Federal Debt Management Policy:

A Re-Examination of the Issues

By V. Vance Roley

Federal debt management policy has been a topic of interest among economists for many years. Among issues currently unresolved are those concerned with the relative desirability and economic effects of alternative debt management policies. Do changes in the maturity composition of the Federal debt affect financial markets and the economy? If so, should policymakers administer the Federal debt with economic stabilization purposes in mind? Or should the main concern be with other objectives such as minimizing interest costs or lengthening the average maturity of the Federal debt? This article examines these issues. The first section defines debt management and discusses the size and composition of the Federal debt in recent years. The second and third sections examine the possible objectives of Federal debt management policy with respect to two broad categories—economic stabilization and interest cost minimization. Federal debt management policies are examined in terms of their economic implications on the financial and nonfinancial sectors of the economy.

THE STRUCTURE OF THE FEDERAL DEBT

Federal debt management policy may be defined as the policy that establishes the Federal debt's maturity composition — the relative supplies of securities with different maturities. In this article, the Federal debt is defined to consist of the outstanding interest-bearing marketable Treasury securities held by private investors. Several features of this definition should be noted. First, the total size of the Federal debt is defined to exclude the noninterest-bearing money liabilities of the Federal Government. Policy concerning the substitution of money for interest-bearing Federal debt, or vice versa, is usually assumed to be in the province of monetary policy.

Second, the portion of the total outstanding Federal debt relevant to debt management policy is the amount held by private investors. Thus, the holdings of Treasury securities by U.S. Government agencies, U.S. Government trusts, and the Federal Reserve System are excluded since they primarily involve intergovernmental transfers.

Finally, debt management policy is jointly determined by the actions of the Treasury and the Federal Reserve System. The Treasury may conduct debt management policy through ordinary refunding of maturing Federal debt and by exercising call options on some outstanding issues. The Federal Reserve System may change the composition of the Federal debt through open marketoperations designed to substitute Treasury securities in its portfolio

Table 1
THE SIZE OF THE FEDERAL DEBT

	1956	1966	1976	1956-66	1966-76
	(Billions of Dollars)			(Average Annual Percentage Change)	
Total interest-bearing Federal debt	274.2	325.0	652.5	1.9	10.1
Nonrnarketable issues	113.8	107.0	231.2	-0.6	11.6
Marketable issues	160.4	218.0	421.3	3.6	9.3
Held by private investors	130.5	159.1	307.8	2.2	9.3
Interest outlays in U.S. budget*	6.3	11.3	34.6	7.9	20.6
	(Per Cent)				
Ratio of the total interest-bearing Federal debt to GNP	65.2	43.2	38.2	-3.4	-1.2
Ratio of marketable issues held by private investors to GNP	31.0	21.1	18.0	-3.2	-1.5
Ratio of interest outlays to total U.S. budget outlays*	8.9	8.4	9.4	-0.6	1.2

*Fiscal years.

SOURCE: **Treasury Bulletin.**

with Treasury securities held by private investors with different maturities. Consequently, when the Federal Reserve System has sufficiently large and 'diverse. holdings of Treasury securities, its potential for producing changes in the composition of the Federal debt equals the wide range of possibilities available to the Treasury.

Marketable interest-bearing Federal debt held by private investors increased from **$130.5** billion in **1956** to **$307.8** billion in **1976.** (See Table **1.)** During the decade beginning in **1956,** the average annual rate of growth was only **2.2** per cent. In contrast, during the more recent **1966-76** period, the rate of growth increased substantially to average **9.3** per cent annually. However, the relative size of the Federal debt has generally decreased during the last two decades. The ratio of the marketable **interest-**bearing Federal debt held by private investors to gross national product **(GNP)** declined from **31.0** per cent in **1956** to **18.0** per cent **in 1976.** Despite the slight average annual rate of decline of **1.5** per cent during the last decade, the value of this ratio increased from **16.7** per cent in **1975** to **18.0** per cent in **1976.**

Interest costs on the Federal debt have increased substantially during the last decade. As indicated in Table **1,** interest outlays by the Federal Government increased from **$11.3** billion in **1%6** to **$34.6** billion in **1976,** growing at an average annual rate of **20.6** per cent. This rise was due both to the increase in absolute size of the Federal debt and to the higher yields on the Treasury securities issued during the period. However, for the entire period

