



Working Papers Series:

Growth and Employment in Europe: Sustainability and Competitiveness

Working Paper No. 23

**THE RATE OF INTEREST, ECONOMIC GROWTH, AND INFLATION:
AN ALTERNATIVE THEORETICAL PERSPECTIVE**

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April, 2002

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by

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Abstract

The premise of this paper is that in a monetary production economy, policy decisions of the central bank, or more generally the 'monetary authority', set the tone not only for nominal interest rates but also for 'real' interest rates defined in the usual way. This is a different question than that of which institution(s) acquire the status of monetary authority at any particular stage of socioeconomic or technological development. Rather the suggestion is that the existence of some such social structure is a prerequisite if anything resembling capitalist monetary production is to be viable. The paper demonstrates that a coherent macroeconomic theory can be elaborated on this basis, including an explanation of economic growth, the business cycle, inflation, the functional distribution of income, the 'Keynesian' problem of the impact of demand growth on economic growth, endogenous money, cumulative causation, and endogenous technical change.

Acknowledgements

I would like to thank J. Barkley Rosser Jr., Markus Marterbauer, Marc Lavoie, Engelbert Stockhammer, Per-Gunnar Berglund, Guiseppe Fontana, and Mario Seccareccia for helpful comments and suggestions on successive earlier versions of this paper. All remaining errors and omissions are the sole responsibility of the author.

Keywords

interest rates, monetary policy, macroeconomics, growth, inflation

JEL

310, 023, 110, 130

The Rate of Interest, Economic Growth, and Inflation: An Alternative Theoretical Perspective.

John Smithin

Introduction

The premise of this paper is that, in the 'monetary production economy', the policy decisions of the central bank, or more generally the 'monetary authority' set the tone not only for nominal interest rates, but also for the 'real' rate of interest, defined in the usual way.

This position is clearly heresy from the perspective of the orthodox barter-exchange economic theory, in which money is a 'veil', and the concept of interest is assimilated to a variety of non-monetary concepts, such as time preference, or the marginal physical productivity of some commodity employed in the production process. If, however, monetary institutions and practices, including the money of account, banks, central banks, credit creation and repayment, and so on, are seen as a system of social relations (Ingham 1999, 2000, 2001), the existence of which, in turn, is the precondition for 'economic' activities such as buying and selling for money, and production for sale in the market, even to take place, this becomes a far more intelligible concept. The role of money becomes a question of 'collectively assigned status functions' (Searle 1998) or 'continually reproduced social interdependencies' (Lawson 1997). If, in short, we have good reason to reject the notion of a scarcity-determined 'natural rate' of interest as in Wicksell (1898), which it seems that we do (Rogers 1989, Smithin 1994, 1999, Lavoie 1996, 1997), it is difficult to see what else the real interest rate *on money* can be, other than simply the nominal rate ultimately set by the monetary authority, as compared to the consensus of shared inflation expectations held by the key actors in the system. This, it should be noted is a rather different question than that of which institution or institutions acquires the status of a 'monetary authority' at given stage of socio-economic and, particularly, technological development, which, for obvious reasons, has attracted a good deal of attention recently (Ingham 2001). Rather the suggestion is that the existence of some such social structure is a

prerequisite if anything resembling capitalist monetary production is to be viable. In any event, this paper demonstrates that a coherent macroeconomic theory can be elaborated on this basis, which includes *inter alia* an explanation of economic growth, the business cycle, inflation, the functional distribution of income (most importantly the profit share), the ‘Keynesian’ problem of the impact of demand growth on economic growth, endogenous money, cumulative causation, and endogenous technical change. This structure advances, and in several respects modifies, work reported earlier in Smithin (1994), Smithin (1997), and Smithin (2001a).

Monetary Policy ‘Rules’

A convenient starting point for the argument is a standard ‘monetary policy rule’ of the type originally advanced by Taylor (1993), and which is frequently discussed in texts on monetary economics and in policy debate (Lewis and Mizen 2000, Mankiw 2001). One version of such a rule, focusing on interest rates, would be the following:

$$(1) \quad i(t) = a_0 + a_1[\pi(t-1) - \pi^*] + a_2[g(t-1) - g^N] + \pi(t-1)$$

where i is the ‘policy-related’ nominal interest rate (IMF 2001) set by the monetary authority, π is the inflation rate, and g is the rate of growth of real GDP. Equation (1) differs only slightly from standard formulations in postulating a ‘growth gap’ rather than simply an ‘output gap’, in order to be consistent with notation to be introduced below. The lagged time subscripts illustrate the point that if this to be a ‘reaction function’ the response should be to variables which are definitely observable at the time policy decisions are being made. In this respect, however the lagged inflation term on the right hand side of equation (1) is something of an anomaly, as it is meant to indicate that the rule is ‘written in real terms’ (Taylor 1993), and that

the lagged inflation rate is explicitly 'a proxy for expected inflation'. In principle, then, the rule in equation (1) should be rewritten as:

$$(2) \quad i(t) - p(t+1) = a_0 + a_1[p(t-1) - p^*] + a_2[g(t-1) - g^N]$$

where (again anticipating the notation used below) $p(t-1)$ is replaced with $p(t+1)$.¹ Equation (2) therefore states that the real policy-related interest rate will be increased if lagged inflation has been greater than some arbitrary inflation target p^* , and also if the economy is believed to be growing 'too fast' in the sense that the lagged growth rate was faster than whatever the current estimate of the 'natural' or 'potential' growth rate, g^N , happens to be. Note that this rule is consistent, for example, with the findings of Mankiw (2001), that in the USA in the 1990s the principle was followed that increases in nominal interest rates were usually greater than any previous increase in inflation (thereby increasing the real rate).

