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MONETARY POLICIES WITH INCREASING RETURNS

by

G. Chichilnisky and G. M. Heal

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Abstract

The paper studies a two-sector monetary economy with two factors of production, labor and capital. The industrial sector has increasing returns to scale, the consumption sector non-increasing returns. All firms maximize profits, and markets clear. For each rate of return on capital the model reaches a general equilibrium with an associated demand for money. A monetary policy is a quantity of money supplied. We prove that restrictive monetary policies decrease the level of operation and profits of the increasing returns to scale sector and eventually force it to operate with negative profits, so that it must close down. The other sector of the economy, however, expands with more restrictive monetary policies, but national income as a whole decreases. Monetary policies affect the rate of interest of the economy and determine whether or not competitive market equilibria exist with a positive output in the increasing returns sector. With very restrictive monetary policies, the only market equilibria with continued output from the increasing returns sector are those where this sector is being subsidized. There are, therefore, two choices open to this economy: either adequate liquidity is provided to allow the increasing returns sector to behave competitively and produce positive output, or else this sector must be regulated and subsidized to prevent it from closing down.

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1. Introduction

Economies with increasing returns often challenge our time-honored views, to the extent of discouraging efforts addressed at policy analysis.[1] Yet the policy issues involved in increasing returns are too important and the impact of alternative policies too far reaching to be brushed aside. In particular, any major industrial economy has sectors which exhibit increasing returns, at least in part of their ranges of production. Increasing returns sectors include at present some of the most important industrial sectors, as well as some of those that seem most vulnerable to government policies in the current recession. Examples are: the automobile industry, communications, aircraft, and other sectors with large fixed costs, including research and development.

The purpose of this paper is to look in such a context into one government tool which is currently much used and discussed: monetary policy. We shall trace the impact of alternative monetary policies, or liquidity regimes, on the functioning of a market economy with two sectors, one of which has increasing returns in part of its range of production. One sector produces consumption goods; the increasing returns sector produces industrial goods. Each sector behaves competitively, and maximizes profits. There are two factors of production: labor and capital. From the real side of the economy we derive a demand for money equation, and the government policy is a supply or quantity of money.

It is shown that restrictive monetary policies have a negative impact on the output of the increasing returns sector, which is forced to operate with lower profits and eventually faces negative profits, so that it must close down. The other sector of the economy, however, expands with more restrictive monetary policies, but national income as a whole decreases. The impact of monetary policy on the rate of interest, and on the prices of commodities in the economy, determines whether or not a competitive equilibrium exists with a positive output in the increasing returns to scale sector. It is shown that with very restrictive monetary policies, the only way this sector can operate is by receiving subsidies that compensate for its losses. The equilibria with subsidies _are_ general equilibrium solutions, but they involve regulation such as marginal cost pricing, rather than competitive profit maximizing behavior. To attain operation of the increasing returns to scale sector without such intervention the economy requires liberal monetary policies.

It should be noted that monetary policies affect the two sectors differently, and also have a different impact on consumption and industrial prices. These are traced in the last section in detail, following through the operation of different markets across the general equilibria of the economy.

Our paper could be seen as drawing from several earlier strands of literature. It is primarily an exercise in general equilibrium analysis in an economy with increasing returns, and in this sense is related to the work of Brown and Heal (1979, 1982), who discuss in a general context the existence of equilibria under such conditions. More specifically, it is an exercise in the study of analytically solvable general equilibrium models. Such models were introduced by Chichilnisky for the study of a range of issues in international economics, and the model used below is derived from that in Chichilnisky (1981, 1982). However, neither the works of Brown and Heal, nor those of Chichilnisky, consider monetary economies, but are concerned with real models, solved as usual only for relative prices.

Another related literature is the extensive work on temporary general equilibrium theory, some of which is explicitly concerned with analyzing the role of money and the impact of monetary policy in general equilibrium models. This literature is too extensive to cite in detail here: Arrow and Hahn (1968) have a section devoted to it, and a more recent survey is in Grandmont (1982).

Finally, our paper is in the same spirit as a number of recent studies which have argued that a solid microeconomic foundation for the explanation of certain macroeconomic phenomena, can best be provided by the analysis of models allowing increasing returns in production. In this vein are recent papers by Hahn (1982), Heal (1981, 1982) and Weitzman (1982).

2. The Model

The real economy is described as follows: there are two productive sectors, a consumption good sector denoted B, and an industrial sector, denoted I. Both sectors consist of a conglomerate of price-taking firms. The overall production function of the B sector is

$$B^S = \min(K^B/a,\ L^B/b) \tag{1}$$

The second sector, I, exhibits an aggregate production function with non-trivial increasing returns to scale in some of its range,

$$I = f(K^I) \tag{2}$$

The function f is specified in detail later.

