INTRODUCTION

A bedrock position of the IS-LM model is that the LM curve slopes upward. This is obtained by assuming either that the central bank controls the monetary base and the money multiplier is constant or simply that the central bank directly controls the money supply. While the base is exogenous, the multiplier is largely determined by the portfolio decisions of banks and the public. That the base is exogenous and the multiplier is endogenous has long been recognized (Rasche and Johannes, 1987) but there has been little effort to incorporate this into a mainstream framework like the IS-LM model.1 We incorporate an endogenous multiplier into such a model and demonstrate that the slope of the LM curve can plausibly take any sign.

The traditional IS-LM model’s assumption of a constant money multiplier masks changes in the money supply solely a function of changes in the monetary base. Prior to 1980 this was an acceptable assumption since changes in the base did primarily determine the month-to-month changes in the money supply (Gauger and Black, 1991, Meltzer, 1989). However, since that time the multiplier has been the main source of money supply fluctuations (Gauger and Black, 1991; Moore, 1988). Gauger and Black state that from 1981 to 1988, "across all definitions of money, the main source of variation in the money stock is from the multiplier, not the base. This implies that actions of the public, rather than the monetary authorities were mainly responsible for the volatility of the money stock" (1991, 888). Today, a plausible macro-model must take into account the roles played by both the multiplier and the base.

With the multiplier now playing a strategic role, two of its empirical characteristics that were of secondary interest before the 1980s become critical. First, the value of the multiplier depends predominantly on the public’s behavior via the currency to checkable deposit ratio (hereafter, the currency ratio) (Garfinkel and Thornton, 1991). Second, the money multiplier is procyclical; empirical studies have shown that the currency ratio is counter-cyclical implying a procyclical money multiplier (Foster
1992; Papademos and Modigliani, 1990; Beensstock, 1988; Moore, 1988). When the impact of income on the money supply is taken into account, the sign of the LM curve's slope depends on the relative response of real money demand and real money supply to a given change in income.

Recent models that re-examined financial markets in an IS-LM framework include Marty and Baytas [1992], Cottrell and Daritz [1991], Papademos and Modigliani [1990], and Bernanke and Blinder [1988]. Marty and Baytas [1992] analyzed how the slope of the LM curve is affected by banks that pay flexible interest rates on deposits. Our model also examines the slope of the LM curve, but we focus on money supply rather than money demand. By specifying a production function with increasing returns, Cottrell and Daritz [1991] found an ambiguous sign to the slope of the LM curve. However, they restricted their analysis to the upward sloping case. Papademos and Modigliani [1990] focused on the interaction of the credit and goods markets, similar to a laborsaving funds framework. They examined a central bank's ability to influence income under alternative operating procedures when the money market plays only an indirect role in influencing the demand for credit. Bernanke and Blinder [1988] modified the traditional IS-LM model by examining the impact of bank loans on the goods market. With bank loans and bonds as imperfect substitutes, Bernanke and Blinder showed that a change in monetary policy influences both the money and goods markets.

As a complement to Bernanke and Blinder's result, we show that if portfolio decisions are specified to be conditional on income and the interest rate, a change in fiscal policy also influences both the goods and money markets. Consequently, a change in either monetary or fiscal policy variables produces larger effects on income than in the traditional model. Moreover, consistent with recent empirical studies, the effect on the interest rate of a fiscal expansion is ambiguous — it depends on the relative response of money demand and money supply to a given change in income.

