Content Articles in Economics

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Government Budgets and Money: How Are They Related?

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The beginning college student probably has a vague notion that an additional dollar of government spending means an additional deficit of a dollar and an equal increase in money in circulation. A not insignificant portion of the instructor's time is devoted to dissuading the student from such a simplistic and erroneous view. The beginning of knowledge in the classroom is the realization that fiscal and monetary policies can be separated. The supply of money is basically controlled by the Federal Reserve (the "monetary authority") and the Fed is a quasi-independent part of government whose goals and objectives are unlikely to be identical with those of elected public officials. Government spending and (a portion of) deficits are controlled by the joint actions of the president and Congress (the "fiscal authority").

While the separation of fiscal and monetary policies along these lines may be the beginning of knowledge in the classroom, it is not all we need to teach to our students. Even with a quasi-independent monetary authority, government budgets can affect the money supply in various ways. Although useful in some contexts, the familiar litany that "the government" can finance its expenditures by taxes, borrowing from the public, or "printing money" is not particularly enlightening because we live in a system where the central bank is supposed to exercise some independent judgment and

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not be a mere bureau of the Treasury. Government expenditures can be financed by money creation only if the monetary authority reacts in a particular way to the stance of fiscal policy.

In this paper, we consider the impact of fiscal variables on the money supply. In a broader context, of course, the important question is, What are the causes of money-supply change, including the possible role of fiscal variables? Until recently, there was surprisingly little technical work in this area. At least partly in response to Buchanan and Wagner's (1977) claim of a strong positive response of money to budget deficits—the so-called debt-monetization or monetary-accommodation hypothesis—numerous studies have now appeared that attempt to resolve this issue.

THEORETICAL LINKAGES

Theoretically, budget deficits can correspond to either an increase or a decrease in the money supply. Some debt monetization is the likely outcome if the monetary authority places great weight on low interest rates or if fiscal- and monetary-policy decision making is linked together in some fashion that requires a partial funding of government expenditures through money creation. But with independent, uncoordinated fiscal and monetary authorities, each having different preferences, debt monetization may not occur. Out of a concern for inflation, for example, the monetary authority may choose to counter expansionary fiscal policy by decreasing the money supply.

Perhaps the most frequently advanced argument for debt monetization is as follows (see, for example, Francis, 1974, and Buchanan and Wagner, 1977). The sale of bonds to finance a deficit puts upward pressure on interest rates, and the monetary authority, because of a hypothesized overriding concern with stabilizing interest rates, counters this pressure with open-market purchases. The debt issued to finance the deficit is, at least to some extent, monetized.

Another argument for monetization considers certain long-run implications of the budget constraints facing both the monetary and fiscal authorities. To increase the monetary base, the monetary authority purchases government debt in open-market operations; this action reduces debt held by private investors, and thus, future interest payments by the fiscal authority to the private sector. Debt monetization thus produces *seignorage*, by which is meant "revenue from money creation," and this revenue source must be considered along with revenues from bond sales and taxes.

Along these lines, Sargent and Wallace (1981) argued that, under certain conditions, monetary policies cannot *forever* be manipulated independently of (the growth path of) government expenditures and the tax structure. The public's demand for bonds constrains the government by setting an upper limit on the real stock of government bonds relative to the size of the economy and by affecting the interest rate it must pay on the bonds. If the fiscal authority is dominant—that is, it independently sets its budgets, announc-

ing all current and future deficits—it determines the amount of revenue that must be raised through bond sales and seignorage. The monetary authority must finance with seignorage any discrepancy between the revenue demanded by the fiscal authority and the amount of bonds that can be sold to the public. Sargent and Wallace showed that if the demand for government bonds implies a real interest rate on bonds greater than the economy's rate of growth, the monetary authority cannot indefinitely hold down the growth in the monetary base in the face of continual deficits because the real stock of bonds will grow faster than the size of the economy. Once the upper limit on the stock of bonds relative to the size of the economy is reached, the principal and interest due on the bonds must be financed, at least in part, by seignorage. Even though the monetary authority can control the sequence of seignorage—it can decide to monetize the deficits now or later—it has no alternative as to whether or not to monetize the deficits.