Factor supplies respond positively to their (real) rewards. Labor supply is

$$(3) \qquad L = \alpha \frac{w}{p_B}$$

where L indicates the labor supply, w the wage, and p_B is price of the consumption good B. The supply of capital responds similarly, i.e.

$$(4) \qquad K = \beta r$$

where r is the rate of return on capital.

In equilibrium, the national income identity (Walras Law) requires that the value of consumption be equal to total income:

$$(5) \qquad p_B B^D + p_I I^D = wL + rp_I K + \pi$$

where p_B and p_I denote the prices of B and I, respectively, rp_I is the income of capital owners, π denotes the aggregate profits of firms in the economy, and a superscript D denotes the amount of a good demanded.

Equations (1) to (5) describe the real side of the economy. They are all homogeneous, i.e., depend only upon relative prices. We now add an assumption that the nominal wage is fixed at a given money level:

$$(6) \qquad w = \bar{w}$$

One could think of this as representing the rigidity of wages in the short run: within the period of the analysis, wages remain at their initial level. This assumption enables us to determine the absolute price level, and knowing this and the values of real variables, we can determine a transactions demand for money.[2] To this end, we write down the monetary identity

(7) $$M \cdot \gamma(r) = Y$$

where $Y = p_B B + p_I I = wL + rp_I K + \pi$ is National Income, M the quantity of money, and γ the velocity of money factor. Equation (7) requires that the quantity of money M times the velocity of circulation of money γ, must equal the national income.

Our plan of action is now as follows. First, we show that the equilibrium of the real side of this economy described by equations (1) to (6) can be used to derive a demand for money equation from (7), denoted

(8) $$M^D(r)$$

Equation (8) determines the quantity of money needed for each rate of interest r, in order to close the model and attain an equilibrium. The computation of (8) is as follows. For each rate r, a general equilibrium of the real side of the economy is computed, yielding supplies B^S, I^S and their prices p_B and p_I. Therefore, we obtain national income Y as a function of the rate of return r, i.e. $Y = Y(r)$. In view of the identity (7), we can then obtain the quantity of money demanded M^D as a function of the rate of return r, defined by

(9) $$M^D(r) = \frac{Y(r)}{\gamma(r)}$$

[2]The purpose of (6) is to provide a way of determining the absolute price level, hence the demand for money at any level of economic activity. An alternative would be to assume the interest rate r to be fixed on international capital markets, in which the economy is a price taker. This would lead to an identical set of results about the impact of monetary policy.

Figure 1 below illustrates this relationship between money demand and r, across general equilibria of the system.

