Universidade de Brasília
Departamento de Economia

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Mauro Boianovsky
Universidade de Brasília

John R. Presley
Loughborough University

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UNIVERSIDADE DE BRASÍLIA
DEPARTAMENTO DE ECONOMIA
Campus Universitário Darcy Ribeiro
Instituto Central de Ciências
Caixa Postal 04302, 70910-900 Brasília, DF, Brasil
Tel.: (55-61) 3072498, 2723548
Fax: (55-61) 3402311
E-mail: econ@unb.br
http://www.unb.br/ih/eco

SÉRIE DE TEXTOS PARA DISCUSSÃO

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On the Natural Rates of Unemployment and Interest: the Robertson Connection

Mauro Boianovsky (Universidade de Brasilia)
John R. Presley (Loughborough University)

> I have now therefore to say something about money, about fluctuations in activity, about 'lapses from full employment'... If I may strike a personal note, this has always been to me the most interesting part of economics - the only part to which I can hope to be remembered as having made any personal contribution. (Robertson, [1959]1963, pp. 325-26)

Abstract

The paper explores in detail the connection between the twin concepts of a natural rate of interest that equilibrates the goods market and a natural rate of unemployment that equilibrates the labour market, put forward by Dennis Robertson (1934). According to Robertson, a divergence between saving and investment under conditions of monetary disequilibrium brings about changes in nominal and real income, caused by incorrect price expectations of producers and by the existence of money wage contracts. In long-period equilibrium the economy will settle at the natural (or normal) rates of interest and unemployment with correct price expectations.

1. Introduction

Dennis Robertson (b. 1890; d. 1963) developed his business cycle theory over a long period, from his 1915 *Study of Industrial Fluctuation* to the third volume of his *Lectures*, published two years after his retirement from Cambridge in 1957.[1] His best known contribution to the field is probably *Banking Policy and the Price Level* ([1926] 1949), where he attempted to extend the real analysis of the *Study* and to establish the notion of forced savings as a key

concept in the discussion of monetary disequilibrium over the business cycle. Nevertheless, he usually referred to his 1934 *Economic Journal* article on "Industrial Fluctuation and the Natural Rate of Interest" as representing the core of his interpretation of economic fluctuations (see, e.g., Robertson [1950] 1952, p. 78 n.; 1963, p. 418). Robertson's 1934 article introduced into the literature the diagrammatic representation of the market for loanable funds (see figure 1 below). More importantly for the purposes of this paper, it brought out for the first time the connection between the twin notions of a natural rate of interest and a natural (or normal) rate of unemployment, which equilibrate the market for goods and the market for labour respectively. That article grew out of another piece published a year before in the same *Journal*, where Robertson (1933) expanded his previous analysis of forced saving in the 1926 book by introducing the effects of unexpected price level changes on the level and distribution of output and, by that, on the position of the saving curve in his loanable funds diagram. It is well-known that Milton Friedman ([1968] 1969) used the term "natural rate of unemployment" in analogy with Knut Wicksell's ([1898] 1936) "natural rate of interest". However, while Friedman (1974, p. 40) regarded the determination of the natural rate of interest and the study of the saving-investment sector as "unfinished business", this was precisely the business of Robertson in the 1930s.

Robertson's dynamic method was based, from his *Banking* book onwards, on period analysis, also known as the "step-by-step approach". He assumed the existence of a period of time, called a "day", which is finite but nevertheless so short that the income which an individual receives on a given day can only be spent or saved in the next unit period - the "Robertsonian lag". Furthermore, he assumed that output is given in the current period and that price level changes clear the market for goods during the "day", which is an extension to the aggregate economy of the Marshallian concept of "market equilibrium" (see Robertson, 1933, pp. 399-401). Unforeseen price changes will affect real wages and output in the short period, since money-wages (assumed as contractually given during the "day") are decided on the basis of the previous price level. Apart from the effects of price fluctuations on the demand for labour, Robertson ([1915] 1948) advanced the notion that producers may temporarily mistake changes in the price level for changes in relative prices and adjust their supply of effort accordingly. In long-period macroeconomic equilibrium, defined by the equality between saving and investment at the natural rate of interest, price level expectations of workers and firms are correct and wages and profits are at their "normal" level (see Robertson, 1934, p. 651). The long-period level of employment of factors of production

corresponding to normal wages and profits is described by Robertson as the average level of employment between boom and depression, instead of as a state of "full employment". The normal or equilibrium rate of unemployment is positive because the curve of investment demand shifts upwards and downwards over the business cycle, due to the combined effects of productivity shocks and the accelerator mechanism, which gives rise to search in decentralized labour markets with heterogeneity of workers and jobs.

