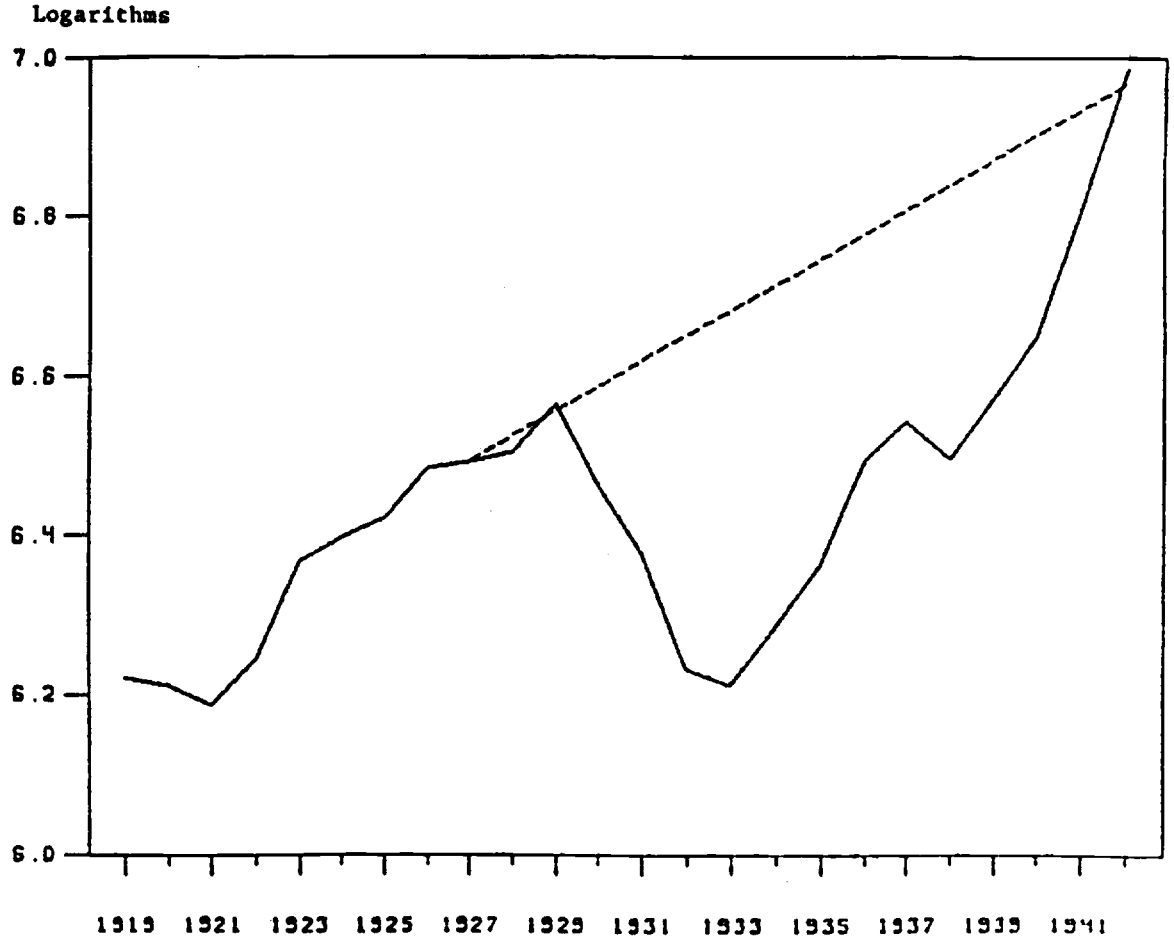

Figure 3

Simulation for Fiscal Policy
(1933-1942)