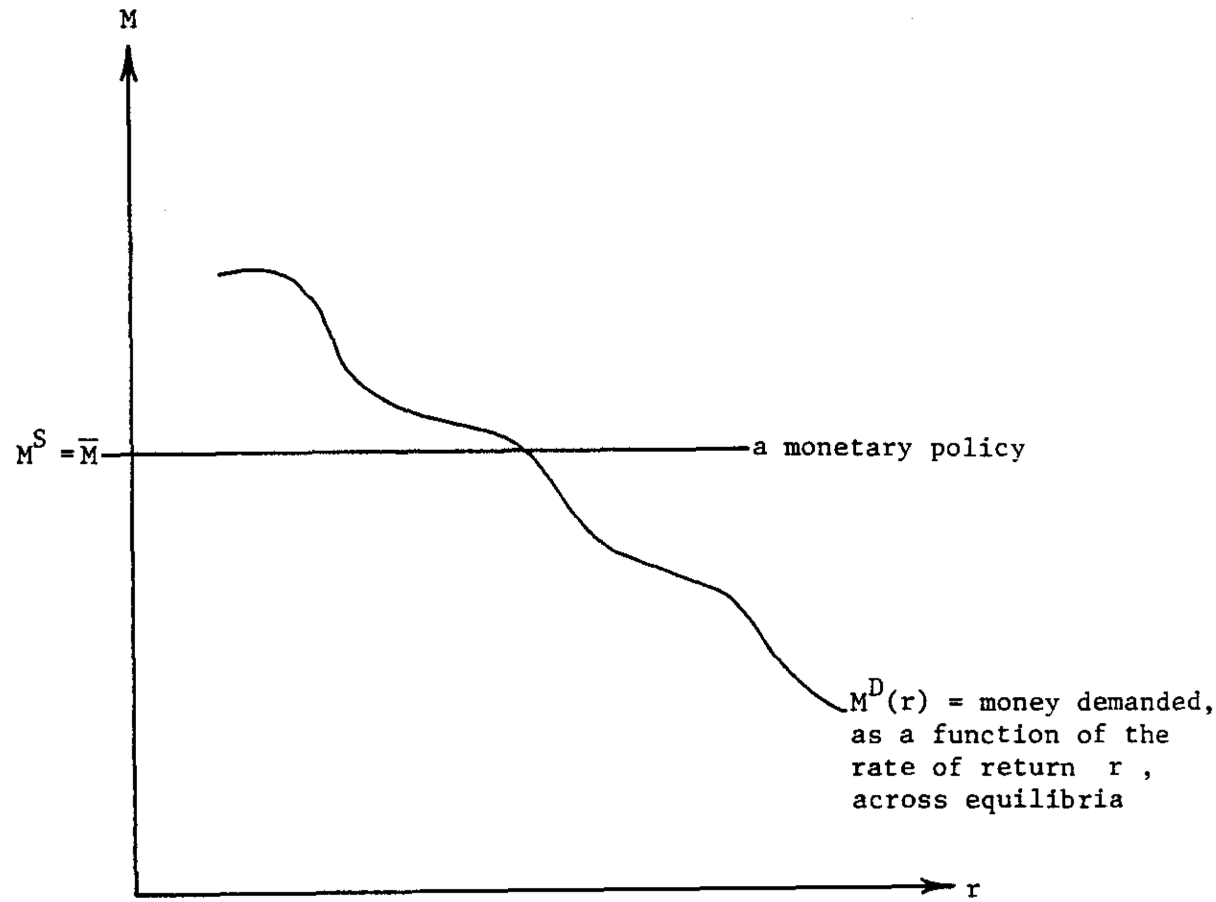

FIGURE 1

General Equilibrium Demand for Money

A <u>monetary policy</u> is now defined as a quantity of money supplied to the economy, $M^S = \overline{M}$ as in Figure 1. Given the general equilibrium demand relation $M^D(r)$, for each monetary policy M^S, we obtain an equilibrium rate of return r^*. We can then compute the corresponding general equilibrium of the economy, namely output, prices and employment of factors.

In view of this, we are in a position to investigate the efficiency of alternative monetary policies. Since the industrial sector I has increasing returns to scale, this sector will only produce positive output on a certain range of its production frontier corresponding to the region where profits are positive. However, production in this region will be shown to occur only for certain values of the (equilibrium) user's cost of capital rp_I, and, in particular, only for relatively low values. In the next section, we shall therefore investigate which monetary policies are consistent with such values of the user's cost of capital, and which are not. This will enable us to identify <u>efficient monetary policies</u> with increasing returns, namely those monetary policies which are consistent with the non-zero operation of the increasing returns to scale sector, given profit maximizing behavior.

Other more restrictive monetary policies will lead to the increasing returns sector closing down if it is to make non-negative profits. This is because, for more restrictive monetary policies, the increasing returns to scale sector must decrease its output in order to maximize profits. Decreasing its outputs decreases also its profits, and when monetary policies become sufficiently restrictive, its profits are driven to zero, and then become negative. When the best the competitive firm can obtain are negative profits, it must obviously close down. Its continued operation under such monetary policies could only be assured by some form of regulation, for example by marginal cost pricing, with a system of lump-sum taxes or two-part tariffs to cover any losses resulting from negative profits (for a discussion of equilibria under such conditions, see Brown and Heal (1980)). Two choices are open to this economy if the increasing returns to scale sector is to produce its output: either adequate liquidity is provided by the monetary policies of the government so that this sector can behave competitively, or else this sector must be regulated and sudsidized.

3. A General Equilibrium Demand for Money Equation

The aim of this section is to trace the general equilibrium response of the economy to the rate of return r, which we take for the moment as a parameter. In addition, we derive an explicit demand for money equation from the economy's general equilibrium response to alternative rates of return r. For this purpose, we first prove that for any given r, equations (1) to (6) give a complete solution of the real side of the economy, and in particular determine the level of national income.

$$Y = wL + rp_I K + \pi$$

Using the monetary identity (7), we then obtain the general equilibrium demand for money as a function of the rate of return r,

$$M = \frac{Y(r)}{\gamma(r)}$$

The following is very much an exercise in computing analytically a general equilibrium. A short description of this process is as follows: for any rate of return r, we can determine by profit maximization the output of the industrial sector I, and its employment of capital K^I. As the total capital stock is $K = \beta r$, and the capital in sector B is $K^B = K - K^I$, we have thus determined the use of capital in the consumption goods sector B, from which the output of this second sector and the employment of labor $L^B = L$ are then determined. Since $L = \alpha w/p_B$, we have also obtained the real wage w/p_B and thus p_B since $w = \bar{w}$. Using the price equation dual to the production equation (1),

$$p_B = arp_I + bw$$

one can then obtain the price of industrial goods p_I . The model is therefore closed, and we thus obtain the value of national income as a function of r . The following lines will formalize this procedure.