The next section shows how the notion of an equilibrium rate of unemployment as an average rate comes out in Robertson's 1934 diagram. Keynes (1936, pp. 180-83, 242-43, 327) rejected Robertson's concept of a normal rate of unemployment as well as his diagrammatic analysis of the determination of the rate of interest, which led to Robertson's criticism that Keynes had overlooked workers' reaction to market real wages distinct from their long-run expected values, as shown in section 3. Section 4 discusses Robertson's insight (introduced in [1915] 1948, p. 212) that price level changes may affect the expectation of relative prices and, by that, labour demand and the supply of effort in the short period. Section 5 examines Robertson's views about how the expected price level is influenced by expectations about the future supply of money. That section also discusses Robertson's notion of accelerating inflation (or deflation) in monetary disequilibrium. He did not discuss them in the 1934 article, but he did so in his 1920s *Money* and *Banking* books and later on in his 1955 article on "Creeping Inflation". While in the 1920s he had explained accelerating inflation as a consequence of the impact of expected rising prices on the demand and supply of loanable funds, in the 1950s Robertson suggested that acceleration would result from the lagged indexation of contracts as an attempt by economic agents to protect themselves against expected inflation caused by the adoption of "full employment" and "cheap money" policies.

The central message of the 1934 article is that convergence to the equilibrium rate of unemployment depends on the strength of the forces that bring the market rate of interest to its "natural" level. Disequilibrium in the labour market is accompanied by disequilibrium in the market for loanable funds, with an ensuing pressure on the market rate of interest. This is the topic of sections 5 and 6, which show that, according to Robertson, changes in real and money income in monetary disequilibrium will eventually push the market rate of interest in the "right" direction. We shall see that his conclusion in that regard was not affected by the Keynesian concept of liquidity preference and by what Robertson used to call the "liquidity trap", unless the only interest rate that can equate saving and investment at normal unemployment is negative. This may result from a condition of long-run stagnation or from

temporary deflationary expectations of the price level. Under the former circumstances, falling money income will eventually bring the rate of unemployment back to equilibrium through Robertson's "induced dislacking" mechanism (which is similar to the Pigou or real balance effects), while in a cyclical depression (such as the downturn of the early 1930s) fiscal policy should be deployed alongside bank rate policy. The textual evidence provided in section 6 (and elsewhere in the paper) indicates that money is neutral in the long period in Robertson's framework, but not superneutral.

2. Real Wages, Forced Saving and the Normal Rate of Unemployment

Robertson (1934, p. 651) introduced the notion of an equilibrium rate of unemployment as part of his discussion of the meaning of the "natural" rate of interest under conditions of cyclical fluctuations in output and employment.[2] The idea of equilibrium associated with equality between saving and investment at the natural rate of interest under those circumstances "implies a state of affairs in which (1) wages and profits are at a 'normal' level, (2) capital is growing, but (3) since the society has already become a prey to fluctuations, employment of the factors of production is not full but at a level which is in some sense the mean between those attained in boom and in depression." He had warned in another article published a year before against the temptation "to try to define normality in terms of the fullness of employment of the factors of production", for "the level of factor-employment attained at the moment of greatest activity is substantially above the average or the most frequent level" ([1933] 1940, p. 100). It is only implicit in the 1934 article what Robertson meant by the "normal level" of wages and profits, but in his *Lectures* (1963, p. 431) he described the "position of 'normality' in the relative rewards of the factors of production" as "corresponding to their long-run expectations", which is perfectly consistent with the Wicksellian/Marshallian mix of that article. Robertson's view that in equilibrium expectations are borne out by facts and that in disequilibrium they differ from outcomes is also in general agreement with the meaning of the term as used in the natural rate of unemployment literature of the 1960s (see Phelps, 1995, pp. 15-16).[3]

In figure 1 below, equilibrium is illustrated by the intersection between the curves of demand for investment DD' ("representing the declining marginal productivity of new lendings in industrial use") and of supply of saving SS' ("representing the rate of new

available savings per atom of time", after deducting savings absorbed in financing consumption by government or families) at the natural rate of interest PM (Robertson, 1934, p. 651). Following Marshall ([1890] 1920, p. 533) and Ramsey (1928), Robertson usually assumed that the aggregate curve of savings is forward-rising and positive if the rate of interest exceeds the pure rate of time discount, as depicted in figure 1 (see also Robertson, 1963, part II, chapter V). Such a long period equilibrium is now disturbed by a shift upwards of DD' to D_1D_1', caused by an exogenous increase in the marginal productivity of investment through, e.g., technical progress. If the banking system keeps the market rate of interest at its initial level MP, the rate of lendings will exceed the flow of new savings to the extent MM_1, which consists of newly created bank money. As explained by Robertson (1934, p. 650), the "market rate of interest" is a rate representative of the term-structure of interest rates in the loanable funds market.