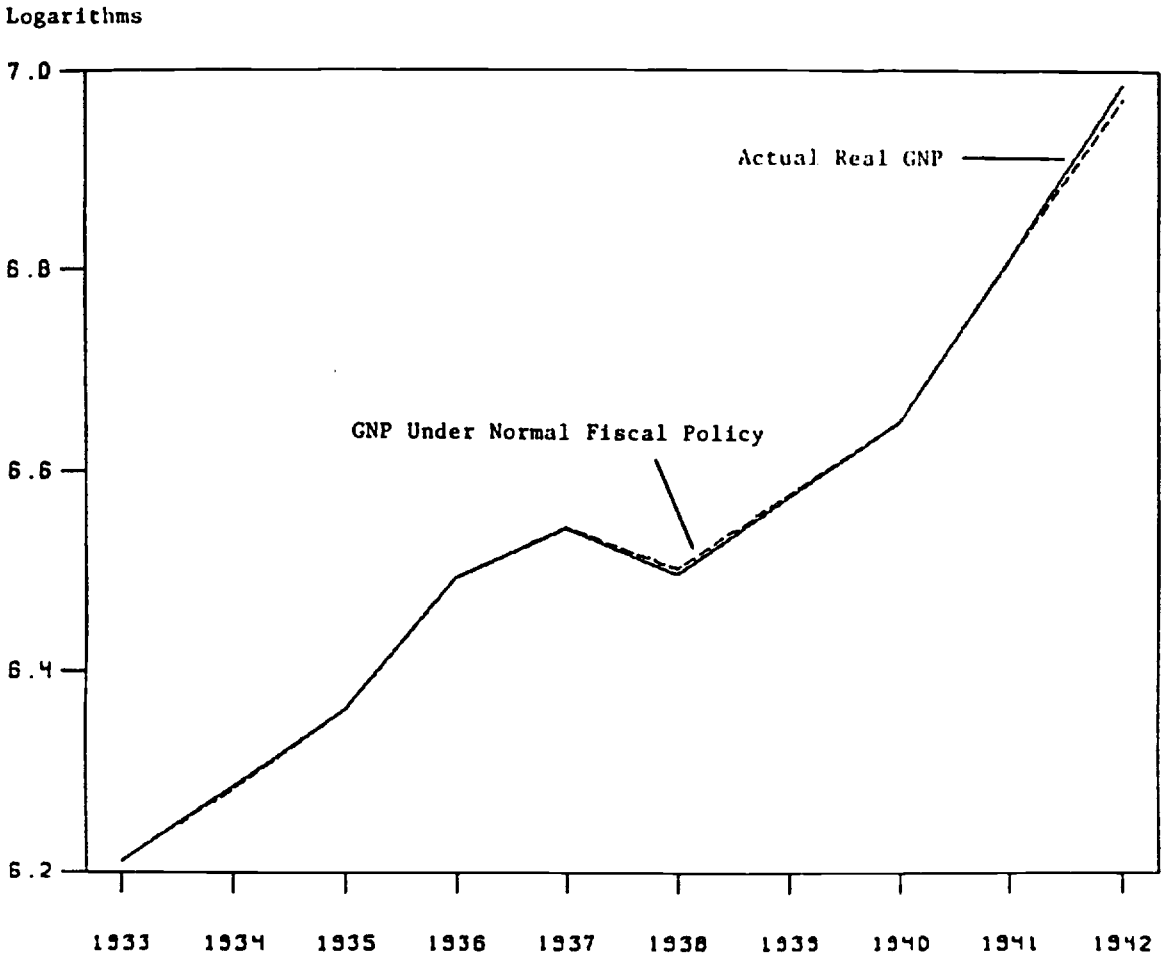

Figure 4

Fiscal Policy Variable (Lagged One year)
(1923-1942)