A critique of the type of policy framework suggested by the above discussion, when viewed from an outside perspective to the discourse represented by 'neoclassical mainstream economics', is that at least three elements in the proposed rule seem to be pure 'social constructs'. They are epistemically subjective in the sense that they are the products of a combination of the ruling (or traditional) economic theory, current political ideology, and the practical rules of thumb and judgements of central bank officials themselves. This is clearly true of the inflation target, p^* , for example, which is simply a question of political fiat, but it also applies directly to the idea that any 'natural' or 'potential' growth rate actually exists. This cannot be directly observed, and its construction from the existing data depends essentially on the economic theory that asserts that there is or should be such a thing. More subtly, this is also

true of the intercept term, \mathbf{a}_0 , in the interest rate rule. In a quasi-Wicksellian framework, this must presumably bear the interpretation of the ‘equilibrium interest rate’ (Taylor 1993, Lewis and Mizen 2000), or again the ‘natural rate’ (of interest). This is turn, however, no matter how deeply entrenched a concept, is also the product of a particular (and essentially non-monetary) economic theory (Smithin 1994, 1999), which in the present paper is itself in dispute, for the reasons mentioned in the introduction. Therefore \mathbf{a}_0 , at any point in time, could also reasonably be interpreted a ‘choice variable’ informed by the relevant economic theory and contemporary political developments. In any event, the status of \mathbf{a}_0 is one of the key issues in monetary theory, the basic dividing line between classical and ‘non-classical’ theory (Keynes 1936, Schumpeter 1954, Humphrey 1993, 1998, Smithin 1999). Now, grouping all the presumed ‘subjective’ elements together we can define a ‘target’ real interest rate, or more broadly a ‘monetary policy regime’, the internal elements of which change with differing views on economic theory, differing weights placed on inflation as a ‘social problem’, different estimates of the capacity of the economy, and so on. Defining this target rate as $r = \{\mathbf{a}_0 + \mathbf{a}_1 \mathbf{p}^* - \mathbf{a}_2 g^N\}$, the monetary policy rule can then be written as:

$$(3) \quad i(t) - \mathbf{p}(t+1) = r + \mathbf{a}_1 \mathbf{p}(t-1) + \mathbf{a}_2 g(t-1)$$

Finally, in the usual context of the debate over monetary policy rules we can also evidently imagine a concern with ‘optimal’ policy aimed at smoothing the business cycle, damping fluctuations of the inflation rate around the target, etc. In such framework, the particular values of the coefficients \mathbf{a}_1 and \mathbf{a}_2 would be of primary interest (Taylor 1999, Lewis and Mizen

2000, Mankiw 2001). However, the main focus here will be on the changes in the intercept, r , interpreted as changes in the *overall monetary regime*. Therefore, both \mathbf{a}_1 and \mathbf{a}_2 will be set arbitrarily at zero simply in order to eliminate extra notation in the calculations below. The interest rule then reduces to:

$$(4) \quad i(t) - p(t+1) = r$$

Formally, of course, this implies the target is itself arbitrary,² but nonetheless we can continue to interpret any change heuristically as, for example, a greater or lesser concern with inflation on the part of policy-makers, or a greater emphasis on growth versus an unwillingness to let the economy ‘overheat’, and so forth.

The Financing of Production

Now consider a simple one sector macroeconomic model of production in which a consumption good, $Y(t)$, is produced by labor inputs, $N(t)$. If the coefficient $A(t)$ represents the average product of labor we have:

$$(5) \quad Y(t) = A(t)N(t)$$

In this formulation, $Y(t)$ is understood as the output of a production process which *begins* in time (t) . A time dimension can then be introduced by assuming that these goods will not actually be available for sale until the next period, $(t+1)$. This a simple device to capture the notion that the overall production process takes time (Smithin 1997, 2001a), and that interest charges are therefore an integral component of final product prices. The one period production lag then defines the basic unit

of time in the model. The model also imposes the *ex post* equilibrium condition that aggregate demand equals aggregate supply, so that if $D(t)$ stands for real aggregate demand in time (t) , and given the overall lag in the production/marketing process, we may write:

$$(6) \quad D(t) = Y(t-1)$$

This does not, however, imply that 'supply creates its own demand' as output decisions in time $(t-1)$ will have been on the basis of the *expected*, rather than the actual, demand for the product in (t) , as this was perceived in $(t-1)$. Given the production/marketing lag, the *actual* level of demand in time (t) will help to determine such variables as the inflation rate and income distribution in that period, but it cannot determine the amount available for sale. This will have become a pre-determined variable by the time the actual demand is realized.

The production and transactions structure of the model is a simplified version of that previously worked out by MacKinnon and Smithin (1993), and is contrived so that firms enter each period with a stock of finished goods on hand but no money balances (no claims on financial institutions). Monetary profits received in the previous period are assumed to have been distributed to the owners of the firms before the current period begins. Also, the technical nature of the production process is assumed to be such that new production must be started and workers must be paid 'in advance' even before the current period goods market opens. The new nominal wage bill, $W(t)N(t)$, must therefore be financed by borrowing from banks at the prevailing nominal interest charge $i(t)$. On reasonable assumptions, the interest rate charged by the 'banks', will be a simple mark-up on the base rate set by the monetary authority (MacKinnon and Smithin 1993). Hence, for convenience the same notation can be employed as above. Having borrowed the current wage bill firms will eventually have to repay principal plus interest, which is also denominated in terms of bank

liabilities. Allowing for the production lag, however, it may be presumed that the loan contracts will specify that firms do not have to repay principal and interest on the current wage bill until after the goods produced have been offered for sale at the *next period's* goods market.