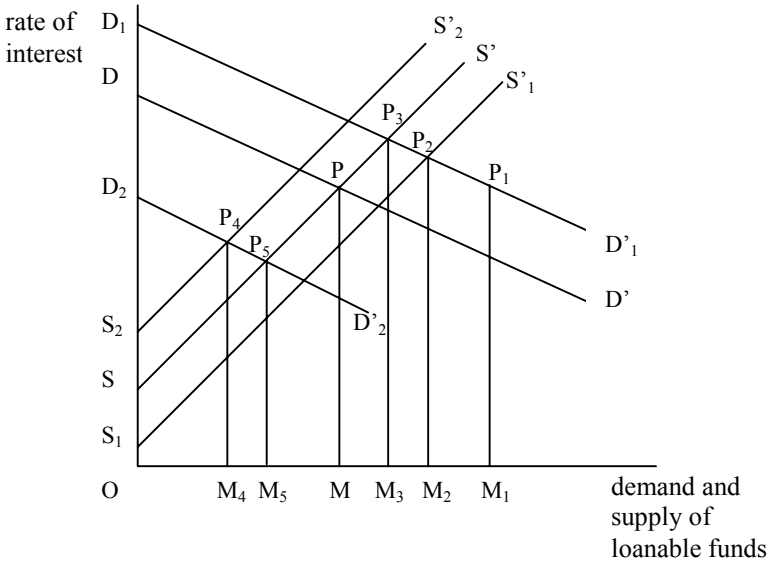

FIGURE 1: The Natural Rate of Interest (Source: Robertson, 1934, p. 652)

Given the "Robertsonian lag" between receiving and spending income, real disposable income is reduced by the ensuing process of rising prices, and consumption by the public is below its expected value, a process called "automatic lacking" by Robertson ([1926] 1949, p. 48). Furthermore, additional saving may be "induced" through the rise in prices, since individuals will seek to restore the real value of their money balances by reducing

consumption (idem, p. 49; this corresponds to the concept of an "inflation tax"). Therefore, under monetary disequilibrium, the equilibrium condition for the goods market decides the rate of change of the price level for which lacking (in its voluntary, automatic and induced forms) equals investment (cf. Robertson, 1933, par. 4; Kohn, 1981, p. 870). In his 1933 article on "Saving and Hoarding", Robertson introduced yet another form of forced saving, brought about by a reduction of real wages to the extent that prices in the current period exceed the level expected when money-wages were initially set. This followed from his distinction between "two classes, 'the public' (A), whose rates of money income are prevented by contract or custom from varying during such short periods of time... and 'entrepreneurs' (B), of whom this is not true" (1933, p. 401). However, while automatic and induced lacking only take place during the process of rising prices, forced saving which results from the "distortion of contracts occasioned by a rise in prices which has already occurred" continues even after inflation stops, that is, the curve of voluntary lacking shifts to the right because of a change in income distribution in favour of the "entrepreneurs" (p. 411).[4] The displacement of the savings curve SS' to S_1S_1' in figure 1 is also in part explained by the effects of the decline in real wages on labour demand, which will "progressively increase total incomes and redistribute them in favour of entrepreneurs" (1934, p. 652).

Robertson (ibid; italics in the original) coined the phrase "*quasi-natural* rate" to describe the rate of interest P_2M_2 which would equilibrate investment and saving under the new conditions. Assuming that the actual rate of interest rises towards its quasi-natural level, the economy will settle at the level of savings (and investment) OM_2, with stable prices and a rate of unemployment lower than its long-run average value. However, as pointed by Robertson (p. 653, italics in the original), this "*quasi-equilibrium*" is temporary, since excess demand for labour at real wages lower than expected by workers will bring about an increase in money-wages in the next period, which raises real wages back to their long period equilibrium level and shifts the saving curve back to its initial position. In the meantime, capital accumulation made possible by the forced saving process will reduce significantly the marginal productivity of the stock of capital goods (which Robertson, ibid, described as "saturation with *existing* instruments") and cause a large displacement downwards of the curve of marginal productivity of "*new* lendings" to D_2D_2' (italics in the original).[5] The ensuing process of falling prices brings about automatic and induced "dislacking" (that is, an unanticipated increase in consumption by the public at lower prices, followed by a reduction in real money balances to their planned level; cf. Robertson [1926] 1949, pp. 48-50), as well

as an increase in real wages involving "the shrinkage of income and its redistribution in favour of non-savers" (1934, p. 653). Hence, the saving curve shifts downwards to S_2S_2', which intersects D_2D_2' at the new quasi-natural rate of interest P_4M_4. If the bank rate of interest is also reduced to P_4M_4, the new position of quasi-equilibrium in the depression will feature a flow of savings OM_4 (equal to the demand for investment) and a rate of unemployment higher than its average value over the business cycle. Such a quasi-equilibrium lasts longer than the quasi-equilibrium position in the boom, since, because the "short period is not of the same length at both ends" (that is, the length of life of durable capital goods is usually longer than the length of time which takes to build them), the curve D_2D_2' is more stable than D_1D_1' (Robertson, 1934, p. 654; 1963, p. 140). Furthermore, due to some degree of downward rigidity of real wages[6], S_2S_2' will not easily move back to SS'.