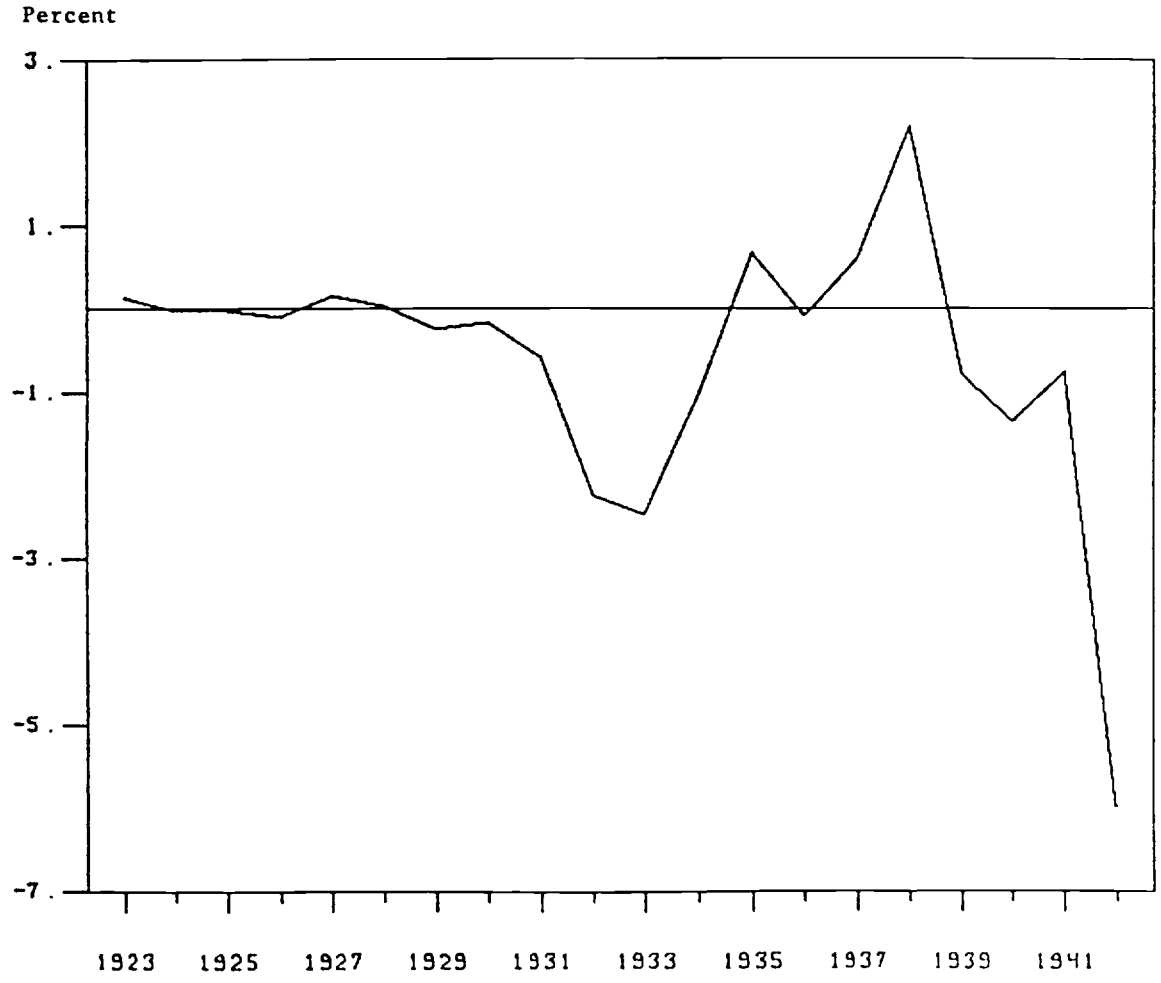

Figure 5

Simulation for Monetary Policy
(1933-1942)