When loans are extended, expanding the asset side of bank balance sheets, the liabilities side, and hence the money supply, will expand also. If the notation, $M(t)$, is used to stand for the *increment* to the money supply at time (t) ,³ we can therefore write:

$$(7) \quad M(t) = W(t)N(t)$$

When the goods market in (t) opens, the newly created money supply, $M(t)$, will be already in the hands of the workforce in the form of current wages and will be available for expenditure on the supply of goods brought forward from the previous period. Note also that as loans outstanding from last period have not yet been repaid, last period's increment to the money supply $M(t-1) = W(t-1)N(t-1)$ is still in circulation, in the hands of savers and recipients of other types of income, and is also available for spending as required. There are therefore always two 'sources of funds' from which payment for current consumption spending can be made, the money newly endogenously created in the current period *plus* money endogenously created in the previous period.

When goods market trading in the current period is completed, firms will be in possession of money balances equal to $P(t)Y(t-1)$ which they can then use to retire the principal of loans outstanding from the previous period and pay interest. The remainder will represent monetary profits to be distributed to firm owners. Firms will then be in the same position as they were to start with, that is with stocks of goods on hand but no money balances. Note also that as the loans from last period, equal to $M(t-1)$, have now been retired, the only money balances available to be carried

forward to period $(t+1)$ will be the current increment to the money supply, $M(t)$, backed by current period loans.

This staggered sequence of loan issue and repayment enables the model to avoid the logical difficulties sometimes associated with endogenous money or ‘fundist’ models in which only the cost of production is loan financed (Seccareccia 1996). In the present environment two generations of loans are circulating in any period with only one repayment to be made, which means that there will be no problem in generating monetary profits. It is always feasible that monetary profits can be positive as long as new nominal borrowing exceeds the previous wage bill, plus any ‘hoarding’ of money balances, plus the interest charge inherited from last period. To avoid misunderstanding, however, note that no special significance is attributed to the fact that it is the wage bill that is loan financed as opposed to (e.g.) other types of firm expenditure, consumption expenditures, or (if we introduced an explicit discussion of the state budget) government expenditures. As with the assumption of the production lag, this particular funding assumption is again in the nature of a device to illustrate by a specific example a phenomenon that is nonetheless held to be of more general significance. In the particular ‘world’ of this model, it is the entrepreneurs who are prepared to go into debt temporarily on the promise of future profits, while (therefore) we must be assuming that consumption spending and other firm spending are typically be financed out of funds that are already in existence. But, it would be equally feasible to construct similar scenarios in which (say) consumers or the public sector go into debt (see Smithin 1997). The key point here is not any question of ‘initial’ versus ‘final’ finance, which is sometimes discussed in the circuitist literature, but the fact that *at least one of* the macroeconomic sectors must be willing to (repeatedly) incur debt in order for monetary profits to be generated. In the present treatment it is assumed that it is the corporate sector that is willing to do this, but other scenarios would be equally valid.

The Demand for Money and Expected Inflation

It will be noted that the holdings of 'money' and 'wealth' are basically conflated in this model, which can be defended on the grounds that some such process is taking place, or is already in existence, in the real world. However, the formulation must therefore allow for the existence of a stock demand for money in addition to the flow demand associated with financing the wage bill. Loans taken out in period (t) , for example, will not be repaid until *after* the closing of the goods market in $(t+1)$. Therefore someone must be willing to hold the associated liabilities of the banking system over the turn of the period. This allows the problem of the 'stock demand for money' to be introduced into the present framework, albeit in a rudimentary fashion.

In the environment as described, one argument that might be made is that a main reason for an economic actor to hold money balances over to a subsequent period would be to have additional funds on hand to be able to participate in that period's goods market. These would be held in addition to, or as a substitute for, any sums expected to be obtainable from participation in the upcoming labour market. In standard terminology this would be something like a 'precautionary' demand for money. The actors hold money over the turn of the period as insurance against the possibility of not being able to obtain enough funds for their needs by participating in ongoing economic activity. A simple hypothesis, therefore, would be that the stock demand for nominal balances carried over from the current period, deflated by the expected price level next period, is proportional to the expected real demand for goods next period (which in turn is equal to current production). In other words:

$$(8) \quad M(t)/P(t+1) = BY(t), \quad 0 < B < 1$$

Logically there might also be expected to be some influence of the (real) interest rate on the demand for money in equation (8). However, as money in this model consists of the interest-bearing liabilities of financial institutions, and money balances held over are the only vehicle for saving, it is clear that an increase in interest rates must have a positive rather than a negative impact on the demand for real money balances held over the turn of the period (MacKinnon and Smithin 1993). This is the opposite effect to that predicted in conventional models of money demand, which assume a non-interest-bearing money. As the inclusion of a positive interest rate argument in equation (8) would affect none the main results reported below, it can therefore be neglected.

For a given level of real wages, determined (e.g.) by the wage bargaining process, the model sketched out in the previous two sections can yield a simple expression for both the expected and actual inflation rate in the economy without, at this stage, any further reference to details of the production process. The price *level* would also be determinate provided that an initial condition can be specified on at least one of the nominal variables at some date in the past.⁴

For a given level of real wages and productivity the expected rate of inflation can be obtained by using equation (5) in equation (7), dividing through by the price level, and taking logarithms of both the result and equation (8). This will yield the following:

$$(9) \quad m(t) - p(t) = [w(t) - p(t)] + y(t) - a(t)$$

$$(10) \quad m(t) - p(t+1) = b + y(t)$$

In these expressions lower case letters have been used to stand for natural logarithms, for example $p(t) = \ln P(t)$. Note also that as the coefficient B (upper case) is a fraction, b (lower case) must be a negative number. Therefore, it will be useful in what follows to define a further expression \mathbf{b} , where $\mathbf{b} = -\ln B = -b$, with $\mathbf{b} > 0$. Now the inflation rate can be determined by substituting (10) into (9).