Darby (1984) contended that Sargent and Wallace's argument is seriously wrong as a guide to understanding monetary policy in the United States, and the monetary base can be manipulated independently of fiscal policy. He presented an analysis which suggests that if the real rate of interest on government debt (assumed to be constant, as in Sargent and Wallace) is less than the growth rate of the economy, then financing the increased interest payments by issuing more debt can be consistent with reaching a new steady-state equilibrium. The historical facts, he argued, are that the before-tax real yield on government securities has been generally below the growth rate of real income in the United States, and thus the more relevant after-tax real yields have necessarily been even lower.

In a rebuttal, Miller and Sargent (1984) argued that in a more realistic model, the real rate of interest is not constant but is an increasing function of the ratio of government bonds to the monetary base. Evidence that the real rate of interest has averaged less than the real rate of growth over some historical period may reflect the actual monetary and budget policies in place during that period. The historical relationships would not be expected to remain constant after a shift to a regime with higher average deficits, as occurred in the early 1980s. Given the size of actual and projected budget deficits, Miller and Sargent remain concerned with the possibility that very large deficits must eventually be monetized.[1]

Most of the relevant literature, however, has focused on finding shorter-run connections between the government's budget and money. If we assume that the fiscal and monetary authorities jointly coordinate their policies, the various methods of financing government expenditures might be analyzed as seeking an optimal tax structure, including the "inflation tax" resulting from money creation. Generally, the optimal tax structure for a given level of expenditures spreads the burden over many taxes.

Along these lines, Barro (1977, 1978a) used a model in which government expenditures are financed by a mix of taxes and money creation, with the particular mix designed to minimize the total cost of raising revenue. For a given amount of tax-collection capital (which is determined in part by the

long-run or permanent level of government expenditures), an increase in current expenditures typically induces an increase in both taxes and money. According to Barro's model, it is temporary government expenditures—or "government expenditures relative to normal"—rather than the deficit that best captures the relation between budget changes and money.

Other considerations, however, suggest that the monetary authority may act to counter expansionary fiscal policy rather than accommodate it. Blinder (1983), for example, developed a game-theoretic framework that assumes two independent authorities, with neither dominant, and each having different ideas of what is best and worst for the economy. The situation is conceptualized as a two-person nonzero sum game. The fiscal authority is assumed to favor the most expansionary policy—a larger monetized deficit —while the monetary authority favors the most contractionary policy—a lowered deficit and lowered reserves. The fiscal authority's most (least) preferred outcome is the monetary authority's least (most) preferred outcome. The Nash equilibrium that emerges is a larger deficit and lowered reserves, which Blinder viewed as "the most plausible outcome of uncoordinated but intelligent behavior."[2] Blinder did suggest that under full coordination the two authorities might select a mix of easy money and tight fiscal policy.

In a framework in which the monetary authority is the follower and the fiscal authority is the leader, McMillin and Beard (1980), for example, derived the conditions under which the Federal Reserve will choose to accommodate or to counter expansionary fiscal policy. In this model, it is assumed that the monetary authority controls unborrowed reserves and that it acts as though it minimizes a loss function that includes as arguments both conventional macrostabilization goals and the goal of stabilizing interest rates. For simplicity, let the monetary authority be concerned with inflation and interest-rate stabilization. Expansionary fiscal actions that increase the deficit will tend, at least in the short run, to raise both the inflation rate and the rate of interest. The Federal Reserve will accommodate the expansionary fiscal policy only if it weights financial-market stability more highly than its macrostabilization goal. But if its concern for inflation is sufficiently stronger than its concern for stabilizing interest rates, it will act to counter the deficit by decreasing unborrowed reserves.[3]

EMPIRICAL EVIDENCE

In the final analysis, the impact of fiscal variables on the money supply is an empirical question. Unfortunately, the empirical evidence has been mixed. Numerous studies have found evidence that the Federal Reserve does accommodate budget deficits or other measures of expansionary fiscal policy; other studies, however, have suggested nonaccommodation. Undoubtedly, there are a number of reasons for the differences in empirical results among studies. In general, the results seem sensitive to the specification of the model, the sample period, and the definition and measurement of the fiscal variable.[4] It is unlikely that Federal Reserve policies or regimes

have been the same over the various years of estimation. A number of different deficit and other fiscal measures have been used as explanatory variables, and it is unclear what the "ideal" measure should be.