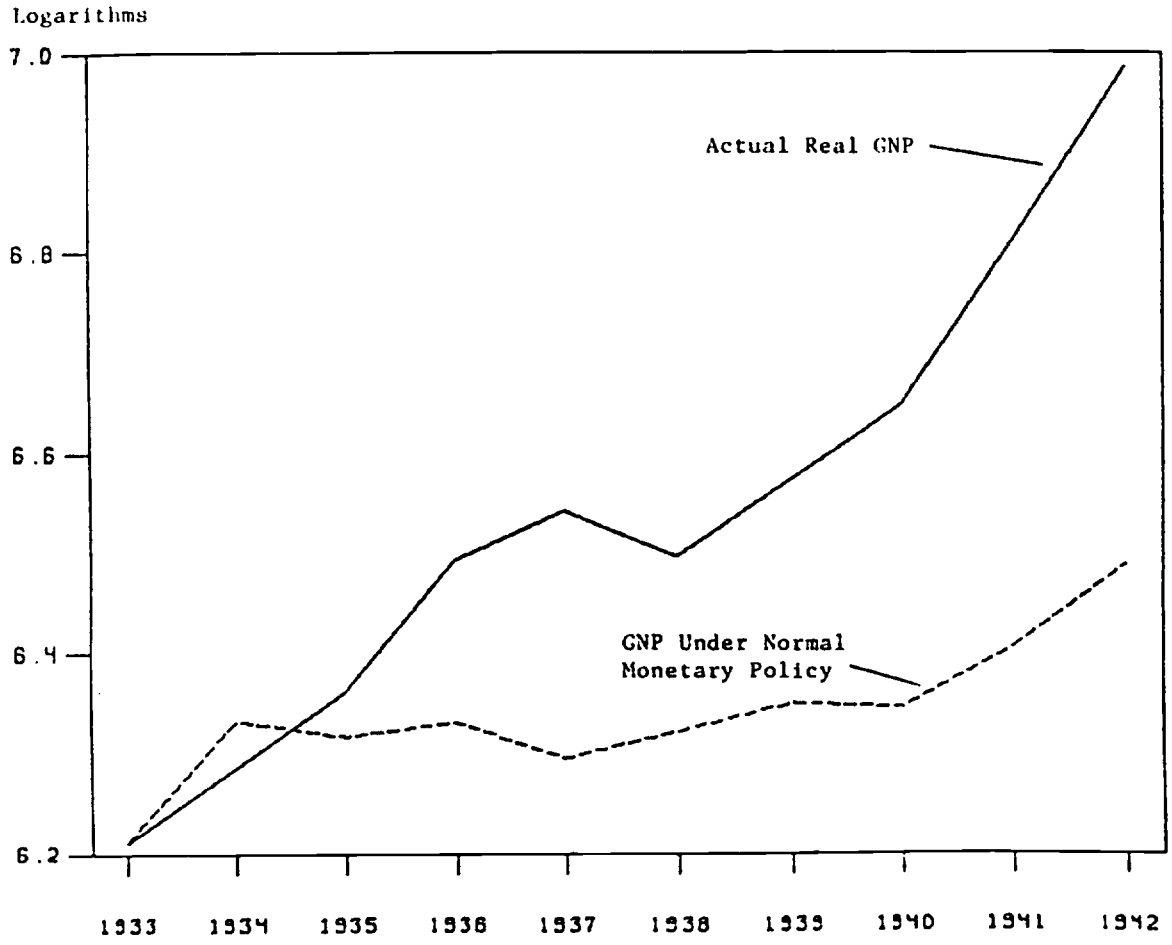

Figure 6

Monetary Policy Variable (Lagged One Year)
(1923-1942)