Using the conventional symbol $p(t+1)$ to stand for the expected inflation rate between periods (t) and $(t+1)$ we then have:

$$(11) \quad p(t+1) = \mathbf{b} + \{[w(t) - p(t)] - a(t)\}$$

The expected inflation rate as of (t) therefore depends on a term involving a parameter, \mathbf{b} , of the money demand function (which is positive) and on the gap between the (log of) real wages and productivity. This view of inflation therefore recalls various cost-push or wage-push theories of inflation that have been influential in the past. Note, however, that here it is the *real* wage bargain rather than the nominal wage bargain that matters, so that a better analogy may be to the 'conflict inflation' theories in the Post Keynesian literature (Rowthorn 1977, Dutt 1990, Lavoie 1992).

As can be seen by using equations (4), (5) and a lagged version of equation (13) below, the actual inflation rate in period (t) must also be:

$$(12) \quad p(t) = \mathbf{b} + [w(t-1) - p(t-1)] - a(t-1)$$

To inquire any further into the details of the inflationary process would then require specifying the various determinants of real wages and productivity, as is done below.

Profits, Wages and Productivity

On the assumptions made above, a forward-looking estimate of next period's GDP, viewed from the perspective of those making decisions in the current period, will be:

$$(13) \quad P(t+1)Y(t) = [1 + k(t)][1 + i(t)]W(t)N(t)$$

where $k(t)$ is the expected profit share from the sale of current production, which is actually realized in $(t+1)$. Equation (13) looks at matters from the point of view of those entrepreneurs involved in making the essential ‘gamble’ or ‘bet’ entailed in participating in the production process (Parguez 1996, Rochon 1999). Now taking logarithms and re-arranging, this will yield:

$$(14) \quad a(t) = k(t) + r + [w(t) - p(t)]$$

where r is the ‘target’ real rate of interest determined by monetary policy as discussed above. Equation (14) is an ‘interest-wage-profit frontier’ (Smithin 2001a), and is arguably the fundamental relationship on the supply side in a money-using capitalist economy. It suggests that the average product of labor must resolve itself into three shares in the functional distribution, the profit share, the real rate of interest, and real wages.

To derive a more complete macroeconomic model we make the following further assumptions: (i) that real wages will tend to increase with growth, and (ii) that productivity is itself endogenous, and is positively related to the rate of growth.

The first of these assumptions, that real wages rise with growth, is best taken as a hypothesis about the determinants of real wages at the systemic level, rather than anything resembling a conventional labor supply function derived from the theory of labor/leisure choice. The argument is simply that the bargaining power of labor is likely to be enhanced in a fast-growing economy, or rather that social mechanisms exist whereby the bargaining power is greater the faster is the rate of growth, a view that goes back at least to Adam Smith (1776) in the *Wealth of Nations*. It is not suggested, though, that the parameters derive from microeconomic labor supply elasticities, or, importantly, that the employment/unemployment

pattern that emerges is necessarily a *chosen* position on the part of individual workers. With these caveats, real wages may be determined, for example, by:

$$(15) \quad [w(t) - p(t)] = w_0 + hg(t), \quad h > 0$$

where w_0 is some base level of real wages (determined by sociological, institutional, or political considerations), and $g(t)$ is the real economic growth rate.

The second assumption allows for such things as the contribution of past capital investment to productivity, productivity enhancement through such factors as 'learning by doing', and increasing returns. A possible specification in the present context would be:

$$(16) \quad a(t) = a_0 + vg(t-1), \quad v > 0$$

This allows for exogenous 'productivity shocks', and also an endogenous component, whereby current productivity depends on past growth. As pointed out by Marterbauer (2000) this is in the spirit of 'Verdoorn's law' after Verdoorn (1949).⁵ It should be noted that the particular specification used here (rather than, say, suggesting that productivity *growth* is related to output growth) allows the model to settle down to a 'steady-state', in which there is an equilibrium growth rate, and hence an equilibrium level of productivity. This serves a heuristic purpose (for example, in being able to work out the comparative statics of the model as below), in a somewhat similar fashion to Schumpeter's concept of the 'circular flow' in the *Theory of Economic Development* (1934).⁶ However, note that such steady-states are not fixed points to which the economy must always return, in the way in which natural rates of unemployment or 'NAIRU's'⁷

are treated in the more orthodox literature, nor are their properties independent of demand considerations or monetary policy. The comparative static results can therefore be interpreted as indicating ‘tendencies’ or likely directions of change as applied to an economy more genuinely in flux. Now using (15) and (16) in (14), the ‘supply-side’ of the model becomes:

$$(17) \quad k(t) = a_0 + v g(t-1) - r - w_0 - h g(t)$$

Equation (17) therefore illustrates one set of factors, relating to the supply side or income distribution, which influence $k(t)$, the profit share or aggregate mark-up.

Aggregate Demand Considerations, the Business Cycle, and the ‘Steady-State’

Turning now to the demand side of the model, and following Smithin (2002b) the expected growth of aggregate demand between (t) and $(t+1)$ may be modeled quite simply as:

$$(18) \quad d(t+1) = \mathbf{q} + e k(t)$$

Here, \mathbf{q} is the growth of ‘autonomous demand’ (treated henceforth as a parameter), while the second term on the left-hand side suggests that demand growth will also increase with profitability due to the absorption of output by firms. As mentioned, however (and given equation 16 above), we do not need to inquire in too much detail how far these expenditures by firms actually contribute to the productive ‘capital stock’. This may well be the intention of some individual firms/entrepreneurs making the investments (whether they succeed or not), and there may also be a discernible aggregative empirical relationship between the total of such spending and productivity.⁸ Equally, however, in making expenditures firms may be using their

surplus simply to absorb goods and services for their own sake (to re-decorate the boardroom, buy an executive jet, schedule a sales conference at a golf resort, etc.). Such types of activities add to demand, but would not be thought of as productive in any technical sense. In the 'Keynesian' tradition, therefore, the demand-creating aspects of firm expenditures are taken as seriously as any contributions to future productivity. The latter, however, are not neglected either, as ongoing technical progress is incorporated via the device of a 'Verdoorn coefficient' as described above.