AN IS-LM MODEL WITH ENDOGENOUS MONEY SUPPLY

In our analysis the macroeconomy is described by:

\[ Y = CY - T_r - \tau - G, \]
\[ M = \pi(Y) f_R([P - I]), \]
\[ P = f(Y - \theta(Y), P, \pi). \]

Equations (1), (2), and (3) are respectively the IS, LM, and Phillips curves. The variables are:

- \( Y \): Real Output
- \( P \): Inflation Rate
- \( \tau \): Expected Inflation Rate
- \( F \): Price Level
- \( \tau \): Nominal Interest Rate
- \( T \): Taxes
- \( C \): Consumption
- \( M \): Real Money Supply
- \( E \): Real Money Demand
- \( I \): Investment
- \( G \): Government Expenditures
- \( M \): Money Multiplier
- \( B \): Monetary Base

The central bank controls the monetary base [Rasche and Johannes, 1987]. The other exogenous variables in the short run are \( G, T, Y, \tau, P \). The key endogenous variables are \( Y, r, P, \) and \( M \). With subscripts representing a partial derivative, we assume the following customary signs: \( C_y, I_y, I_r < 0 < C_p, I_p, P_r \).

To highlight the impact of an endogenous money supply on the basic IS-LM model, we employ the narrow definition of money (M1) and its multiplier for simplicity. We follow standard models and assume that \( m \), the multiplier, is such that \( m > 0 \). We then must first discuss the relative impact of income on the components of the multiplier.

The money multiplier is negatively related to the required reserve ratio, the excess reserve ratio, and the currency ratio. A change in the required reserve ratio is a central bank policy option, though we do not address such policy actions in this paper. In theory the excess reserve ratio moves countercyclically (which supports a procyclical multiplier). Though recent empirical evidence found its impact on the multiplier to be minimal [Gauger and Black, 1991, 685]. In contrast, changes in the currency ratio explain over 50 percent of the month-to-month variability in the multiplier [Garrison and Thornton, 1991, 52]. It is the movements in this ratio which call for a further examination of the endogeneity of the money supply [Moore, 1988]. Though all effects on the multiplier cannot be traced to changes in the currency ratio, for simplicity we use this ratio to motivate the theoretical changes in the multiplier from changes in \( Y \).

In the traditional model the currency ratio was assumed to be constant. That this ratio depends on the public's portfolio choice implies that changes in income, for example, were assumed to produce proportional changes in the demand for both currency and demand deposits. However, as pointed out in many studies [Garrison and Thornton, 1991; Papademos and Modigliani, 1990; and Moore, 1988] changes in income do not influence the demand for currency and checkable deposits proportionally. An increase in real income has been found empirically to have a negative effect on the currency ratio, a result consistent with the income elasticity of the demand for currency... being smaller than the income elasticity of the demand for checkable...
deposits" [Papademos and Medigiani, 1960, 423]. (It should be noted that this income effect on the currency ratio is not a new empirical result — e.g., Mints [1945]). The inverse relation between income and the currency ratio implies that the money multiplier and money supply move procyclically.

As compared to money demand, relatively few studies have examined the direct impact of income on the money supply (as opposed to, say, the currency ratio). Hence, there is little information on the current value of the income elasticity of money supply for the United States. There are, however, two recent studies for the United Kingdom — Beesneck [1989] for M1, and Foster [1992] for Sterling M3. Beesneck found a positive relationship between income and the money multiplier using a components approach like that of Rosse and Jahnnes [1987]. He found the income elasticity of money supply to range between 0.53 and 1.07. For comparison, Foster also found the income elasticity of M3 to be 0.53 during the period 1963-85. Hence, our assumption of a procyclical money supply is based on the fact that changes in the currency ratio explain most of the variability in the money multiplier, the evidence of a counter-cyclical currency ratio, and the direct empirical results of Beesneck and Foster.

The results of comparable studies for money demand in the United Kingdom are as follows. Relevant to Beesneck’s results, Hendry and Ericson [1991] found the income elasticity of M1 money demand from 1964 to 1989 to range between 0.25 and 0.28. An estimate of 0.118 for a similar period was reported by Goldfeld and Siegel [1990]. Relevant to Foster’s results, Steel and Richardson [1991] found the income elasticity of M3 demand from 1955 to 1986 to be between 0.44 and 0.49.