Table 2
THE COMPOSITION OF THE PRIVATELY HELD MARKETABLE INTEREST-BEARING FEDERAL DEBT FOR SELECTED YEARS
(In Per Cent)

Years to Maturity	1956	1966	1976	1956-66	1966-76
				(Changes)	
Within 1 year	34.9	42.1	51.2	7.2	9.1
1 to 5 years	30.6	30.3	33.7	−0.3	3.4
5 to 10 years	12.7	15.4	10.1	2.7	−5.3
10 years and over	21.8	12.2	5.1	−9.6	−7.1
Total	100.0	100.0	100.0	0.0	0.0

SOURCE: Treasury Bulletin.

considered, interest costs as a ratio to total U.S. budget outlays have stayed in the range of **8** to **9** per cent.

The maturity composition of the Federal debt has exhibited significant changes over the past two decades. (See Table 2.) The percentage of securities held by private investors maturing within **1** year has increased from **34.9** per cent in **1956** to **42.1** per cent in **1966,** and to **51.2** per cent in **1976.** In contrast, privately held Treasury securities with **10** years and over to maturity have declined proportionately throughout these periods to **5.1** per cent of the total in **1976.** However, due to the recent emphasis by the Treasury in issuing long-term securities, the percentage of securities with **10** years and over to maturity has increased to **5.8** per cent of the total in the third quarter of **1977.**

ECONOMIC STABILIZATION AS AN OBJECTIVE OF FEDERAL DEBT MANAGEMENT POLICY

This section investigates the potential effectiveness of Federal debt management for economic stabilization. Federal debt management is potentially effective for stabilization if changes in the maturity composition of the debt do, in fact, affect the economy. Two types of effects may be distinguished — the interest rate effect and the liquidity effect.[1] A change in the maturity composition of the Federal debt will have an impact on the economy through the interest rate effect: if two conditions are met. The first condition is that changes in the maturity composition of the Federal debt affect the relative yields on different maturities of Treasury securities, implying that investors view different maturities of Treasury securities as distinct financial assets. Second, given that different maturities of Treasury securities are

[1] **A detailed analysis of the liquidity impact of Federal debt management is beyond the scope of this article. Researchen who have investigated the liquidity impact usually find that a shift from long- to short-term Treasury securities promotes economic expansion. However, in times of full employment and full capacity utilization, a similar shift may propagate inflationary excess aggregate demand. See, for example, Warren L. Smith, "Debt Management in the United States," in Joint Economic Committee, *Study of Employment, Growth, and Rice Levels* (Washington: Government Printing Office, 1960); and James Van Home and David A. Bowers, "The Liquidity Impact of Debt Management," *Southern Economic Journal,* Vol. *34* (April 1968), pp. 526-37.**

distinct, then changes in the maturity composition of the Federal debt affect private security yields which influence the level of economic activity. In particular, a decline in long-term private security yields may increase the incentive to produce capital' goods, and an increase in long-term private security yields may decrease the incentive to produce capital goods.

Federal Debt Management and Treasury Security Yields

There are several competing theories concerning the impact of changes in the maturity composition of the Federal debt on relative yields of different maturities of Treasury securities. Two such theories are the "pure expectations" and "market segmentation" hypotheses.

The "pure expectations" hypothesis implies that a change in the relative supplies of different maturities of Treasury securities *does* not affect their relative yields. The rationale of this theory is that investors are not concerned about the lengths to maturity of different Treasury securities. Instead, investors are concerned only with the expected holding-period yields[2] on securities. For example, if an investor has a 3-month planning horizon, he may compare the current yield on a 3-month Treasury bill with the interest payment and expected capital gain on a long-term Treasury security. If the expected holding-period yield on the long-term Treasury security is greater, the investor will purchase the long-term security, and vice versa. Thus, this theory implies that investors buy and sell securities until all future holding-period yields are expected to be equal,' regardless of the relative amounts supplied in the market.