From equation (2) therefore, note that overall 'demand-side' of the model can conveniently be written as:

$$(19) \quad g(t) = \mathbf{q} + ek(t)$$

Equations (17 and (19) then constitute a complete macro model, which can be solved for the time paths of GDP growth (the business cycle), and the profit share. The growth cycle, or business cycle, is given by:

$$(20) \quad g(t) = [ev/(1+eh)]g(t-1) + [1/(1+eh)]\mathbf{q} + [e/(1+eh)](a_0 - r - w_0)$$

If $|ev/(1+eh)| < 1$, the system will converge, giving the steady-state solutions:

$$(21) \quad g = \{1/[1+e(h-v)]\}\mathbf{q} + \{e/[1+e(h-v)]\}(a_0 - r - w_0)$$

$$(22) \quad k = \{(v-h)/[1+e(h-v)]\}\mathbf{q} + \{1/[1+e(h-v)]\}(a_0 - r - w_0)$$

Equations (21) and (22) therefore summarize the long-run determinants of the growth rate and the profit share respectively, or, at least, they do so on the assumption that the original specifications were realistic and that there is no radical change in the underlying social structure over the same 'long-run'.

Interpretation of the Formal Results for Growth and Profitability

The above results can be visualized in a simple graphical framework by constructing the loci:

$$(23) \quad k = a_0 - r - w_0 + (v-h)g$$

$$(24) \quad k = (1/e)(g - q)$$

Equations (23) and (24) both illustrate relationships between the profit share and the growth rate. Equation (24), summarizing the demand side, is upward-sloping in k, g space.⁹ The slope of equation (23) however, relating to supply and income distribution, is ambiguous. It will be downward-sloping for $h > v$, and upward-sloping otherwise. The issue at stake is the impact of growth on the profit share. In a system which is not technologically progressive, and/or in which the bargaining power of labor over real wages is exceptionally strong, growth will tend to reduce profits, because real wages will tend to increase faster than productivity. On the other hand, if growth enhances productivity by more than enough to offset any increase in real wages, the profit share can increase.

There are therefore three possible configurations, which, borrowing terminology from the Post Keynesian and 'social structuralist' literature (see Epstein and Gintis 1995), can be labeled the *profit-squeeze*,¹⁰ *golden-age Keynesian*, and *austere neoclassical*, cases, respectively. The first of these, with $h > v$, is illustrated in Figure 1. As can be seen, in this case there will a definite

relationship between real interest rates, economic growth, and profitability. A higher real rate of interest will reduce both the rate of growth and profits. Vice-versa for a fall in interest rates. Note, however, the specific way in which interest rates and profits are related in this context. There is no tendency, for example, for any *rate* of profit and the interest rate to be equal, nor even for the profit share (net of interest) to move in the same direction as the interest rate. Interest and profit are two different concepts. The fact that in this model an increase in the rate of interest tends to *reduce* the profit share does seem to accord with common-sense notions of the likely impact on industry of monetary tightening, although it differs from what has sometimes been suggested in theoretical discussions.

Another Keynesian-style result that seems to follow is that an increase in the rate of growth of autonomous demand increases the growth rate of real GDP. Moreover this is a permanent or long-run effect, as was the interest rate result discussed above. Neither is an artifact of ephemeral short-run rigidities or misperceptions. Note, however, that in this 'profit squeeze' case the increased growth and employment caused by a demand expansion is accompanied by a *fall* in profit share, (which is why it deserves such a label). In terms of political economy, this may go some way towards explaining the apparent hostility even of *non-financial* business to 'Keynesian economics', which is sometimes observed in practice. The mechanism by which the fall in profit occurs is simply a question of the increased economic growth improving the bargaining power of labor and hence real wages, thereby cutting into profits. This need not occur, it should be noted, in the case of growth stimulated by lower interest rates, for in that case there is space for an increase in both wages and profits.

Figure I

Insert Figure 1 Here

A more harmonious regime than the above would prevail if $v > h$, but with the slope of equation (23) now flatter than that of equation (24). This is illustrated in Figure 2. The interpretation is that the system is now sufficiently technically progressive that growth stimulates a large enough improvement in productivity to offset any increase in real wages. This allows the profit share to increase, even though there may also be an increase in real wages. The reason for calling this configuration the ‘golden-age Keynesian case’ is simply on a conjecture that some such conditions may have prevailed during the so-called ‘golden age of capitalism’ (Marglin and Schor 1990), in the industrialized nations in the third quarter of the twentieth century. Something of the sort would seem to have been necessary to make the putatively Keynesian policies of the period palatable to both ‘big business’ and ‘big labor’. The difference from the more pessimistic scenario above is that as demand growth now causes an increase in both economic growth and profitability, there is no real reason for entrepreneurial capital to oppose expansion. We should note, however, that as for interest rate changes, the same results as described earlier continue to apply, so in that area there remains a potential source of conflict of interest between what we might call ‘financial capitalists’ and ‘industrial capitalists’.