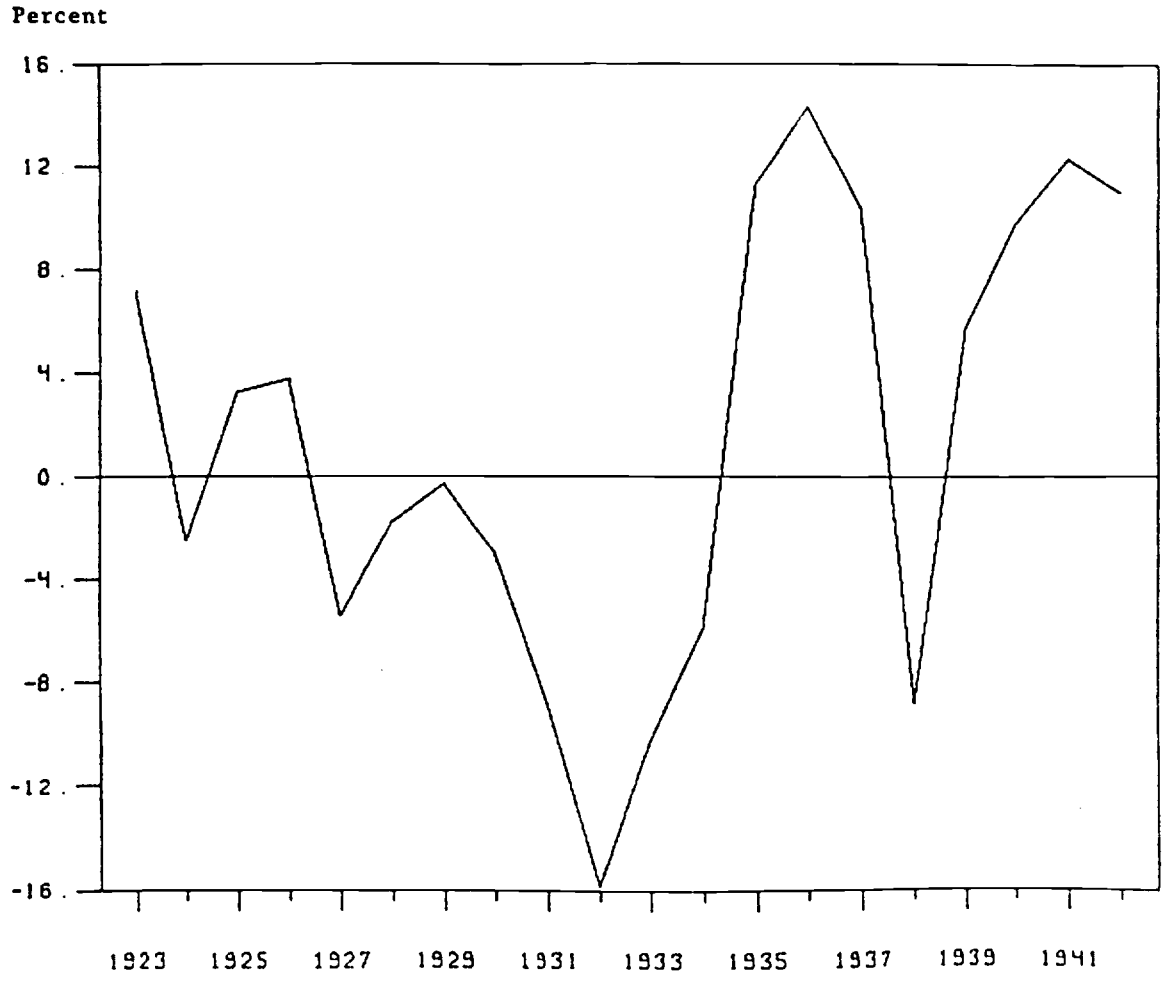

Figure 7

Nominal and Ex Post Real Commercial Paper Rate
(Quarterly, 1929-1942)