The importance of the relative sizes of the income elasticities of money demand and supply become apparent when considering the slope of the LM curve:

\[ \frac{dY}{dM} |_{M^*} = -\left(\frac{M_L - L_p}{M_L - L_p + L_c}\right) \geq 0 \quad \text{as} \quad M_L < L_p \]

where \( M_L = (\mu L) / P \) and \( L_p = (\mu L) / P \). The ambiguous sign results from the two effects of a change in income on the money market. Higher income increases transactions, which increases the demand for money. In addition, there is a portfolio effect when income changes: the currency ratio declines as income increases. This increases the money multiplier which, in turn, increases the money supply. The traditional positive slope is obtained if \( M_L < L_p \). If \( M_L > L_c, (M_L - L_c) \), an increase in income increases money supply more than (equal to) money demand which results in a downward sloping (horizontal) LM curve. Given the above recent estimates of \( M_L \) and \( L_p \), the case of a downward sloping LM curve is quite plausible (and quite probable for at least the U.K.).

**COMPARATIVE STATIC ANALYSIS**

To illustrate the above endogenous money supply model, we present the short-run comparative static results of a downward sloping LM curve (as those of an upward sloping curve are well-known). We focus on a change in taxes, though changes in government spending and the monetary base are briefly discussed. Differentiating equations (1) - (3), we have:

\[ \left[ \frac{dY}{dt} - \left( \frac{L_p - V_d}{L_p} \right) \right] = \left[ \frac{dM}{dt} - \frac{dL}{dt} \right] \left( \frac{M_L - L_c}{M_L - L_c + L_p} \right) \]

Let \( \Delta = (M_L - L_c)(1 - C_p - L_p) + (C_p + L_p)(M_L - L_p) \) denote the determinant of the system of equations (5). The slope of the IS curve is \( \frac{dY}{dM} = (1 - C_p - L_p + L_c) \). We follow standard macro models in assuming that the marginal propensity to save is greater than that to invest (i.e., \( 1 - C_p > L_p \)), this gives us \( \frac{dY}{dM} > 0 \). Employing the correspondence principle requires \( (dM)/dY < \) (dM)/dY for stability; assuming this requirement is satisfied implies \( \Delta > 0 \).

The short-run comparative static results have traditional signs except for \( \frac{dM}{dt} \) and \( \frac{dL}{dt} \) which depend on the sign of the LM curve’s slope. From equation (5), we have:

\[ \frac{dM}{dt} = C_p(M_L - L_p + L_c) > 0 \quad \text{as} \quad M_L > L_p \]

In the traditional specification, the response of money supply to a change in income is absent (i.e., \( M_L = 0 \)) and, hence, \( \frac{dM}{dt} = 0 \). However, when the influence of income on the money multiplier, and thus on the money supply, is included, the effect on the interest rate from a change in money may not conform with the traditional model.

Figure 1 portrays the case of \( L_p < M_L \). A reduction in taxes shifts the IS curve upward at the initial level of income (from \( IS(G, T) \) to \( IS(G, T) \)). This has an expansionary effect on income which, as described in the previous section, has two effects in the money market. First, the demand for money increases from \( L(T) \) to \( L(T) \). Second, there is a reduction in the currency ratio which increases the money multiplier and, in turn, the money supply (from \( M^* \) to \( M^* \) in Figure 1). Since at the initial interest rate we have \( L(V^*) < M^* \), the excess supply of money results in a reduction in the interest rate.

In the terms of the impact on income, the short-run fiscal policy multipliers are \( \frac{dY}{dT} = C_p(M_L - L_p + L_c) > 0 \) and \( \frac{dM}{dT} = (M_L - L_p + L_c) > 0 \). Since \( dM/dT > 0 \), the larger are the absolute value of the fiscal policy multipliers, the larger are the response of the money supply to changes in income. For an intuitive explanation, consider the interaction between the real and monetary sectors. A reduction in taxes (or increase in \( C_p \)) shifts the IS curve up and increases income. In the traditional model money demand increases with income and the final interest rate is higher than the initial level. When \( M_L > 0 \), the increase in income also increases money supply. If the LM
SUMMARY AND CONCLUSIONS