Figure 2

Insert Figure 2 Here

We now turn to changes in the parameters a_0 and w_0 . As might be expected, a positive ‘productivity shock’ (which is one way of characterizing an increase in a_0), always (that is in all configurations of the model) tends to increase both growth and profits. The opposite conclusion holds for an increase in w_0 , the intercept term in the wage equation, which might be termed a ‘labor relations shock’. This latter result requires careful interpretation, however. There is a positive correlation between *actual* real wages and GDP growth in this framework, unlike the much criticized ‘textbook Keynesian’ model (Mankiw 1991). The latter only allows a reduction in unemployment if real wages fall. In the present case, however, growth itself causes the hypothesized increase in the bargaining power of labor, and hence an increase in *actual* real wages. A ‘labor relations shock’ however, is taken to represent a different type of change in labor’s bargaining position, that which can occur even in the absence of an increase in economic activity. This may come about, for example, through social legislation favoring labor unions or other historical/insitutional/political changes. An improvement in labor’s position, in this sense, tends to *reduce* both profitability and the growth rate. Such developments may therefore be strongly resisted by ‘management’ (Kilpatrick and Lawson 1980, Lawson 1997). However, note that this is a different result to that usually emerging in the ‘canonical’ Kaleckian/Post Keynesian model (Lavoie 1992), which stresses the positive impact of real wages on demand.

In the last of the three potential configurations, illustrated in Figure 3, equation (23) now has a steeper slope than equation (24). This is called the ‘austere neoclassical’ case because now austerity-type policies as recommended on the basis of neoclassical economics seem to ‘work’. A reduction in the demand parameter q *apparently* leads to an increase in both the rate of growth and the profit share. So, if feasible, this would be a solution in the spirit of fiscal conservatism, IMF-type policy packages, and the like. However, we can also definitively assert that this will not be a viable scenario in any practical application of the model, as this case is unstable. The slopes of the schedules now violate the stability condition $\{|ev/(1+eh)| < 1\}$.

Figure 3

Insert Figure 3 Here

Therefore the only two practically relevant scenarios are actually those depicted in Figures 1 and 2, respectively. Presumably, the best recipe for economic success in a capitalist-type system would be the latter, which requires that the system be technologically progressive in a particular sense.

Comparative Statics

From equation (21) the comparative static results for steady-state growth can be stated more formally as follows:

$$(25) \quad dg/dr = - \{e/[1+e(h-v)]\}, \quad (< 0)$$

$$(26) \quad dg/dq = \{1/[1+e(h-v)]\}, \quad (> 0)$$

$$(27) \quad dg/da_0 = \{e/[1+e(h-v)]\}, \quad (> 0)$$

$$(28) \quad dg/dw_0 = - \{e/[1+e(h-v)]\}, \quad (< 0)$$

In other words, lower target values of the real interest rate of interest (that is say, an overall ‘easier’ monetary policy regime) tend to lead to higher equilibrium levels of output growth, and vice versa. Similarly, higher rates of growth of autonomous demand lead to higher GDP growth, exogenous technical progress leads to higher growth, while an increase in social conflict (i.e., a worsening of labor relations) will lead to lower growth.

From the point of view of the various monetary policy options, which were the starting point of the discussion, these results suggests that central banks concerned with output and employment outcomes should attempt to pursue a ‘cheap money’ policy in the sense of stabilizing *real* interest rates at some fairly low level. Meanwhile, as far as other policy choices are concerned, it can also be seen that ‘maintaining the pressure of aggregate demand’ is as important for growth as it is for short-run stabilization purposes.

We can also report the impact of each of the various exogenous impulses on the long-run profit share in a compact format as below:

$$(29) \quad dk/dr = - \{1/[1+e(h-v)]\}, \quad (< 0)$$

$$(30) \quad dk/dq = \{(v-h)/[1+e(h-v)]\}, \quad (?)$$

$$(31) \quad dk/da_0 = \{1/[1+e(h-v)]\}, \quad (> 0)$$

$$(32) \quad dk/dw_0 = - \{1/[1+e(h-v)]\}, \quad (< 0)$$

A permanent increase in real interest rates, and also an increase in the intercept of the wage equation will both cut into the profit share, whereas a fortuitous technological improvement increases it. As mentioned, the impact of an increase in the rate of growth of autonomous demand on the profit share is ambiguous, which is why demand policy is likely to be a sensitive issue in 'political economy'.

At this point, the discussion can now return to the question of the determination of the inflation rate, as previously sketched in equations (11) and (12) above. The steady-state inflation rate can be derived by combining equations (12), (15), (16) and (21) to yield:

$$(33) \quad \mathbf{p} = \mathbf{b} + \{1/[1+e(h-v)]\}[w_0 - a_0] + \{e(h-v)/[1+e(h-v)]\}\mathbf{q} - \{e(h-v)/[1+e(h-v)]\}r$$

This then gives rise to the following comparative static results for inflation (again recalling that the stability condition $\{|ev/[1+eh]| < 1\}$ is assumed to hold):

$$(34) \quad d\mathbf{p}/dr = - \{e(h-v)/[1+e(h-v)]\}, \quad (?)$$

$$(35) \quad d\mathbf{p}/d\mathbf{q} = \{e(h-v)/[1+e(h-v)]\}, \quad (?)$$

$$(36) \quad d\mathbf{p}/da_0 = \{1/[1+e(h-v)]\}, \quad (> 0)$$

$$(37) \quad d\mathbf{p}/dw_0 = - \{1/[1+e(h-v)]\}, \quad (< 0)$$

Interestingly enough, the impact of a change in the real interest target (or monetary policy regime) on inflation is actually ambiguous, depending on the sign of $(h - v)$. Once again it depends on the relative technical progressivity of the system. For a fall in real interest rates, it is simply a variation on a

standard theme among practitioners in the financial markets to argue that this would be inflationary, even if accompanied by an increase in the growth rate as per equation (25) above. And, this case does in fact occur when we have $(h > v)$. However, if, on the other hand, there is a productivity improvement as a result of the increased growth, which in turn is greater than that of any increase in real wages, then the lower real interest rates will *not* be inflationary. This is perhaps a surprising result when looked at from a traditional point of view. In this case, a ‘cheap money’ policy leads to higher growth with *lower* inflation.