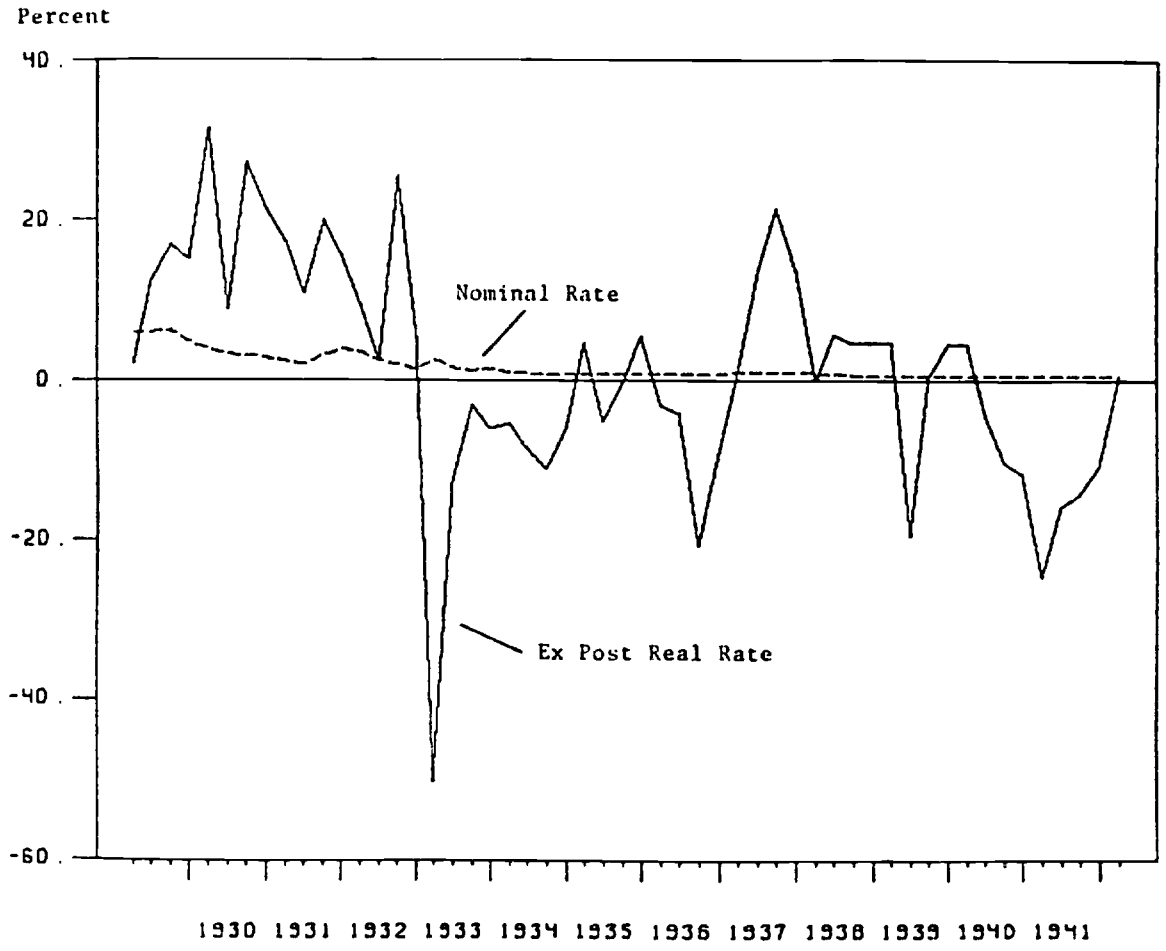

Figure 8

Estimates of the Ex Ante Real Interest Rate
(Quarterly, 1929-1942)

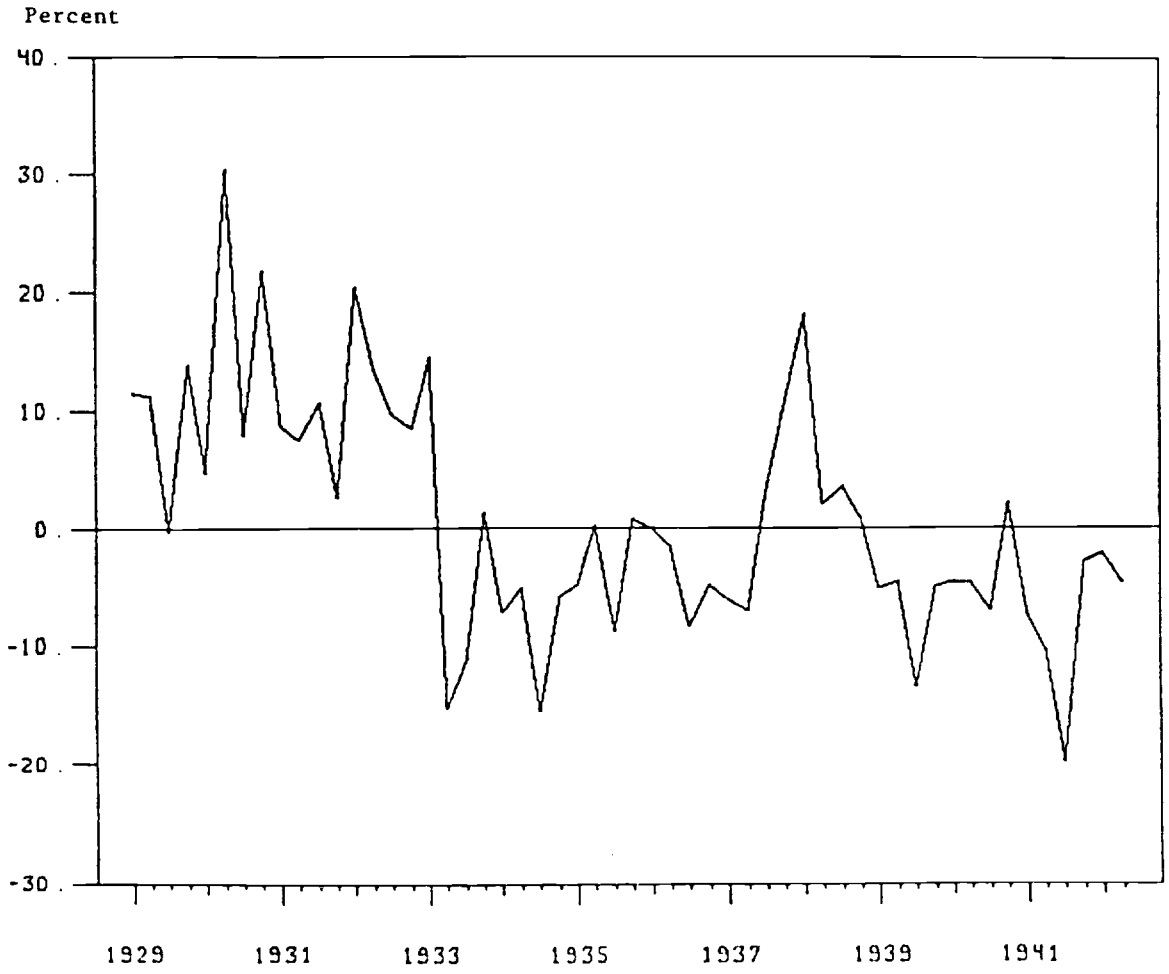

Figure 9

Real Fixed Investment and Ex Ante Real Rates
(1930-1942)