Robertson's assumption that the market rate of interest follows the quasi-natural rate with a lag was based on the "Marshallian proposition that the same monetary action which tends to lower the rate of interest now will set in motion forces tending to raise it again later" ([1938] 1940, p. 149) because of its effects on money income and bank reserves. He combined that with the Wicksellian proposition that "the monetary authority has in its powers to keep these forces indefinitely at bay through administering repeated doses of the same medicine" (ibid; see also 1936, p. 183), but usually assumed throughout his writings in the 1920s and 1930s that the banking policy of the central bank aimed either at the "gold standard principle" or the "principle of price stabilisation" ([1928] 1940), which are both consistent with the framework of the 1934 article. Robertson ([1938] 1940, p. 149), therefore, listed two forces "deflecting the actual from the natural rate, which we may call for short monetary policy and liquidity preference". While the former is related to the determination of money supply, the latter has to do with money demand. In both cases, changes in money income will eventually bring the actual rate of interest back to its natural level, as discussed further in section 6. Moreover, under the full-employment policy and "cheap-money regime" of the late 1940s and early 1950s, the interest rate mechanism becomes "jammed", leading to potentially accelerating inflation and ensuing pressure on the market rate of interest (see section 5).

The asymmetry between quasi-equilibrium positions in the upward and downward phases of the business cycle is behind Robertson's (1934, p. 654; 1963, pp. 430-31) suggestion that the bank rate of interest should be reduced below its quasi-natural rate level P_4M_4 towards P_5M_5. As explained by Robertson, P_5M_5 cannot be called a natural rate of interest, since it is unlikely that (given the position of D_2D_2') the expansion and

redistribution of income promoted by a reduction of the bank interest rate will bring the saving curve right back to its normal position SS'. Anyway, a reduction of the bank rate will displace S_2S_2' right wards to some extent and create conditions favourable to an eventual rise of D_2D_2' to DD' when a new wave of technological change comes along (ibid). Robertson (p. 655) was at pains to stress that "if, in a society which has already become a prey to fluctuation, full employment of the factors of production, in their existing distribution between consumption and construction trades, is taken as the objective of policy, there seems a virtual certainty that normality will be overstepped, and the ball of cyclical fluctuations set rolling again." Although he did not explicitly refer to his diagram to illustrate that, Robertson probably had in mind a reduction of the bank rate of interest to such a level as to reduce real wages to an extent that D_2D_2' would intersect a saving curve at the level of investment OM and a rate of unemployment lower than "normal" .

3. Robertson versus Keynes on Employment

It is against the background of the 1934 article that the controversy between Keynes and Robertson following the publication of *The General Theory* should be read. According to Keynes (1936, p. 327), "Mr D. H. Robertson assumes, in effect, that full employment is an impractible ideal and that the best that we can hope for is a level of employment much more stable than at present and averaging, perhaps, a little higher", a position he described as "defeatist". Keynes's rejection of Robertson's view of monetary policy was preceded in the book (pp. 180-82) by a strong criticism of the analysis of the determination of the rate of interest in the 1934 diagram, which Keynes adapted from Robertson (that was, incidentally, the only diagram used in *The General Theory*). In Keynes's view, Robertson's diagram could not be used to determine the rate of interest, since the saving function is not independent from the investment curve in the sense that a shift in investment brings about a change in income and, by that, a displacement of the saving curve as well. There are, therefore, not enough equations to decide the rate of interest, which should be solved by bringing liquidity preference into the picture in order to determine the rate of interest from outside the savings-investment mechanism. We discuss in section 6 why Robertson - even granting Keynes's assumption that changes in income are accompanied by irreversible changes in real wages

and, therefore, in the position of the saving curve - did not accept the Keynesian explanation of the determination of the rate of interest through liquidity preference.

Assuming for now the validity of the loanable funds theory, the issue in hand is whether a change in real income brought about by a shift of the investment function and the Keynesian multiplier can displace the saving curve to such an extent that the quasi-natural rate of interest is pushed all the way back to the original level of the natural rate of interest. Starting from point P in figure 1, a shift to D_1D_1' would cause a displacement of the saving curve to the same extent as the shift in the investment curve, that is, until point P_1 (which is lower than the new natural rate at P_3), and vice versa for a shift to D_2D_2' also starting from point P (the new natural rate would then be at P_5; in the specific illustration depicted in figure 1, given the assumed large shift downwards of investment demand, the equalization of investment and saving through income change at the initial interest rate PM would only happen at a negative flow of savings, since the rate PM would be lower than the net rate of time preference on the new saving curve, but we shall disregard this possibility in the following). The matter has been discussed by Axel Leijonhufvud (1981, pp. 165-69; see also Kohn, 1981, pp. 859-60), who has argued that, in the case of a downward shift in investment, the market rate of interest remains on its initial level PM (above the new natural rate P_5M_5) without any excess supply in the market for loanable funds (because of the corresponding shift of the saving curve through the multiplier) and, therefore, with no pressure towards the appropriate adjustment of the market rate of interest. In such a state of "unemployment equilibrium" the price that is "wrong" is the rate of interest, not the money-wage. Leijonhufvud (p. 173) has suggested that that became Robertson's approach after *The General Theory*, that is, Keynesian effective demand with loanable funds instead of liquidity preference.