Similarly, we noted above that an increase in demand growth (holding real interest rates constant) always leads to an increase in economic growth. However, it can also be seen that the demand expansion also may or may not be inflationary. Again, this will depend on the sign of $(h - v)$. The political economy of this case is particularly suggestive. For $(h > v)$ a demand expansion does indeed lead to an increase in growth, but accompanied by higher inflation, and, crucially, as discussed earlier, lower profits. It is therefore easy to see how a popular view that a boom is ‘unsustainable’ due to inflation might gain ground, even if it may be argued that the real point at issue is the effect on profitability. For $(h < v)$, on the other hand the demand expansion actually leads to *lower* inflation and higher profits, as well as increased growth, with the induced increase in productivity primarily responsible for this more benign result.

Finally, note that the impact on inflation of changes in either of the parameters a_0 and w_0 is *unambiguous*. A fall in the former (representing an exogenous positive ‘technology shock’) will reduce inflation, whereas a rise in the latter will increase it.

The results from equations (25) to (28), and (34) to (37), can be conveniently summarized in the following table, which illustrates the complete set of steady-state comparative static results relevant to standard notions of the growth/inflation ‘trade-off’.

Table 1: Summary of Comparative Static Results for Growth and Inflation

	dr	dq	da_0	dw_0
	-----	-----	-----	-----
dg	-	+	+	-
$dp(h > v)$	-	+	-	+
$dp(h < v)$	+	-	-	+

From the above it can be noted that there is no question here of the existence of any ‘vertical’ long-run Phillips curve (LRPC). This latter, of course, is a basic construct of contemporary orthodox macroeconomics, which suggests that there is a given supply-determined steady-state growth rate (or natural growth rate), which in turn can be compatible with any steady-state inflation rate at all as determined by the demand parameters of the system. Instead of this, in Table 1 there are a wide variety of alternative steady-state growth/inflation combinations, determined *jointly* by supply and demand considerations, each of which could potentially occur in a particular set of circumstances. Outside of the steady-state, presumably, many different configurations of conventional short-run Phillips curves (SRPC) may also exist, depending on such things as temporary nominal rigidities, misperceptions, and the like. However, it should be stressed that the results here refer only to the more fundamental LRPC argument.

The potential long-run co-movements of inflation and growth depend upon both the source of the initial ‘disturbance’ to the economy, and also on the other parameters of the system. For monetary policy (interest rate) changes it is quite possible to observe a positive relation between growth and inflation, similar to the original Phillips curve idea of the 1950s and 1960s. However, also, in different circumstances, a negative one. Similar remarks apply to autonomous or policy-induced changes in aggregate demand growth. A Phillips curve trade-off may exist, but for some such

initiatives a fortunate constellation of circumstances may avoid this. For 'technology shocks', meanwhile, the Phillips curve would always be negatively-sloped (in pg space), whereas a positive labor relations shock (negative from the point of view of employers) would be one of the possible causes of 'stagflation'. As suggested above, therefore, there are plausible explanations for many of the observed growth/inflation combinations that might occur.

Concluding Remarks

In one sense, this paper has followed the 'horizontalist' literature as in Kaldor (1986), Moore (1988) and Lavoie (1996) in treating the rate of interest as a policy determined variable set by the administrative decisions of the central bank. The rate of interest is determined outside the ordinary framework of demand and supply analysis and, yet, it is pivotal for the behaviour of the rest of the system. Given such a policy-determined interest rate, the purpose of this paper has been to work out the consequences of interest rate changes in a simple model of a credit economy, in which production takes time and the money supply responds endogenously to the financing needs of productive firms. In particular, the focus has been on the impact of interest rate changes, and other types of macroeconomic changes, on output growth, profits and inflation. One point on which the analysis differs from some of the earlier literature is that the main channel by which interest rate changes have an effect is mainly from the supply side, via costs of production. The key relationship in the model is an 'interest-wage-profit' frontier, the characteristics of which depend on such things as the bargaining power of labor, monetary policy, and technical change.

It could be argued that more conventional monetary theory such as Chicago-style monetarism, or contemporary 'representative agent' models with constant rates of time preference, also have exogenous interest rate concepts (Tobin 1974, Smithin 1989). This may therefore be a source of confusion in interpreting the results. However, the policy-determined interest rate discussed

in this paper should not be confused with other sources of interest rate exogeneity. In more conventional monetary theory, the real rate of interest is exogenous *to the monetary system*. This would be in the nature of a 'natural rate' supposedly determined in the barter economy solely by the forces of productivity and thrift. The idea is that monetary interest rates must conform to this exogenously set standard rather than vice versa. In this treatment, however, the position is reversed, the interest rate is set by the central bank or 'monetary authority' *within* the monetary system, and it is the real economy that must do the adjusting.

One important conclusion that emerges is that even though the rate of interest is clearly a monetary phenomenon in the sense described above, it still makes a great deal of difference whether the authorities seek to stabilize nominal rates or 'real' rates (that is the rate of interest on money loans adjusted for expected inflation). Frequently, the standard notion of cheap money policy has been that *nominal* interest rates should be kept low. If the above analysis is correct, however, the notion of cheap money should therefore be reinterpreted to mean low real rates of interest rather than low nominal rates.

One main result is that a cheap money policy (lower real rates of interest) will tend to increase *both* the growth rate and the share of entrepreneurial profit. Whether or not this will lead to inflation, however (which would be the usual criticism), is ambiguous. This certainly could occur, but there is also a possibility that the expansion would lead to lower rather than higher inflation. In any event, there is no question of 'short term pain for long term gain', or *vice versa*. Even if the opposite policy of 'tight money' did reduce inflation as expected, then, in that case, to permanently keep inflation low by monetary policy means would also require a permanently depressed (low growth/high unemployment) real economy. The model therefore implies that the most sensible policy advice to be given to central banks concerned with growth and unemployment outcomes is that they should aim at a cheap money policy in the sense of 'low' (but still positive) real

interest rates. They should follow a 'real interest rate rule', rather than a monetary growth rule or an inflation rate rule.