In studies conducted by Barro (1977, 1978a, 1978b), McMillin and Beard (1980), McMillin (1981, 1985), Levy (1981), Hamburger and Zwick (1981, 1982), Dewald (1982), Barth, Sickles, and Weist (1982), Allen and Smith (1983), Laney and Willet (1983), Hoffman, Low and Reineberg (1983), and Blinder (1983), a generally positive impact of some measure of expansionary fiscal policy on the money supply, the monetary base, or bank reserves was found. However, the strength of this positive relationship varied widely, and, in the case of Blinder, the direction of effect of the deficit on bank reserves depended upon the recent history of inflation and the growth in real federal purchases. Generally, mixed results were found by Froyen (1974) and Thornton (1984), and results from studies by Gordon (1977), Niskanen (1978), McMillin and Beard (1982), and Dwyer (1982) suggested nonaccommodation.

In a majority of studies, the fiscal variable used has been some measure of budget deficits, and the issue at debate has been the validity of the debt-monetization hypothesis. Deficit measures have included various measures of funds raised by government from the private sector in credit markets, the national-income-accounts deficit (surplus), and the high-employment budget deficit (surplus). Often, the absolute size of the deficit has been scaled by a measure of the size of the economy, for example, the GNP deflator times trend real GNP. Barro, however, found government expenditures relative to normal to be the relevant explanatory variable. The levels of government purchases and exogenous net taxes were used also in McMillin and Beard (1980) and McMillin (1981).

The most common approach has been to estimate a reaction function for the Federal Reserve of the following general form:

$$M = f(M_{-1}, U, P, R, D, X),$$

where M is some monetary aggregate (usually its rate of growth) that is assumed to be controlled by the Federal Reserve; M_{-1} is a lagged dependent variable; U represents Federal Reserve concern for a macrostabilization objective, such as unemployment or the gap between real output and real potential output; P represents concern for another macrostabilization variable—inflation; R represents interest rates or Federal Reserve concern for financial market stability; D is some deficit measure or other measure of fiscal policy; and X stands for a variety of other possible variables, including the balance of payments or other international variables and the influence of different presidential administrations or timing of elections. Few studies have employed this large a number of variables; many have used only three or four. Most estimated reaction functions have been "reduced-form" single-equation models, although three studies—McMillin and Beard (1980), McMillin (1981), and Levy (1981)—tested the fiscal policy–money supply relation within the context of a structural model.[5]

In two important papers, Barro (1977, 1978a) estimated an equation to predict the growth rate of the money supply in which the explanatory variables were lagged values of money growth, a lagged unemployment-rate variable, and real federal expenditures relative to normal. To test Buchanan and Wagner's (1977) suggestion of substantial debt monetization, Barro (1978b) added a deficit variable—the national-income-accounts surplus divided by the GNP deflator times trend real GNP—to his money-supply equation. This equation was estimated for annual-average M1 for 1941–1976, using yearly data. When entered separately, the surplus variable showed the expected significant negative sign (i.e., a deficit leads to monetary accommodation). However, when both the surplus and Barro's expenditure variables were used, the sign of the surplus variable changed and the main explanatory power from the state of the federal budget was derived from expenditures relative to normal rather than from any independent information contributed by the surplus variable. A regression for the 1946–1976 period also provided no support for the debt-monetization hypothesis.

Hamburger and Zwick (1981) argued that the 1960s witnessed major changes in macroeconomic policy, as emphasized by Buchanan and Wagner, and thus the years prior to 1961 should be omitted. For the period 1954–1976, they presented results that were consistent with Barro's results, but when the equation was reestimated for 1961–1974, deficits had a stronger influence on money growth than did the expenditure variable. The results were even stronger in favor of a positive deficit-money linkage when funds raised in credit markets by the government in the flow-of-funds accounts was substituted for (the negative of) the national-income-accounts surplus variable.