Although Leijonhufvud has successfully captured some elements of the Robertsonian approach, his general conclusion of unemployment equilibrium is not supported by a careful reading of Robertson, except if money-wages are fixed. Robertson's usual assumption was that money-wages are "relatively sticky" (1963, p. 440), that is, not flexible enough to clear the market within a single unit period. Under these conditions of "wage flexibility with a lag", if the bank rate of interest is kept above its natural level the economy will suffer from continuous and steady deflation accompanied by constant (not rising) unemployment. Keynes's claim that a reduction in investment would cause unemployment to "grow and grow until, as a result of the consequent reduction in real income and therefore in saving, a

stable position is again reached at a very low level both of money income and of employment" is acceptable only under the assumption of fixed money-wages (Robertson, 1963, p. 442). As explained by Robertson (p. 443), the money-wage will be falling at the same rate as the price level, with a constant real-wage rate (above its long-run market clearing value) and a constant (but below long period equilibrium) level of employment. "Let us therefore go on to assume that as a result of an initial lag in wage reduction, *some* unemployment has already developed, but that thereafter money wage rates and aggregate money demand fall *pari passu*. In this case the fall in money wages will prima facie be powerless to cure the unemployment which has already developed [since the rate of interest is given in the exercise]. But... there is no need for unemployment to get any worse; i.e. if wages are perfectly flexible, even though with a lag, the Keynesian position of mass unemployment equilibrium will never be reached" (italics in the original). The upshot is that there will be continuous excess supply in the loanable funds market and downward pressure on the rate of interest caused by falling prices and wages, contrary to Leijonhufvud's interpretation (see also Kohn, 1981, pp. 873-74). The economy will approach its long period equilibrium with a normal rate of unemployment if the banking system reacts by reducing the market rate of interest towards its natural level.

Robertson's insight that a rate of unemployment below (above) its normal equilibrium level is accompanied by a continuous increase (fall) in money-wages and prices is behind his criticism that Keynes did not contemplate the notion that a high level of employment in the transition to minimum unemployment could be associated with a positive rate of change of prices and money-wages - that is, the notion of a Phillips curve. As put by Robertson ([1936] 1940, p. 109; 1963, p. 436 cf. Keynes, 1936, pp. 303-04 on "true inflation"), in Keynes's view "not until unemployment is conquered can inflation in any damaging sense be said to begin". However, it was only in his *Lectures* (pp. 437-38) that Robertson explicitly reacted against Keynes's (1936, p. 327) criticism as quoted above. "On p. 327 of the *General Theory* you will find that I am subjected by Keynes to mild reproof for having in the 1930s set my sights too low. That may or may not have been; certainly I thought - apart from all my criticism of detail - that the general tenor of that famous book, with its dramatisation of the contrast between general and mass unemployment on the one hand and 'full employment' - a phrase I have always mistrusted - on the other, over-simplified the problem of objectives as it then presented itself" (see also Robertson [1922] 1948, pp. 204-05). The definition of what should be regarded as a "normal" level of activity was regarded by Robertson ([1938] 1940, p. 144)

as “the real key to the controversies of the present day”, the topic of his 1938 “Survey of Monetary Controversy”. According to Robertson (ibid), the Keynesian “optimist” view is that the process of expansion from a depression to full employment “is a mere process of transition from one stable equilibrium to another... and he sees no reason why that higher level should not be the ‘normal’ level in what he regards as the only respectable sense of that word, namely the level at which there is virtually full employment of all the human and material resources of the community.” Building on his 1934 article, Robertson ([1938] 1940, pp. 146-47) rejected the identification of “normality” with full employment regardless of the composition of output, since the distribution of productive factors between consumption and investment is the result of the business cycle, “and can neither be permanently taken for granted nor altered in the twinkling of an eye. Thus in respect of fullness of employment the ‘normal’... cannot be attained through the Optimist’s recipe of aiming at it directly by letting the cumulative expansion rip - that would only be to court reaction and relapse.” Such a reaction would come from economic agents affected by the process of forced saving, including workers, so that “sooner or later their effort to react against this system will play its part in inducing crisis and collapse” ([1936] 1940, p. 110). Robertson ([1938] 1940, pp. 149-50), therefore, rejected the Keynesian “optimist” position that the banking system could, by means of its bank rate policy, establish “without risk of reversal” such a level and distribution of output that the relation between the propensity to save and the rate of interest is always satisfied.