An increase in the growth of 'autonomous demand', holding real interest rates constant, will tend to increase the growth rate. However, in this case, if the endogenous rate of increase in technical progress is not strong, the expansion would also tend to *reduce* the profit share, and *increase* inflation. So this would be the case in which 'Keynesian economics' would not be popular with the business community. In a more technically progressive system, the growth/profit relationship may be altered to become upward-sloping. In this case, the rate of increase in productivity is more than enough to offset improvements in the real wage caused by the improved bargaining power of labor. This would imply a more harmonious relationship between labor and entrepreneurial capital, as now both the profit share and real wages can increase with demand-led growth. Again, the 'increasing returns' element in this case would enable there to be an economic expansion without inflation.

A fortuitous (exogenous) improvement in technical progress, as in so-called 'new economy' scenarios will also tend to increase both the growth rate and profitability in a non-inflationary environment. Hence, presumably, one of the incentives for innovation under capitalism.

We should finally recall that the formal scope of the argument has been restricted to the closed economy context. Strictly speaking, therefore, any 'policy advice' which could be taken from this discussion would apply to a hypothetical closed economy, the world economy as a whole (from the point of view of a hegemonic national central bank dominating global monetary developments, or from that of an international agency), or the policy of the leading player in a relatively self-contained

trading system with fixed exchange rates. However, for the application to the situation of a small open economy with flexible exchange rates, see, for example, Smithin (2001b, 2002b).

Notes

- 1 Not $p(t)$. Given the timing assumptions of a particular model, $p(t)$ may still be unobservable when the interest rate is set, but it will not have any causal significance for forward-looking decisions made at that time.
- 2 We now have simply $r = a\theta$, but the point remains that $a\theta$ is taken to be a chosen value, not a given marginal product of capital or other non-monetary concept imported from outside of the monetary system.
- 3 This, in turn, will become the *stock* of money that is carried forward to the next period. Hence, it would awkward here to use any notation representing change such as (e.g.) DM .
- 4 The supposed indeterminacy of nominal prices under regimes other than those involving a fixed nominal money supply was at one time much debated in the neoclassical literature. It poses no problem here, as long as the initial condition can be specified. See MacKinnon and Smithin (1993) for further discussion.
- 5 According to evidence presented by Marterbauer (2000) for the European case, the best specification on empirical grounds would involve both lagged and contemporaneous growth terms. However, adding an extra coefficient would not affect the qualitative results worked out below.
- 6 Unlike Schumpeter, however, the 'positions of rest' still allow for positive interest and profits, and the continuous 'flux and reflux' of the money supply due to credit creation and repayment.
- 7 NAIRU stands for 'non-accelerating inflation rate of unemployment'.
- 8 These effects and others are already implicitly included in equation (16).
- 9 On the reasons for this see (e.g.) the discussion of the 'social structuralist' model by Gordon (1995).
- 10 Smithin (2001a) called this the 'pseudo-Marxist case' but this now seems misleading. In Marx there is a falling *rate* of profit, whereas here it is the profit share or aggregate mark-up that is declining. It is not really a meaningful exercise to attempt to calculate any profit rate in this framework.

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Figure 1

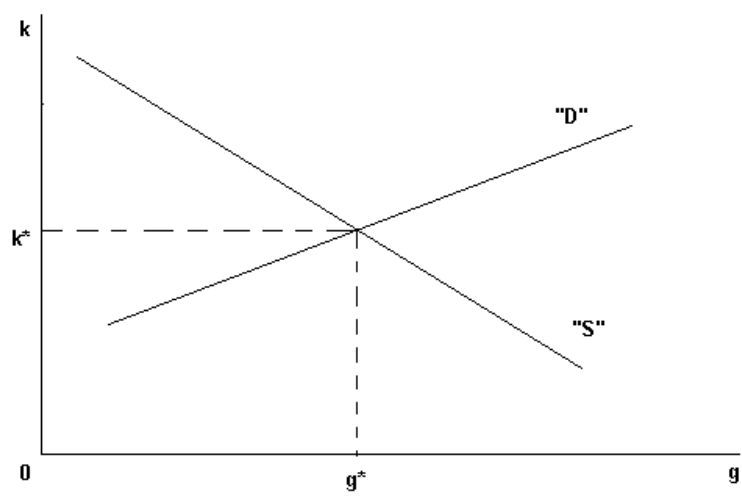


Figure 2

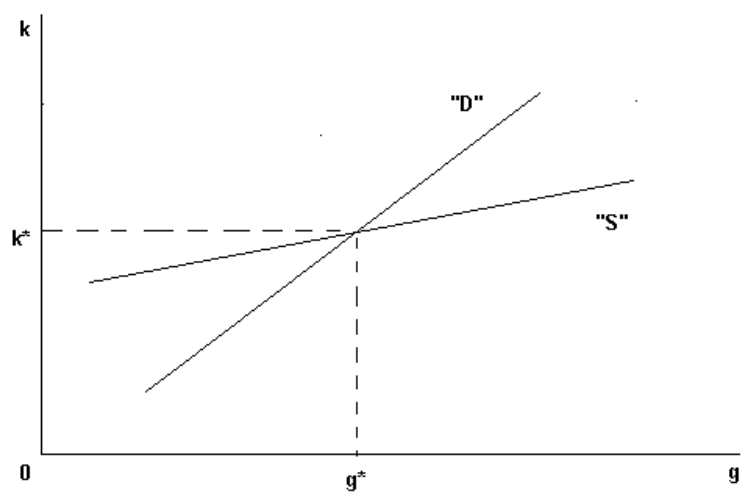


Figure 3