For a given r , consider the profit maximizing decision of the industrial sector

$$\max_{K^I \geqq 0} \pi = p_I f(K^I) - rp_I K^I$$

Then given r we obtain as a necessary condition

$$\frac{\partial \pi}{\partial K^I} = p_I f^1(K^I) - rp_I \leqq 0$$

i.e.

$$f'(K^I) \leqq r \text{ , with inequality only if } K_I = 0 \text{ .}$$

First, we consider situations where $K_I > 0$. In this case, it follows that when r is known, then $f'(K^I)$ is known; it is identical to it. This will give a volume of capital K^I employed in the I sector, and a volume of industrial goods produced for this rate r .

To fix ideas, and obtain an explicit demand for money equation, consider the following production function for the industrial sector:

$$f(K^I) = \frac{C}{2}(K^I)^2 + \frac{D}{3}(K^I)^3$$

where C is a positive constant, and D is a negative constant. Figure 2 below shows that this function exhibits increasing returns to scale until a certain volume of capital is utilized, and decreasing returns to scale thereafter. In order to admit free disposal, we assume

$$f(K^I) = \frac{5}{6}\frac{C^3}{D^2} \quad \text{for} \quad K^I \geq \frac{-C}{D}$$

See Figure 2.

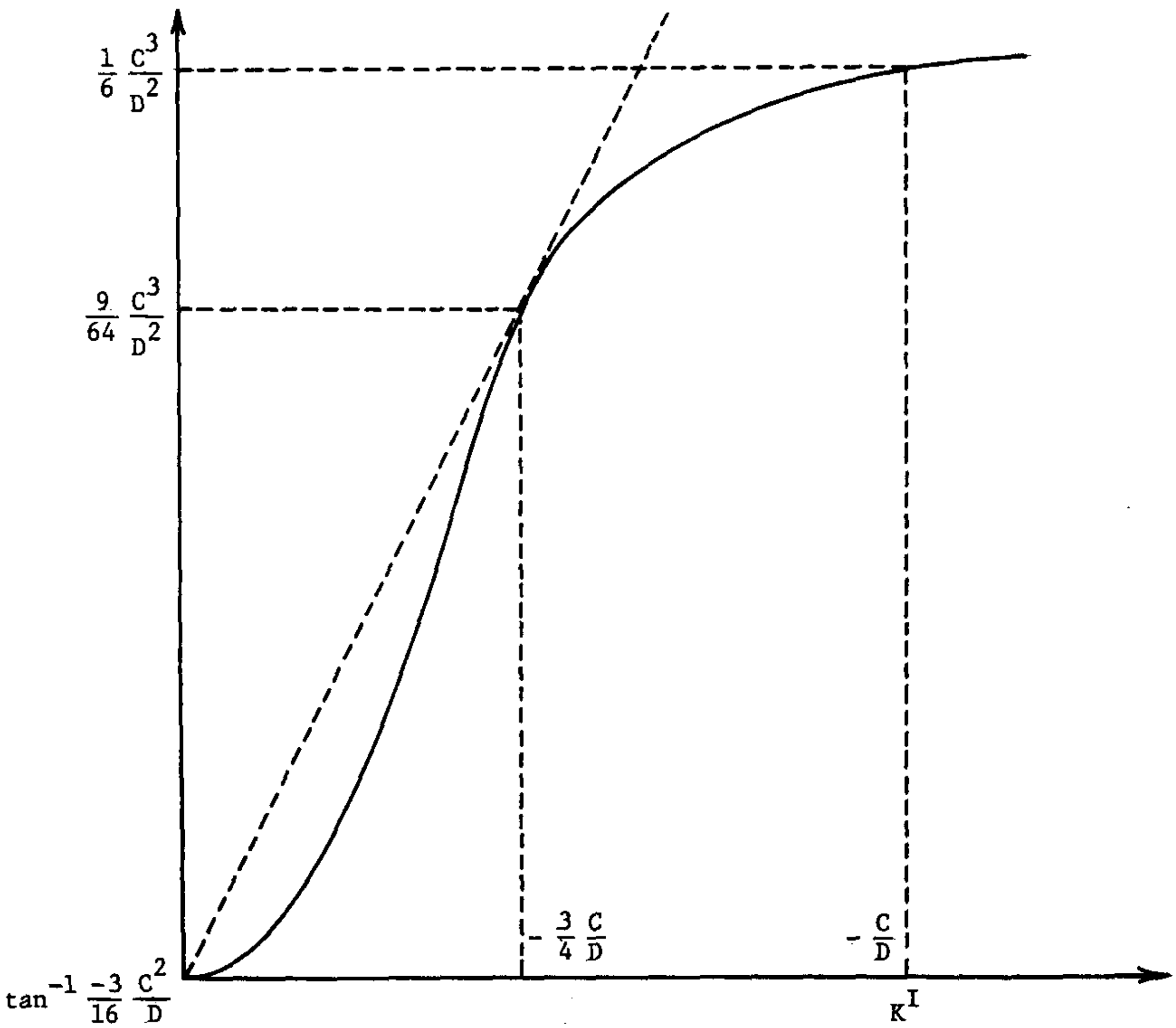

FIGURE 2

The Increasing Returns Technology in the Industrial Sector

With this explicit form for the production function f, we can characterize a profit-maximizing production plan in the I-sector fully. This is given by