Robertson’s interpretation of the “normal” level of activity is partly based on the notion that the mobility of workers between consumption and capital goods sectors is not perfect. The size of the normal rate of unemployment is explained by the “gradual industrial and local transfer” of labour against a background of “structural change” ([1936] 1940, p. 111). Apart from “ignorance and actual cost of movement” (1963, p. 285), Robertson ([1937] 1940, p. 127) pointed out that immobility is associated with the heterogeneity of workers, since they are trained and qualified to produce certain kinds of goods. A normal level of activity can only be attained by checking the cumulative expansion at some point and “then letting the slow process of occupational adjustment get to work” ([1938] 1940, p. 147; see also 1963, p. 437 on the “occupational mobility of labour”) under the impact of a shift downwards of the expected marginal productivity of investment. Instead of the Keynesian alternative of abolishing the “residuum of unemployment” by cumulative expansion, Robertson ([1936] 1940, p. 110) suggested that “by acquiescing in its temporary continuance”

it would be possible to promote "a tempo of industrial progress and an eventual distribution of labour between industries" more conductive to stability, since relative prices have now changed in favour of consumption goods. This is perfectly consistent with his 1934 definition of normal unemployment as an average rate over the business cycle.[7] Robertson came back to that in his *Lectures* (pp. 436-37), where he pointed out that, on account of the discontinuous process of capital accumulation over the business cycle, the variability of employment is greater in the investment sector than in the consumption trades. Monetary policy should damp down the expansion process "while there is still a residue of unemployment in the instrumental trades, in the hopes of promoting a partial demobilisation of those trades and a redistribution of resources, in favour of the consumption trades, which will ultimately prove more compatible with stability." From Robertson's perspective, as put by John Hicks (1967, p. 202), "it is quite wrong that people should have to suffer in order to provide this reserve [of labour to cope with unexpected demands]...but to 'provide work' in order to keep this desirable reserve 'fully employed' is as wrong as to provide crime in order to ensure the full employment of policemen."

4. Price Expectations and Money Illusion

According to Robertson, the oscillation of the level of employment around its normal value is explained by the effects on output of unanticipated price changes. Steadily rising prices have a positive effect on the long-run rate of economic growth through the forced saving process, while changes in the price level have only a short-run effect on employment and output. Money is, therefore, neutral, but not "superneutral", in the Robertsonian framework in the long period, as discussed further in section 6. As pointed out in his book *Money*

> The stimulus of rising prices is partly founded in illusion. The salaried official and the trade unionist have been beguiled into accepting employment for a lower real reward than they intended. Even the business leader is the victim of illusion: for he is spurred on not only by real gains at the expense of his debenture-holders and his doctor and even... of his work-people, but also by imaginary gains at the expense of his fellow business men. It is so hard at first to believe that other people will really have the effrontery or the good fortune to raise their charges as much as he has raised his own. But whether real or

> illusory, the spur is effective; for in economic as in other matters human endeavour feeds partly on illusion, and only part on truth (Robertson [1922] 1948, p. 139).

He repeated in the *Lectures* (pp. 411 and 415) the notion that "to some extent this optimism" caused by rising prices "is irrational - people are slow to realise that other people's selling-prices will rise as well as their own" (see also Robertson [1926] 1949, p. 39 for a similar passage). The final part of that passage from *Money* attracted the attention of Edmund Phelps (1969, p. 157, n. 31), who quoted it in the paper in which he introduced his famous "islands parable". In Phelps's interpretation, Robertson is suggesting that a representative firm will react to an increase in (aggregate) demand and money-wages by raising its price less than proportionally to its demand price, to the extent that the firm's expectation of the current price at competing firms is revised upwards in smaller proportion to the rise of its own demand. Hence, an unanticipated change in aggregate demand yields the disequilibrium result of a rise of the price level by less than the money-wage rate, with an ensuing increase of output and employment despite the increase of real wages. And vice versa in the downswing, with a pro-cyclical pattern of real wages.

Phelps's interpretation is not fully borne out by the quoted passage from *Money*, since Robertson did not refer explicitly to pro-cyclical real wages on that occasion. Nevertheless, there is evidence that Robertson (1963, pp. 146, 180, 279, 343) sometimes replaced his usual assumption of price flexibility by price rigidity in the depression, along the lines of the well-known Marshallian analysis of the producer's fears of "spoiling the market". In a time of depressed demand, "price is *not* driven right down to marginal variable cost, and output is reduced more than our [purely competitive] model would suggest", and the demand for labour is depressed below its "competitive level", which modifies the tendency for real wages to rise in times of depression - a conclusion that Robertson (1963, p. 343) carried to his discussion of the sources of non-neutrality of money in the short period.[8] He did not, however, extend his analysis of sticky prices to the upswing, and neither did he explicitly associate that with incorrect expectations of the price level by firms, in contrast with Phelps's treatment. There is, however, another way to interpret the passage quoted from *Money*, involving the effects of money illusion on the supply of effort by entrepreneurs and workers alike, which is closer to Milton Friedman's (1968, 1975) framework . Such an interpretation comes to the fore if one takes into account a similar, but much longer discussion in Robertson's 1915 *Study*. As

pointed out on pp. 239-40 of that book, an increase in money supply "induces each producer to expect a rise in the exchange value of his own product". According to Robertson,

> An increased volume of currency, whether due to an increased confidence in the breasts of bankers, or to an increased supply of metallic gold, will tend, it need hardly be argued, to raise the general level of prices. If all prices (including wages) were equally affected, the result would probably be a general increase in production beyond the point which is in fact most advantageous: for it seems to be a natural tendency of every man to suppose that the product which he sells will be more rapidly and deeply affected by any current price-movement than the products which he buys either for personal consumption or for industrial use (Robertson [1915] 1948, p. 212).