The past decade has seen pronounced changes in the methodology of theoretical macroeconomic research; one of the most distinct is an avoidance of the IS-LM-Phillips curve framework. However, opinions continue to vary on whether this framework is appropriate in pursuing analytical issues—this perhaps is due in part to stereotyping all IS-LM analysis into pre-1970 versions of the model. For example, King (1993, 68) recently remarked that this framework has limited application due to the treatment of expectations in the "traditionally constructed" IS-LM model, even though there have been many IS-LM-rational expectations models in the literature. In contrast to this narrow view, Darity and Young's (1993) history of the IS-LM model clearly demonstrates its general flexibility. They point out that this flexibility not only allows it to produce Keynesian results but "can be maneuvered to support non-Keynesian or even anti-Keynesian propositions" as well (1993, 88-9).

For policymakers and applied macroeconomists the IS-LM-Phillips curve model remains "the best way" to interpret economic policy (Mankiw, 1990, 1645-6); however, this framework does have its empirical problems. As pointed out by Blinder (1988, 299), the LM curve (as traditionally constructed) is "the most obvious" of this framework's empirical failures. It is the construction of the LM curve that has been addressed in this paper. We endeavored the money supply by incorporating a money multiplier that is a positive function of both income and the interest rate, thus releasing the LM curve from the straitjacket of a positive slope only.

The comparative static results suggest two interesting points. First, the impact on income of a change in a monetary or fiscal policy variable is larger here than in the traditional model, regardless of the sign of the LM curve's slope. Second, by reflecting some of the changes that have occurred in financial markets, the simple theoretical model here can produce non-traditional comparative static results. For example, expansionary fiscal policies were believed to result in an increase in the interest rate, a necessary result if the LM curve takes its traditional positive slope. In contrast, if the money supply responds more to a change in income than does money demand (which is what recent studies have found), the same policies will result in a decrease in the interest rate. Since recent studies have found support for a negative or zero relationship between deficits and interest rates, the IS-LM model here can yield predictions consistent with empirical observations. It is clear, however, that renewed attention needs to be focused on empirical estimates of the current LM curve. Such empirical work is an area of our future research.
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1. See Morty and Botts (1995) for an example of a model that assumes the money supply is completely controlled by the central bank. Unlike most models, however, they recognize that the central bank actually controls the monetary base. Their assumption of an exogenous money supply is made for simplicity and is motivated by assuming a constant currency to deposit ratio and thus a constant money multiplier. (See footnote #3 in their paper).

2. Since the force of this paper is on the demand side of the economy, the Phillips curve only concerns the economy’s supply side. Given the Phillips curve here (one with an explicit supply-shock variable as in Coe (1997)), the money market specification does not alter the IS-LM-Phillips curve model’s ability to generate such a phenomenon as stagflation. For a discussion of how an IS-LM-Phillips curve equation with a supply-shock variable...See the USA data during the 1970s and the 1980s extremely well...See Blinder (1988), 263.

3. Since inflationary expectations play no role when deriving the LM curve, i is assumed to be exogenous for simplicity. In examining optimal monetary policy instruments with a money market specification similar to that here, Back, Diewend, and Hendry (1992) provide a model where i is endogenous via rational expectations.

4. There is a corresponding multiplier for each of the broad definitions of money. With the alternative multiplexers, there are different interest rate elasticities for the different competing assets. See Pappademos and Modigliani (1960) for a detailed derivation of the various broad money multipliers and a discussion of their characteristics regarding income and the interest rates on competing assets.

5. Also see Manchester (1989) for the relative impact on the multiplier of changes in income and the real interest rate. Further empirical support of income’s impact on the money supply are found in the vast credur literature; one relevant example is Holmes and Hutton (1993).