$$f'(K^I) = r\ ,\quad K^I > 0 \quad \text{if} \quad r \leqq \frac{-3}{16}\frac{C^2}{D}$$

$$K^I = 0 \quad \text{if} \quad r > \frac{-3}{16}\frac{C^2}{D}$$

Let $\frac{-3}{16}\frac{C^2}{D} = \hat{r}$: then our discussion implies that for $r \leqq \hat{r}$, profit-maximizing firms will produce at a point satisfying the first order condition $f'(K^I) = r$, but otherwise they will close down. The positive value of K^I corresponding to $\hat{r}$ in the equation $f'(K^I) = \hat{r}$, will be denoted $\hat{K}^I$. This is just the well-known point that the supply correspondence of a firm with a non-convex production set may be discontinuous. First, we consider cases where $r \leqq \hat{r}$.

Now, from $r = f'(K^I)$ we obtain

$$CK^I + D(K^I)^2 - r = 0\ , \tag{9}$$

which has as its unique profit-maximizing solution, the root,

$$K^{I*} = \frac{-C}{2D} - \frac{\sqrt{C^2 + 4Dr}}{2D} \tag{10}$$

from which we determine, given r, the profit-maximzing use of capital in the industrial sector K^{I*}, and therefore the profit-maximizing output

$$I* = f(K^{I*})$$

Now, since by equation (4)

$$K = \beta r ,$$

we can determine the use of capital in the consumption sector β ,

$$K^{B*} = \beta r - K^{I*}$$

Note that K^{B*} is not positive for all values of the rate of return r, so that the requirement that it be non-negative will impose constraints on the range of value of r for which a general equilibrium will exist. It is routine to verify that $\partial K^{B*}/\partial r > 0$, so that K^{B*} falls towards zero as r falls, and of course from (10) K^{I*} rises. The I-sector takes an increasing amount of a decreasing capital stock as r falls. Define $\underline{r}$ as the solution of

$$K^{B*} = \beta r = \frac{C}{2D} + \frac{(C^2 + 4Dr)^{\frac{1}{2}}}{2\,D} = 0$$

Then the existence of a non-negative solution requires that $r \geq \underline{r}$. We can verify that this constraint on $\underline{r}$ is consistent with $r \leq \hat{r}$ and positive production in the I-sector if $\beta C \geq 4$, for in this case K^{B*} evaluated at $\hat{r}$ is strictly positive. From now on we therefore assume $\beta C \geq 4$.

From the production function for B , equation (1), we obtain

$$B^* = K^{B*}/a = \frac{K^* - K^{I*}}{a} \quad , \quad \text{i.e.}$$

(11) $$B^* = \frac{r}{a} + \frac{C}{2aD} + \frac{\sqrt{C^2 + 4Dr}}{2aD}$$

Now we obtain the level of employment in sector B ,

(12) $$L^{B*} = B^*b$$

Since $(L^B)^* = L^*$, $L^* = \alpha w/p_B$, and $w = \bar{w}$ by equation (6), we can then obtain the equilibrium value of p_B

(13) $$p_{B*} = \frac{\bar{w}}{B^*b}$$

The price equation associated to the technology (1) is, under conditions of competitive use of factors,

(14) $$p_B = ap_I r + bw$$

so that the equilibrium price for industrial goods

(15) $$p_{I*} = \frac{p_{B*} - b\bar{w}}{ar}$$

is obtained. Finally, note that because of its constant returns to scale, sector B makes zero profits, while the industrial sector's profits in equilibrium are given by the equation

$$(16) \qquad p_{I*}f(K^{I*}) - rp_{I*}K^{I*}$$

We have thus obtained: K^{I*}, K^{B*}, $L*$, $B*$, $I*$, p_{B*}, p_{I*} and $\pi*$. The model is therefore closed for each rate of return r. Note that the absolute levels of prices depend on the choice of the nominal wage $\bar{w}$, but the real side of the economy (employment of factors, and output) depends only on relative prices.

We can now compute the equilibrium demand for money equation $M^D(r)$. This requires us to compute first the (nominal) national income Y as a function of r.

Since by Walras' Law (equation (5))

$$Y = wL + rp_IK + \pi = p_BB^D + p_II^D ,$$

it suffices to compute the equilibrium value of $p_{B*}B* + p_{I*}I*$ as a function of r.