Hamburger and Zwick altered Barro's equation by calculating the deficit on a complex weighted-average basis, which they claimed more closely aligns the deficit and money-growth measures. Although it apparently did not matter for 1954–1976, the averaging of the deficits did matter for 1961–1974. When the deficits were not averaged, that is, when the actual deficits from the national income and product accounts and the flow-of-funds accounts were used, McMillin and Beard (1982) found no strong or consistent relationship between either deficits or expenditures and money growth over the same 1961–1974 period, or over the longer 1961–1976 and 1961–1978 periods. Again using their technique to average the deficits, Hamburger and Zwick (1982) found continued debt monetization over the longer 1961–1981 period, although a dummy variable was included for 1975 and 1976 in their regression.

If anything, this debate raises obvious questions about the stability of regressions based on so few observations. Apparently, not only is the time period important, but so is the choice of fiscal measure and its alignment in time with the money supply. Using monthly, rather than yearly, data, Hoffman, Low, and Reineberg (1983) regressed the percentage change in the monetary base on the percentage change in gross Treasury debt outstand-

ing, and separately on a budget-surplus measure. Alternative lead-lag schemes were used. In general, they found that the strength of the debt-monetization hypothesis depends crucially on the sample period (the unusual 1975–1976 period was noted), but that, on average over the 1960–1980 period, the Federal Reserve acted in an accommodating fashion. Interestingly, some of this accommodation occurred one or two months in *advance* of the actual debt issue, and there is also evidence of both contemporaneous and lagged effects.

Allen and Smith (1983) estimated Barro-type reaction functions based on quarterly data for a period extending from 1954 to 1980 and for various subperiods. Barro's expenditure variable was generally insignificant. Using the total change in the government's debt, which includes off-line budget items, Allen and Smith found a significantly positive impact on the growth of the monetary base for 1954:1–1961:2 and 1961:3–1969:3, but not for the most recent subperiod 1969:4–1980:4 or for the longer periods 1954:1–1980:4 and 1961:3–1980:4. When coefficient instability during the latter period was corrected by a dummy-variable technique, however, the debt variable remained stable and was positive and significant.

Levy (1981) estimated a reaction function with quarterly data from 1952 to 1978 and reported a very strong positive effect of changes in a debt variable (not deflated by either a price index or a trend value of real GNP) on changes in the monetary base. Unlike the individual studies discussed above, Levy estimated a reaction function within the context of a structural model of the economy and he considered a larger number of right-hand variables. Several were statistically insignificant, however, and only lagged change in the monetary base, the expected inflation rate, seasonal dummies, and the debt variable were significant. He indicated that the equation was not stable over the whole period.

Blinder (1983), using annual fiscal-year data, investigated the relationship between deficits and bank reserves. Regressions were run for 1949–1981 and various subperiods. For the long period, he regressed the change in reserves on a deficit measure and the change in the public's currency holdings, with all variables relative to GNP. He found no significant results. After exploring possible interactions between the effects of a deficit on the change in reserves and six other variables, he concluded that the lagged rate of inflation and the rate of growth of real government purchases are the most important variables for explaining the fraction of the deficit that is monetized. Interestingly, the regressions for the entire period and the subperiods indicated that higher inflation and faster growth of purchases reduce the fraction of the deficit that is monetized (the strength of these relations varied across subperiods). Even with no inflation or growth in real purchases, only modest debt monetization was suggested. If the inflation rate or growth in purchases is high enough, as seems most likely, the Federal Reserve will decrease the growth in reserves, so that negative monetization rates will occur.

McMillin and Beard (1980) estimated the same quarter impact of nominal

levels of government purchases and exogenous net taxes on unborrowed reserves in the context of a linear *IS-LM* structural model with an expectations-augmented Phillips curve appended. Quarterly data were used for 1953–1976. The Federal Reserve reaction function contained a large number of variables—lagged nominal output, measures of both macrostabilization and interest-rate-stabilization objectives, the two fiscal variables, and a variety of dummy variables. The results indicated that the Federal Reserve reacts systematically to both macrostabilization and interest-rate-stabilization goals, and that on balance it accommodates fiscal expansion. The reduced-form money-supply equation indicated a significantly positive, but modestly sized, impact of both an increase in the level of government purchases and a reduction in exogenous net taxes. With the use of a similar structural model, the analysis was extended to a dynamic setting in McMillin (1981). Simulations were run for 1961–1976. While the dynamic multipliers for a sustained increase (decrease) in government purchases and the deficit (exogenous net taxes) declined over time, the cumulative dynamic multipliers increased over a four-year period.