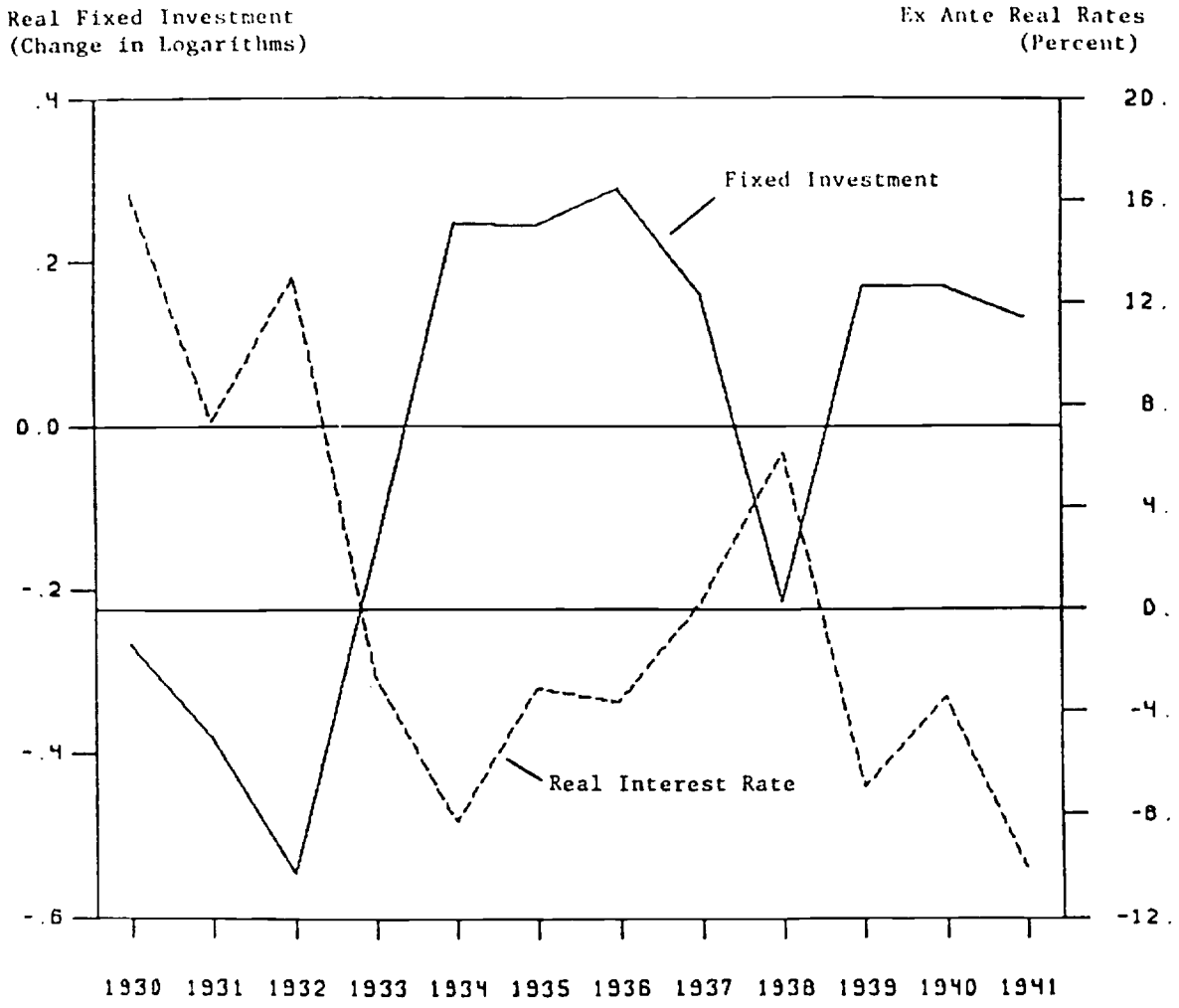

Figure 10

Real Consumer Expenditures on Durable Goods and Ex Ante Real Rates
(1930-1942)