In contrast,. the "market segmentation" hypothesis asserts that a change in the relative supplies of different maturities of Treasury securities *does* affect their relative yields. The rationale of this theory is that investors have definite preferences for specific maturities of Treasury securities which result from institutional or regulatory factors. For example, since the liabilities of insurance companies and pension funds are committed for long durations, these types of investors may prefer to invest in long-term financial assets. In this case, a difference in the expected 3-month holding-period yields between 3-month Treasury bills and long-term Treasury securities will not induce these investors to shift out of their preferred maturity unless the differential is substantial. Hence, the market yields on securities with different maturities are determined by the approximately independent market demands and supplies for each maturity class of Treasury securities. This implies that the expected holding-period yields for securities with different maturities may not' be identical over a given period, and that shifts in relative supplies affect relative yields by changing the individual supplies in the segmented markets for Treasury securities.'

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2 A security's holding-period yield is defined as the sum of interest payments and capital gain that occurs during the period of measurement as a per cent of its beginning-of-period price. The capital gain, in this 'sense, may be positive, negative, or zero.

3 Other variants of this theory have included risk or liquidity premiums in the yields on long-term securities. This is based on the reasoning that investors may want to hold securities for only relatively short time periods. Thus, if a long-term security was purchased, there would be the risk of having a capital loss. Therefore, in order to persuade investors to purchase long-term securities, they must have higher yields as compensation for their greater risk. See, for example, John R. Hicks, *Value* and *Capital* (London: Oxford University Press, 1939), pp. 141-52.

4 For further' discussion of the market segmentation hypothesis, see J. M. Culbertson, "The Term Structure of Interest Rates," *Quarterly Journal of Economics*. Vol. 71 (November 1957), pp. 485-517.

To summarize, under the pure expectations hypothesis, changes in the relative supplies of different maturities of Treasury securities would be ineffective in changing the term structure of Treasury security-interest rates, and under the market segmentation hypothesis, changes in relative supplies would be effective. However, actual market yields are most likely determined by market forces consisting of a combination of these theories. Thus, the actual extent of the effect on Treasury security yields from a change in the maturity composition of the Federal debt must be resolved empirically.

Previous empirical research tends to support the pure expectations hypothesis.[5] However, the methodologies used in previous research have several shortcomings. First, these studies have not investigated the demand for Treasury securities by separate categories of investors, such as insurance companies, pension funds, and commercial banks. Thus, any influences from partly segmented markets—because of differing portfolio selection behavior among separate categories of investors—have not been included in previous studies. Second, these studies have utilized reduced form equations in describing market-determined Treasury security yields. That is, instead of using supply and demand relationships for various maturities of Treasury securities and finding those interest rates that equate the individual market supplies with the individual market demands, the most common approach has been to try to explain interest rates by using any of the possible variables that may influence investors' demands. While the reduced form procedure is appropriate when it is constrained by the underlying demand relationships, previous empirical research has not imposed this restriction. Finally, many previous studies have neglected the possible implications of cash or wealth flows on the short-run portfolio selection behavior of investors.

The shortcomings outlined above were avoided in recent empirical research where the impact on yields from a change in the relative supplies of different maturities of Treasury securities is analyzed by constructing a disaggregated structural model.[6] The model is designed to explain how yields are determined and to identify the factors that affect yields. In the model, yields on different maturities of Treasury securities are determined by considering the market demands and supplies. The demand for Treasury securities in each maturity category by various categories of investors is determined separately. In addition, special attention is given to short-run portfolio adjustment and to the impact of new cash or

5 A partial list of the empirical research that finds small, if any, effects on the term structures of Treasury security interest rates from a change in the maturity composition of the Federal debt includes Arthur M. Okun, "Monetary Policy, Debt Management, and Interest Rates: A Quantitative Appraisal," in Commission on Money and Credit, *Fiscal and Debt Management Policies* (Englewood Cliffs: Prentice-Hall, 1963), pp. 331-80; Robert Haney Scott. "Liquidity and the Term Structure of Interest Rates," *Quarterly Journal of Economics*, Vol. 79 (February 1965), pp. 135-45; Franco Modigliani and Richard Sutch, "Innovations in Interest Rate Policy," *American Economic Review*, Vol. 56 (May 1966), pp. 178-97; Modigliani and Sutch, "Debt Management and the Term Structure of Interest Rates: An Empirical Analysis of Recent Experience," *Journal of Political Economy*, Vol. 75 (August 1967), pp. 569-89; Michael Hamburger and William L. Silber, "Debt Management and Interest Rates: A Re-examination of the Evidence," *The Manchester School of Economic and Social Studies*, Vol. 39 (December 1971), pp. 261-67; and Richard W. Lang and Robert H. Rasche, "Debt Management Policy and the Own-Price Elasticity of Demand for U.S. Government Notes and Bonds," Federal Reserve Bank of St. Louis *Renew*, September 1977, pp. 8-22. Somewhat larger effects than those indicated in these studies have been found by Gail Pierson. See Pierson, "Effect of Economic Policy on the Term Structure of Interest Rates," *Review of Economics and Statistics*, Vol. 52 (February 1970), pp. 1-11.