As an alternative to reaction functions, some researchers have used relatively unrestricted multivariate vector autoregressions employing "Granger-causality" tests. Variable X—for example, some deficit measure—is said to Granger-cause variable Y—for example, the monetary base—if the past values of X in conjunction with the past values of Y can be used to predict Y more accurately than it can be predicted using only past values of Y. Dwyer (1982), considering six variables and assuming a common lag length for all variables, found that government debt acquired by the private sector does not Granger-cause debt acquired by the Federal Reserve or the money supply. He used quarterly data for the period 1952–1978 and reported that the results were basically unchanged when pre-1961 data were dropped.

Dwyer argued that a change in the government's indebtedness is better measured by the change in the *real* value of privately held government debt than by conventional deficit measures. Simply put, if inflation is anticipated, a change in the inflation rate will increase nominal interest rates and thus lead to larger nominal deficits to finance those interest payments. The real government deficit measures both the decrease in the real value of outstanding bonds (as nominal interest rates are higher) and the increase in the deficit necessary to keep the real value of outstanding bonds constant. Statistics indicate that the real government deficit has risen little over time, and Dwyer's empirical results are consistent with the view that the money supply determines deficits and not vice versa.[6]

Different results, however, were found by McMillin (1985) for the 1961:1–1979:3 period. Employing a statistical technique that allows the lag lengths for variables on the right-hand side to differ and using the market (rather than par) value of privately held government debt, McMillin found that a change in the real-debt variable does Granger-cause the monetary base. Further, two conventional measures of the deficit also were found to Granger-cause the monetary base. Coefficient instability was indicated, however,

when data prior to 1961 or subsequent to 1979:3 were added to the sample. Thornton (1984), using two conventional deficit measures, found mixed evidence; no debt monetization was evident for 1972:3–1983:4, but for a longer period, 1960–1983, there was evidence of debt monetization with one of the deficit measures.

OTHER EXPLANATIONS OF FEDERAL RESERVE BEHAVIOR

Applications of the theory of bureaucracy may offer useful insights into Federal Reserve behavior, as suggested by Friedman (1982), but as yet, precise connections between government budgets and the money supply have not been worked out. Chant and Acheson, in a series of pioneering papers concerned with the Bank of Canada (e.g., Acheson and Chant, 1973), argued that a central bank cannot be analyzed solely in terms of public interest or its stated objectives, but also must be analyzed in terms of self-interest or the bureaucratic incentives faced by its officials. Toma (1982) argued that the Federal Reserve values its discretionary profits and this introduces an inflationary bias to monetary policy. He found that changes in Federal Reserve expenditures are a function of changes in its revenues. Shughart and Tollison (1983) focused on the Federal Reserve's size, as measured by the number of its employees, and presented evidence in a reaction-function equation that the monetary base increases when Federal Reserve employment increases. This result, they argued, suggests that one motivation for excessive expansion in the money supply is to finance the growth of the bureaucracy.

A key concept in the literature on the political business cycle is that there are vote-gaining incentives to follow expansionary policies aimed at generating a boom prior to an election. The resulting longer-run inflationary pressures largely occur after the election, and contractionary policies are then pursued. But can this argument be applied to the Federal Reserve, where a strong rationale for maintaining its "independence" has been to guard against political influence? Many observers question the extent of Federal Reserve independence; in articles by Weintraub (1978) and Kane (1980, 1982), the highly political environment in which the Federal Reserve System actually operates was emphasized. Kane (1982), for example, identified strong political forces that constrain the Federal Reserve to dampen the size of short-run increases in nominal interest rates, and these pressures are especially evident in election years.

Using a method of classifying Federal Reserve intentions as "tight" and "easy," Potts and Luckett (1978) found that the Federal Reserve System responds to political influence in the sense that its ordering of priorities with respect to stabilization objectives reflects the priorities of different presidential administrations. The finding that the Federal Reserve is influenced by the party in power is consistent with that of a number of traditional reaction-function studies (e.g., Froyen, 1974, and McMillin and Beard, 1980). Employing the technique used in their earlier study, Luckett and

Potts (1980), however, found no support for the view that monetary policy is more expansionary during the period prior to presidential elections.