6. In a survey article, Arce and Lewis (1990) list the estimates of the income elasticity of money demand in the United Kingdom to be between 0.3 and 0.8 for earlier time periods. For US demand, the study in Arce’s survey closest to that of Foster (1987) is for 1960-74 which produced an income elasticity estimate of 0.00. For estimates of M2, see Back, Hendry and Diewend (1992), Hendry and Ericsson (1990), and Goldberg and Richel (1989).

7. In the long run, γ = γ p = p = t = f, and 0 is exogenous and γ is an endogenous. While In the short run, the money market reduces a change in income, money creation or destruction. In the long run this effect is not present since γ t = 0...Thus, the long-run comparative static results concur with those of the traditional IS-LM-Phillips curve model.

8. There does not appear to be a consensus regarding the empirical relationship between deficits and interest rates. As examples, see Friedman (1991) and Hubbard and Pye (1989) for evidence of a positive relationship and Board and McMillan (1991), Brusis (1989), Kohlen and Giancana (1987) and Plosser (1987) for evidence of a non-existence or negative relationship. Koletl and Giancana argued that a non-positive relationship “is conceivable...although theoretically the nature of the relationship is not clear...” (1989), 128. One possible theoretical explanation may be the response of the money supply to changes in fiscal policy presented here.

9. This issue of debt service was pointed out to us by an anonymous referee.

10. One could consider the specification in MacKie and Simmons (1988) and Holmes and Smyth (1978) in that disposable income (instead of nominal income) is used in both money demand and money multiplier as the scale variable. As can be easily verified, the sign of dW is ambiguous in this case, though the effect of the LM curve itself depends critically on whether I_s > 0 is greater than, equal to, or less than M_s. If I_s > M_s, the LM curve is upward sloping and we obtain the Holmes-Smyth effect, a reduction in taxes shifts the LC curve "up" and, with the effect on the IS curve this results in an ambiguous sign for dydt. In contrast, if I_s < M_s, the LM curve is downward sloping and a reduction in taxes shifts the LC curve does no net. In this case the Holmes-Smyth effect no longer results: a reduction in taxes unambiguously increases national income (i.e., dy dt> 0).
DISPLACEMENT AND OCCUPATIONAL MOBILITY: EVIDENCE FROM THE DISPLACED WORKER SURVEYS

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INTRODUCTION

Continuing structural change in the economy not only contributes to worker dislocation but reduces overall employment prospects in related occupations. Many workers who lose jobs will switch to new occupations. Are their mobility decisions guided by the same kinds of optimizing strategies which the literature suggests motivate the mobility decisions of voluntary quits? Empirical evidence suggests that workers who voluntarily quit their jobs gain from such decisions [Bookin, 1974; Galler and Sicherman, 1990; Erikson, 1991; Jeravich, 1979; McCann, 1996; Miller, 1984; Minicer and Jovanovic, 1981; Paglin and Rufolo, 1990; Shaw, 1987]. What has not been examined extensively in the literature is whether displaced workers who accept jobs in a different field fare better (i.e., have higher expected earnings) than they would have had they continued to search in their old occupations.

We find some evidence that workers’ expected post-displacement earnings are higher as a result of their mobility decisions. That is to say, displaced workers whose expected earnings are higher if they switch occupations are, in fact, more likely to move and those who would be better off staying in the same occupation are more likely to stay.

THE DATA

The data for this paper are obtained from the 1988, 1990 and 1992 Displaced Worker Surveys (DWS), published as supplements to the January Current Population Survey. The DWS has been conducted biennially since 1984. All workers aged twenty years and above are asked whether they lost a job within the five years prior to the survey date. Those responding affirmatively to the question are then asked a series of questions about the lost job and the period of joblessness that followed.

The samples used in this analysis consist of males, 25-54 years of age who lost their jobs more than one year prior to the survey due to a plant closing or relocation, abolition of a job shift or position, or slack work. Workers who lost part-time jobs or who were not employed at the survey date were excluded from the subsamples. Those who reported losing jobs in forestry, fishing, or agriculture and construction were also dropped from the sample. Employment in those sectors is inherently unstable and a temporary expedient for many workers, obscuring the meaning of...