6 V. Vance Roley, A *Structural Model of the U.S. Government Securities Market*, Ph.D. dissertation, Harvard University, 1977.

Table 3
DYNAMIC SIMULATION RESULTS FOR THE 3- TO 5-YEAR AND LONG-TERM YIELDS ON TREASURY SECURITIES FOR 1960:I-1975:IV
(In Per Cent)

Yields	Actual Mean	Control Mean	Control RMSE*	Experiment Mean	Experiment Difference from Control
3- to 5-year	5.44	5.43	0.34	5.07	-0.36
Long-term	5.21	5.19	0.20	5.70	+0.51

*RMSE is the root-mean-square error.

wealth flows on the short-run demand for Treasury securities. .

After determining the Treasury security demands for each investor group, the individual demands are totaled across investor groups to arrive at market demands for each maturity category. Total demands along with the outstanding supplies are then used to determine the yields on each maturity category. The investor categories included in the model are commercial banks, households, life insurance companies, mutual savings banks, nonfinancial corporate businesses, other insurance companies, private pension funds, savings and loan associations, state and local government general funds, and state and local government retirement funds. The maturity categories are formed by disaggregating Treasury securities into four weighted maturity classes. Short-intermediate-term and long-term Treasury securities, which roughly correspond to 2 to 5 years and over 10 years to maturity, respectively, are currently included in the model. .

The empirical results of the model indicate that the disaggregated structural model performs well in explaining Treasury security yields with a high degree of accuracy. A control simulation was used to determine the model's performance during the sample period used for estimation (1960:I–1975:IV). The control simulation determines the Treasury security yields predicted by the model.' The results for the control simulation reported in Table 3 indicate that the model has no significant bias in its within-sample predictions—that is, the actual average yields of 5.44. and 5.21 per cent are very close to the predicted average yields of 5.43 and 5.19 per cent for the 3- to 5-year and long-term yields, respectively.' In addition, the model's. within-sample predictive performance is comparable to previous approches on the basis of the reported measure of dispersion (root-mean-square error) on the predicted yields.

More importantly, the empirical results of the model ,indicate that the maturity composition of the Federal debt does affect Treasury security yields. This is shown by an experiment. In the experiment, the structure of

[7] In addition, the control simulation is fully dynamic in the sense that all lagged endogenous variables (i.e., Treasury security yields and demands) take values solved from the model in previous periods.

[8] The fad that there is no significant bias in the results for the control simulation is not a property that necessarily follows from the way the model is constructed. Unlike single equation models that contain constant terms, the mean of the "predicted values does not necessarily equal the mean of the actual values. In addition, the control simulation uses values solved in the model for all lagged endogenous variables included in the model thereby canceling the necessity of the zero bias property even in single equation models.

the Federal debt was changed permanently by shifting $2.5 billion from short-intermediate-term securities to long-term securities beginning in 1959:IV.[9] That is, levels of short-intermediate-term and long-term Treasury securities were made different from their historical values, in the manner indicated above, by $2.5 billion in each period. As reported in Table 3, this shift resulted in a decrease of the 3- to 5-year yield by an average of 36 basis points, and an increase in the long-term yield by an average of 51 basis points over the period beginning in 1960:I and ending in 1975:IV.

The impact of Changes in the Maturity Compositlon of the Federal Debt on Private Security Yields

When considering the effect of debt management on private security yields, it is usually maintained that the impact depends on investors' behavior in making portfolio selections among Treasury and private securities.[10] The analysis of the impact on private security yields, and the role played by investor behavior; may be simplified by assuming that there is only one type of private security — equity. In the simplified model including equity, short-term Treasury securities, and long-term Treasury securities, the link between private security yields and the nonfinancial economy is described in terms of the yield on equity. If, for example, the yield on equity falls (price increases),. then investment in capital goods increases. That is, since the price of equity is the price of a unit of existing physical capital, the higher the price of equity compared to the price (reproduction cost) of a unit of new capital, the greater the incentive to produce new capital goods. Hence, an increase in the price of equity (decrease in yield) stimulates the economy.