Robertson illustrated his argument with a diagram, of the same kind as he used in the first, "real"part of the book. In the diagram, reproduced below as figure 2, "units of effort" are measured along the abscissa and "units of utility" along the ordinate. *EE'* is the "curve of marginal disutility of effort", while *AA'* and $A_1A'_1$ are, respectively, the curves of "actual" and "anticipated marginal productivity of effort", prices having risen in the ratio $A_1A : AO$ (pp. 212-13). Because of the effect of the rise in the price level on anticipated marginal productivity, the total volume of effort expended will be *ON*, instead of *OM*, and total utility enjoyed will be *AONR*, which is less than total utility if the marginal productivity of effort had in fact gone up (A_1ONQ), but more than total utility at the original equilibrium (*AOMP*). The whole exercise is based on the assumption that the elasticity of demand for income in terms of effort is positive - that is, that the supply curve of effort (from workers and entrepreneurs alike) is positively sloped - which explains why the curve *AA'* shifts to $A_1A'_1$ when the expected effort price of income falls. Under this assumption, the (wrongly) anticipated increase of relative prices and real wages will bring about a larger aggregate output, because a uniform rise in wages and prices is interpreted by workers as a rise in their real wages (measured in terms of the workers' consumption goods) and by entrepreneurs as a reduction in the real wages they pay (measured in terms of the products they sell). Hence, both the supply and demand of labour go up, as well as the supply of effort by entrepreneurs.[9]

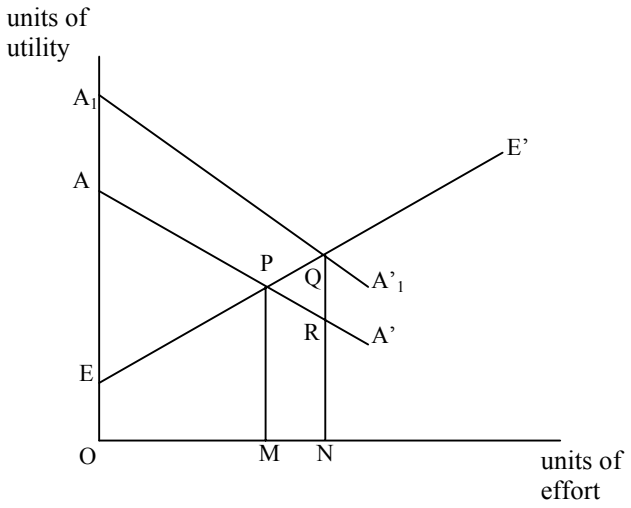

FIGURE 2: Money Illusion in the Boom (Source: Robertson [1915] 1948, p. 212)

Such an increase of aggregate supply does not last long, though. As explained by Robertson ([1915] 1948, pp. 217, 240), the producer will eventually realize that "the rise in prices is not confined to his own product" and the fact of a general rise in prices is "bound sooner or later to be discovered". The anticipated productivity will, therefore, fall "till it corresponds with the real productivity of effort, and the volume of production suffers restriction". As pointed out by Robertson (p. 217) if the working-class's realisation of error "occurs *after* the point at which the effort-demand for anticipated commodities becomes inelastic, it will very possibly set up a reverse movement towards an enlargement of production". This overshooting mechanism is illustrated in the diagram reproduced as figure 3 below. In the diagram, *AA'* and *aa'* are, respectively, the curves of anticipated and actual "commodity productivity of effort"; *BB'* and *bb'* are, respectively, the curves of anticipated and actual "satisfaction productivity of effort". Assuming that the further raising of *AA'* to $A_1A'_1$ lowers *BB'* to $B_1B'_1$ until it falls below *bb'* , production "having been restricted from OM_1 to OM_2 will on the realisation of error be expanded to OM_3 ". Furthermore, the cyclical pattern of inventory accumulation is also partly explained by the effects of a changing price level on expected relative prices. After an accumulation in store "of a considerable part of what is produced" under the impact of falling prices in the depression, goods are drawn into the market again at times of business revival. "While a general rise in the exchange value of all consumable goods in terms of each other is clearly impossible, it is perfectly possible that each group of producers or owners should *expect* a rise in the value of its own products, and

consequently be willing to withdraw them from store. Moreover, the existence of a monetary economy affords a mechanism by which such an expectation may be raised simultaneously in many trades" (p. 156).