First note that from the production equation (1) in equilibrium

$$(17) \qquad B* = L*/b$$

and from the supply of labor equation, in equilibrium

$$(18) \qquad p_{B*} = \frac{\alpha\bar{w}}{L*}$$

It follows that, in equilibrium

$$(19) \qquad p_{B*}B* = \frac{\alpha\bar{w}}{L*}\frac{L*}{b} = \frac{\alpha\bar{w}}{b}$$

Now consider the term $p_{I*}I*$. From the price equation (15) and the production equation (2)

$$(20) \qquad p_{I*}I* = \left(\frac{\alpha\bar{w}}{L*} - b\bar{w}\right)(1/ar)f(K^{I*})$$

Therefore, national income, as a function of r , reads

$$(21) \qquad Y = \frac{\alpha\bar{w}}{b} + \left(\frac{\alpha\bar{w}}{L*} - b\bar{w}\right)(1/ar)f(K^{I*})$$

where $L*$ and K^{I*} are the equilibrium values of employment of labor and of capital in the industrial sector, and are, therefore, functions of the rate r themselves. $L*(r)$ and $K^{I*}(r)$ were given above in equations (10), (11) and (12) respectively, and are not linear equations. It follows immediately that across equilibria with different values of the rate r , the demand for money equation is

$$M^D(r) = \frac{\alpha\bar{w}}{b\gamma(r)} + \frac{1}{ar\gamma(r)}\left(\frac{\alpha\bar{w}}{L*} - b\bar{w}\right)f(K^{I*})$$

where $\gamma(r)$ is the velocity of money.[3]

Our next step is to compute the changes in the demand for money $M^D(r)$ as r changes, i.e.

$$\frac{\partial M^D(r)}{\partial r}$$

[3]Note that the demand for money of course depends on the nominal wage rate $\bar{w}$, which we have taken as exogenous. It can be shown to be increasing in $\bar{w}$.

We shall therefore need to specify further the velocity of money equation $\gamma(r)$. Following standard practice, γ will be assumed to be a non-decreasing function of r . The quantity theory of money case, where γ is a constant, is, of course, included also.

First, note that the term

$$\bar{w}\left(\frac{\alpha}{L^*} - b\right) \tag{22}$$

in the national income equation, is always positive. This is because from (3) we obtain in equilibrium

$$\frac{\alpha}{L^*} - b = \frac{p_B}{w} - b \tag{23}$$

Since from the price equation (14)

$$\frac{p_B}{w} = \frac{arp_I}{w} + b\ , \tag{24}$$

(24) implies that $p_B/w > b$. It follows that (22) is always positive. Now, as r increases, $f(K^I)$ decreases when the industrial sector produces output levels using a capital stock above $\hat{K}^I$.

Since $K^I \geq \hat{K}^I$ because $r \leqq \hat{r}$, it follows that the second term of Y , namely

$$\frac{w}{ar}\left(\frac{\alpha}{L^*} - b\right)f(K^I) \tag{25}$$

is a decreasing function of the rate of return r . Since the first term in Y , $\alpha w/b$, is a constant function of the nominal wage, and since the velocity factor $\gamma(r)$ is a non-decreasing function of r , it follows that for $K^I \geq \hat{K}^I$ and $r \leqq \hat{r}$, the demand for money equation is a <u>decreasing</u> function of the rate of return r , i.e.

$$(26) \qquad \frac{\partial M^D(r)}{\partial r} < 0$$

corresponding to the illustration in Figure 1, and to the general theory on rates of interest.[4] Note that we have not had to use arguments about the opportunity costs of holding money to establish that the transactions demand falls with r . The argument is based purely on general equilibrium considerations.

So far we have considered only the case or $r \leqq \hat{r}$. We now consider the remaining case of $r > \hat{r}$. In this case, profit-maximizing behavior of the firms in the I-sector requires that they close down, with $K^I = 0$. In this case, the demand for money becomes simply

$$M^D(r) = \frac{\alpha \bar{w}}{bV(r)}$$

which is a decreasing function of r . The money demand is now a discontinuous function of r , as shown in Figure 3.

This discontinuous drop in money demand $M^D(r)$ occurs, of course, because of the discontinuous decrease in national income as the I-sector closes down.