Laney and Willet (1983) estimated a traditional reaction function using yearly data for 1960–1976. Although their results did not support the view of partisan political behavior by the Federal Reserve, they did find a systematic election-cycle effect on fiscal policy. A high-employment deficit variable had a quantitatively large positive effect on Federal Reserve behavior, as measured by changes in the money supply, and they found weak evidence that the Federal Reserve System may respond more to a "political component" of the deficit than to the residual component.

SOME CONCLUDING COMMENTS

There is no lack of plausible explanations of Federal Reserve behavior. Concerns for deficits, interest rates, traditional macrostabilization objectives, political factors, and even the self-interest of bureaucrats might help explain the behavior of the monetary authority and, thus, the money supply. It is also obvious, however, that there is no generally accepted, well-specified, single model of the Federal Reserve that we can rely on to "solve" the question of the impact of federal budgets (and other variables). Compounding this problem is the possibility that the Federal Reserve will react differently to the relatively larger actual and projected deficits of the 1980s than it did to smaller deficits of earlier years.

An important question concerns the best measure of "the deficit." Boskin (1982), for example, argued that conventional deficits are far different from any reasonable measure of the change in the government sector's wealth, and he pointed to the large number of conceptual, measurement, and accounting problems involved in providing an appropriate measure of net deficits or surpluses, adjusted for inflation. His argument suggests that previous research on the impact of deficits has been based on analytically inappropriate concepts or has been subject to large measurement errors so that such issues as debt monetization have been analyzed and tested in an inappropriate manner.

Eisner and Pieper (1984) recently constructed several new statistical series for the real market value of both federal government assets and liabilities. As now widely noted, conventional deficit measures fail to account for changes in the real market value of outstanding federal debt. As higher inflation rates drive up nominal interest rates, for example, the real market value of outstanding government securities falls, thus reducing real indebtedness. Adjustments of conventional deficit measures to make them correspond to changes in net financial liabilities entail both these interest-rate effects and the effect of inflation on the real values of the corrected market values.

As Eisner and Pieper noted, not to account for the effects of inflation represents a type of money illusion. Even if their arguments are accepted, however, the question still remains of how the Federal Reserve should be

modeled for purposes of testing the debt-monetization hypothesis. Has it, in fact, acted as a wholly rational bureau of government that is free of money illusion, thereby suggesting that an inflation-corrected measure of the deficit is appropriate? Or, as suggested by Blinder (1983), has the Federal Reserve suffered from inflation illusion so that the uncorrected deficit is the appropriate measure?

Despite the absence of a simple, unequivocable relationship between deficits and money, it is best that we explore these issues with students in the classroom. It is better to consider the ways in which deficits and other variables might influence Federal Reserve behavior than to simply ignore the entire question.

NOTES

1. For a more technical discussion of the issues in this debate, see Dwyer (1984b).
2. In a noncooperative game, the "players" make their decisions independently and there is no coordination. A Nash equilibrium exists when neither player has an incentive to change his strategy if acting unilaterally, that is, each would be worse off if he changed his strategy while the other player held his strategy constant.
3. Most discussions in the literature ignore possible private-sector effects on the money supply. Yet a deficit-induced increase in market interest rates can increase the money supply even with Federal Reserve behavior unchanged as financial institutions alter their holdings of excess and borrowed reserves and individuals and firms rearrange their portfolios of assets in response to the higher interest rates. For example, given the discount rate, banks will borrow more at the discount window and economize on excess reserves in order to expand their portfolio of loans and securities. The magnitude of this effect is thought to be small, however. This issue is treated in McMillin and Beard (1986).
4. Similar results were found by Barth, Iden, and Russek (1984) in their survey of the impact of budget deficits on interest rates.
5. Although there is a sizable literature on Federal Reserve reaction functions, most early studies concentrated on stabilization objectives and did not explicitly test for the impact of fiscal variables. In twelve studies catalogued through 1978 by Barth, Sickles, and Wiest (1982), only Froyen (1974) tested for fiscal variables, and he found mixed results, depending on the sample period. A survey of the relevant literature through 1980 can be found in McMillin and Beard (1981), and some recent reaction-function literature is considered in Dwyer (1984b).
6. See the debate between Garrison (1984) and Dwyer (1984a) over the validity of Dwyer's deficit measure and the appropriateness of Granger-causality tests.

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