Three different types of investors' portfolio selection behavior have been hypothesized. The types differ according to investors' assessments about the degree of substitutability among equity, short-term Treasury securities, and long-term Treasury securities. One type says that short- and long-term Treasury securities are regarded as perfect substitutes since' both have fixed nominal returns and no default risk. The empirical results presented earlier make it possible to reject this type of investor portfolio selection behavior. In particular, the ability to change the spread between short- and long-term Treasury security yields is contradictory to the perfect substitutes hypothesis which implies that the yield spread would remain constant.

A second'type of portfolio selection behavior says that long-term Treasury securities and equity are regarded as perfect substitutes since both are long-term financial assets. This second type also may be questioned because it implies that investors do not distinguish between other characteristics of long-term Treasury securities and equity. In particular, since the return on equity depends on the earnings of private corporations and the return on long-term Treasury securities includes a fixed nominal interest payment, investors probably view these assets as imperfect substitutes.

'The third type of portfolio selection behavior says that equity, short-term Treasury securities,

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9 These changes correspond to a 6 per cent average change for short-intermediate-term securities, and a 14 per cent average change for long-term securities.

10 See, for example, Earl R. Rolph, "Principles of Debt Management," American Economic Review. Vol. 47 (June 1957), pp. 302-20; James Tobin, "An Essay on the Principles of Debt Management," in Commission on Money and Credit, Fiscal and Debt Management Policies (Englewood Cliffs: Prentice-Hall, 1963), pp. 143-218; and O. H. Brownlee and I. O. Scott, "Utility, Liquidity, and Debt Management," *Econometrica,* Vol. 32 (July 1963), pp. 349-62.

and long-term Treasury securities are imperfect substitutes because of either their differing time to maturity or risk characteristics. Based on the above criticisms of the other two types, this third type appears to provide the most accurate description of actual investor behavior. In addition, the third type of investor portfolio selection behavior implies that changes in the maturity composition of the Federal debt affect private security yields. For example, a shift in Treasury security supplies from long- to short-term Treasury securities would leave investors wanting to purchase long-term Treasury securities, and sell short-term Treasury securities to restore the previous asset composition of their portfolios. However, with the change in the supplies of short- and long-term Treasury securities, investors on the whole cannot. restore the original asset composition of their portfolios. Since total investor demand for long-term Treasury securities is greater than supply, and total investor demand for short-term Treasury securities is less than supply, the price of long-term Treasury securities is bid up (yield falls) and the price of short-term Treasury securities is bid down (yield rises). Furthermore, during this process, investors are also evaluating the desirability of holding equity relative to the separate amounts of short- and long-term Treasury securities. Since the yield on long-term Treasury, securities has decreased, investors desire to hold more equity; but since the yield on short-term Treasury securities has risen, investors desire to hold less equity. When all yields have adjusted to the point where investors are content to hold the existing supplies of assets, the ultimate impact of equity yields depends on which Treasury security yield had the strongest effect on the demand for equity. Thus; equity yields will have changed, although the direction may be uncertain.

To summarize, this discussion suggests that a change in the maturity composition of the Federal debt affects the term structure of Treasury security interest rates, and that there may be further effects on private security yields which directly influence nonfinancial economic activity. Thus, Federal debt management could possibly be used to affect and help stabilize the economy. For example, if a debt management policy that is consistent with the stimulation of the economy is desired, then the relative supplies of different maturities of Treasury securities should consist of the combination that maximizes the prices (minimizes the yields) of private securities. This combination of Treasury securities most likely consists of more short-term than long-term Treasury securities held by private investors since the demand for equity depends more on the price of long-term Treasury securities than on the price of short-term Treasury securities. Thus, it is desirable to keep the price of long-term Treasury securities high (yields low) in order to stimulate the demand for equity. However, if the price of short-term Treasury securities becomes too low (yield too high), then investors would increase their demand for short-term Treasury securities and reduce their demand for equity. Therefore, a suitable balance between the relative supplies of short- and long-term Treasury securities must be maintained, but the best combination most likely has more short-term than long-term Treasury securities.