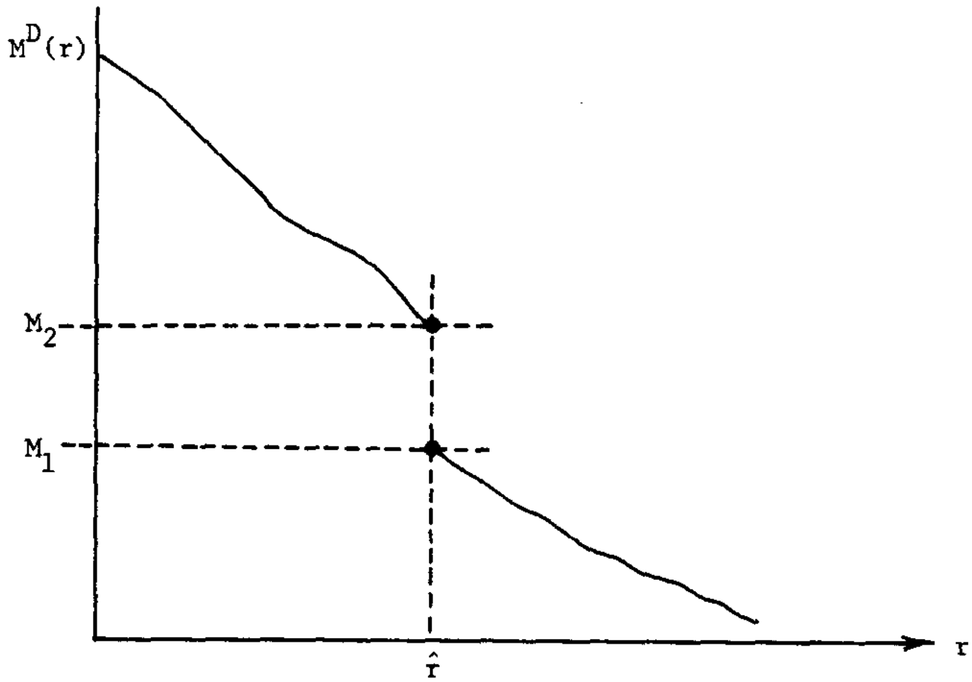

FIGURE 3

Money Demand Is Discontinuous in r When Firms in the I-Sector Maximize Profits

4. The Effects of Monetary Policy

It is now a straightfoward matter to use Figure 3 to analyze the effects of different monetary policies on the equilibrium of this economy There are clearly three possibilities. Low money supplies, i.e. stringent monetary policies, with $M \leqq M_1$, will give rise to an inefficient equilibrium, i.e. an equilibrium in which the industrial sector I closes down. Stringent monetary policies force interest rates so high that this sector cannot operate profitably. Slightly surprisingly, as the monetary policy is eased and M increases above M_1 , the economy does not immediately establish an efficient equilibrium. For $M_1 < M < M_2$, i.e. an intermediate range of monetary policies, there is no equilibrium in the money market. Only when the money supply is increased beyond M_2 , can an efficient equilibrium be established. In summary, tight monetary policies lead to inefficiency in the sense of non-operation of the increasing returns sector, intermediate monetary policies are incompatible with equilibrium, and only liberal monetary policies within certain ranges are compatible with an equilibrium in which the increasing returns sector operates on a positive scale. It may be worth remarking that because the slope of the money demand function is higher at high nominal wage rates (see note 4), the interest rate is less responsive to changes in the money supply at high nominal wages.

Figure 3 was constructed on the assumption that firms are profit-maximizing and so the industrial sector I closes down, for $r > \hat{r}$. This is probably the most obvious assumption, but there is an alternative which also yields interesting insights. We shall suppose that for $r \leq \hat{r}$, firms in the I-sector profit-maximize so they wish to close down for $r > \hat{r}$. However, society wishes them to continue in operation at higher levels or r , and for values of r larger than $\hat{r}$ the I-sector is state regulated to run on a marginal cost pricing basis. This means that they will determine output from the equation $f'(K^I) = r$, and in the event of two positive solutions to this, we shall arbitrarily assume that they choose the larger root for K^I . [For a discussion of the relationship between marginal cost pricing and first order conditions, see Brown and Heal (1979).] For $r > \hat{r}$, this behavior may involve losses in the I-sector: this will be reflected in negative profits in Walras' Law, so that there is an implicit tax on factor incomes to meet these losses. This "tax" is determined by the Walras Law, identity (5).

In this case, the first-order condition $f'(K^I) = r$ will hold for all r , up to a value r_{max} which is the finite maximum value of $f'(K^I)$

along the production function. We now restrict our attention to $r \leqq r_{max}$, as this is the range where the problem is well-defined. For all $r \leqq r_{max}$, the money demand equation is now

$$M^D(r) = \frac{\alpha\bar{w}}{b\gamma(r)} + \frac{1}{ar\gamma(r)}\left(\frac{\alpha\bar{w}}{L} - b\bar{w}\right)f(K^I)$$

We know from our earlier discussion that for $r \leqq \hat{r}$, this is a decreasing function of r. Clearly $\hat{r} < r_{max}$, and it can be shown that $M^D(r)$ is still decreasing for $\hat{r} \leqq r \leqq r_{max}$. Hence, we have a situation as shown in Figure 4.

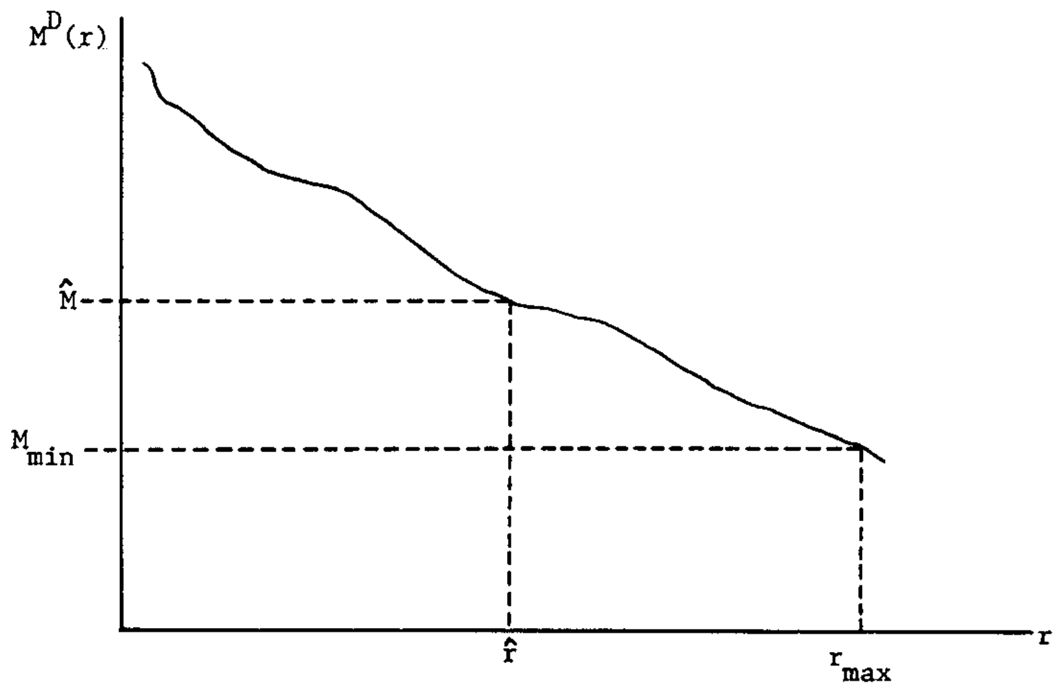

FIGURE 4

Money Demand When the Increasing Returns to Scale Sector is Regulated, for $r > \hat{r}$

Tighter monetary policies correspond to higher interest rates. There is now an equilibrium for all $r < r_{max}$ and so all money supplies $M > M_{min}$. In this case, however, as the monetary policy is eased, there is a qualitative change in the kind of equilibrium that can be supported. For $M < \hat{M}$, i.e. for tight monetary policies, production in the industrial sector I can only be sustained if this sector is regulated, its prices set at marginal cost, and is possibly subsidized. For $M \geqq \hat{M}$, a normal profit-maximizing competitive equilibrium will exist. Tight monetary policies therefore force an institutional change, and a greater degree of government involvement in the industrial sector.

We have so far considered just the effects of monetary policy on the operation of the increasing returns sector in equilibrium. Obviously, it has other effects as well, and we now turn to a review of these. We already know from the analysis of (25) that national income is a decreasing function of the rate of return r, and so it increases as the money supply is increased. This is the traditional reflationary impact of a relaxation of monetary policy. However, national income does not rise with M because the economy expands uniformly: in fact as M rises and r falls, the I-sector expands and the B-sector contracts.

That the I-sector expands has already been established, and follows from the fact that in the first order condition $f'(K^I) = r$, a decrease in r resulting from an increase in M, requires a rise in K^I in the range of $r \leqq r_{max}$. That the B-sector contracts, may be seen as follows. From (4), a fall in r lowers $K = K^I + K^B$: as K^I rises, then clearly K^B must fall. But from (1), $B^S = K^B/a$, so that the output of B falls. A loosening of monetary policy therefore expands the economy by changing its balance substantially: the capital-intensive and increasing returns I-sector expands, and the B-sector contracts. We should point out that because the B-sector is the only employer of labor, which it employs in fixed proportions, its contraction leads to a reduction in employment, which, for market clearing, requires via equation (3) a reduction in the real wage $\bar{w}/p_B$. As nominal wages $\bar{w}$ are fixed, p_B must therefore rise. The fact that employment falls as national income rises, is clearly a product of the rather sharp form in which we have modelled the difference between the two sectors. With further intermediate sectors, or with labor employment in the I-sector or substitution in the B-sector, one would expect this effect to be reduced or even reversed. It is arising here because a reduction in r expands the capital-intensive I-sector, which has no effect on employment, while reducing the supply of capital, thus forcing down capital use in the other sector. The absence of substitution possibilities here then inescapably forces down its output and employment. So clearly labor use in the I-sector, or substitution in the B-sector, could break this relation between employment and the expansion of the industrial sector. An extension of this model in these directions would, therefore, seem desirable. But in any case the overall conclusions of the model about the effects of monetary policies on an increasing returns economy, will clearly remain the same.

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