At other times, however, it may be desirable for debt management policy to provide a restrictive impact on the economy. For example, during times of inflationary excess aggregate demand, the most desirable debt management policy may be to reduce the prices of private securities (raise the yields) to help eliminate the possibility of inflation. Thus, if the existing composition of the Federal debt

causes the price of equity to be at its maximum, then it may be desirable to increase the supply of long-term relative to short-term Treasury securities to reduce the price (raise the yield) of equity.

INTEREST COST MINIMIZATION

The reduction of interest costs on the privately held Federal debt may be an additional objective for Federal debt management policy. It may be desirable to reduce interest costs when considering two factors. First, the transfer of funds from taxpayers to holders of the Federal debt may involve disproportionate effects on individuals in different income or wealth classes. That is, there may be a transfer of funds from lower to upper income classes. Second, on the portion of the Federal debt held by foreign investors, there is a net outflow of funds. That is, if taxation is used to finance the interest costs on the Federal debt, the net result is to transfer funds from U.S. taxpayers to foreign investors.

Interest costs may be minimized in the short run or the long run. A short-run cost minimization strategy could imply that the interest costs are minimized on a period-by-period basis—each month or each quarter, etc. Thus, when refunding maturing debt, or when making outright substitutions between different maturity classes, the policymakers would examine actual prevailing market yields to calculate the composition of the Federal debt that has the lowest total interest cost during the period. In most periods, since short-term yields are usually below long-term yields, this would imply a very short average maturity for the Federal debt.

A short-run interest cost minimization strategy could call for policy actions that are opposite to those desired for purposes of economic stabilization. First, this strategy would imply issuing long-term Treasury securities when long-term yields are below short-term yields, and such a yield structure has sometimes occurred during recessionary periods. Based on the analysis in the previous section, issuing long-term Treasury securities during a recession may not provide stimulation to the economy. Second, in times of full employment, the short-run strategy could lead to excessive liquidity with possible inflationary consequences.

A long-run cost minimization strategy would involve a planning horizon in which maturing short-term debt would be rolled over several times. Thus, in this case, there is a choice between issuing long-term securities with maturity equal to the length of the planning horizon, or a series of short-term securities with uncertain average interest costs that must be forecasted. An optimal policy might be formulated by considering the expected interest costs and their estimated dispersions for alternative combinations, and then making a policy choice based on the subjective trade-off between these two factors.

A long-run interest cost minimization strategy could also call for policy actions that are opposite to those desired for purposes of economic stabilization. Under a long-run strategy, it is again possible that a large amount of long-term Treasury securities would be issued during a recession, and vice versa during expansions. This is the case since long-term yields have sometimes been below short-term yields during recessionary periods, and both yields may be expected to rise during the economic expansion that could shortly follow. Thus, the long-run interest cost minimization strategy may not provide stimulation to the economy during some recessions. In addition, there is a greater incentive to issue long-term Treasury securities at all times with this strategy since "short-term

or floating debt is said to leave the government at the mercy of impatient lenders."[11] That is, by issuing long-term debt the interest costs can be stabilized over longer periods.

CONCLUSION

This article's analysis suggests that Federal debt management policy should recognize the trade-off between economic stabilization and interest cost minimization. Previous empirical research has supported the "pure expectations" hypothesis of Treasury security yield determination thereby implying that changes in the maturity composition of the Federal debt would be ineffective for economic stabilization. However, there are several methodological shortcomings in previous research which make the results questionable. Many of these shortcomings were avoided in the empirical results reported in this article by using a disaggregated structural model of the Treasury securities market. Using the model, an experiment suggests that debt management may have a significant impact on the relative yields of different maturities of Treasury securities. Thus, even if debt management is not actively used to stabilize the economy, the resultant maturity composition of the Federal debt may have implications for the overall level of economic activity. Furthermore, because of the impact on the economy from changes in the maturity composition of the Federal debt, interest cost minimization should not be the sole objective of debt management policy.

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11 Richard A. Musgrave, *The Theory of Public Finance* (New York: McGraw-Hill Book Company, Inc., 1959), p. 599.