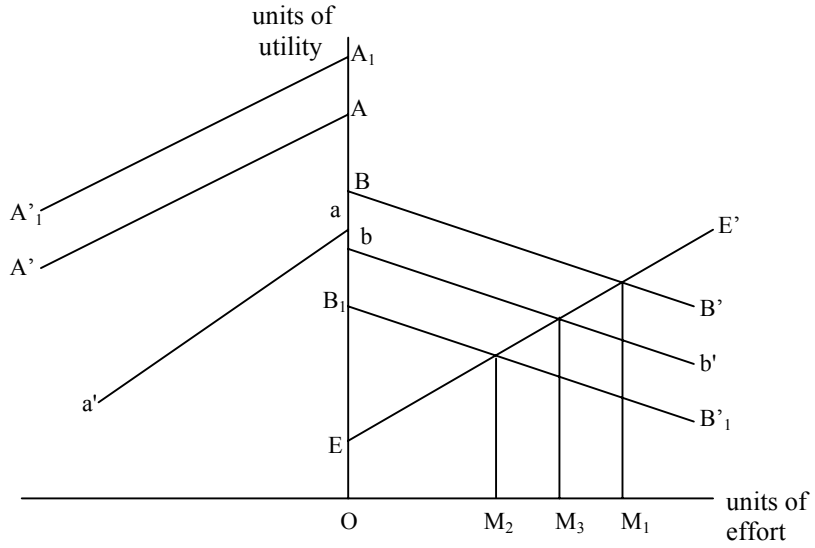

FIGURE 3:

Money Illusion and Overshooting in the Depression (Source: Robertson [1915] 1948, p. 217)

During the downswing, the decline in the money supply brings about falling prices, with similar effects on output and labour demand. "As the divergence between the real and the anticipated productivity of effort operated during the boom to stimulate production, so now it operates to restrain it" (p. 225). It should be noted, however, that the analysis applies now to labour demand and to the supply of effort by businessmen only, since Robertson did not describe the decline in employment in the depression as the outcome of a downward shift in labour supply induced by money illusion by workers, but as an excess supply of labour. He approved of the usual description of unemployment during the depression as "involuntary" (p. 210), which he explained by the fact that saturation and over-production of capital goods brings about an inelastic effort-demand for *all* commodities (including instrumental goods) which is higher for businessmen than for workers, since the latter do not demand capital goods. "For those reasons it is plain that the scale of production which commends itself to the

business class may be smaller than that which commends itself to the working classes" (pp. 209-10; see also [1926] 1949, pp. 21-22).[10]

Robertson's analysis of the effects of a changing price level on expected relative prices did not make a general impact on the business cycle literature of the 1930s and is not mentioned in Robertson's 1934 article. Since the main purpose (see Robertson, 1934, p. 650) of that article was the application of Robertson's (1933) concept of saving to the then existing literature on the "natural" and "market" rates of interest - mainly Keynes (1930) and Hayek (1932) - it is hardly surprising that Robertson focused instead on the consequences of sticky money-wages. As mentioned in the passage from *Money* (p. 139) quoted above, Robertson applied the term "illusion" to describe a fall in real wages brought about by an increase of the price level unanticipated at the time of setting the money-wage contract. One of the main features of a monetary economy, according to Robertson ([1922] 1948, pp. 11-13) is that it is based on the "institution of *contract* - on the fact that people enter into voluntary but binding agreements with one another to perform certain actions at a future date, for a remuneration which is fixed here and now in terms of money". The existence of monetary contracts, especially in the markets for hired factors, means that "any change, however slight, in the value of money, so long as it is not perfectly foreseen, leads to a certain redistribution of the real income of society".

In contrast with the effects of rising prices through pure "monetary misapprehension", the gains for firms from real wages lower than expected are not just "illusory", but "real" ([1915] 1948, p. 217). As explained by Robertson (1931, p. 407; see also [1926] 1949, p. 21), a rising price level involves both a "doctoring of past contracts" in favour of entrepreneurs (that is, forced saving) and the opportunity of "making new contracts" on favourable terms, thus giving them "both the means and the motive to expand the scale of their operation". Nevertheless, just like the "illusory" stimulus discussed above, such a "real monetary stimulus" to production eventually disappears "by the revision, in accordance with the rising price level, of the claims of wage-earners" until they "correspond with the real charges which those who provide [labour] intend to make" ([1915] 1948, pp. 217, 240). The same applies to the temporary effects of falling prices on real wages and output in the depression, with the proviso that, against the background of a long-run trend of increasing productivity, workers may find it difficult to distinguish between the "windfall element in real wages which should be surrendered in the interest of higher employment, and the increment due to secular progress which can safely be retained" (Robertson [1938] 1940, p. 146).[11] Usually, as

mentioned in section 2 above (see also endnote 6), Robertson ascribed more importance to real wage rigidity than to money-wage rigidity. This is in part related to Robertson's views about the perception by firms and workers of the influence of expected money supply on the expected price level, which is discussed next.

5. Money Supply and Inflation Acceleration

Robertson's theory of the determination of the price level was based on the "Cambridge equation" M = KRP, where M is the quantity of money in existence, K is the proportion of its annual real income over which the community wishes to keep command in the form of money, R is the real aggregate output and P its price (see [1922] 1948, ch. II; 1963, part III, ch. I). Robertson (1963, pp. 329-30) defined "money" as "anything which is generally acceptable in payment for goods or discharge of other obligations", which includes demand deposits and, under certain circumstances, time deposits. He often applied the Cambridge equation to a Wicksellian pure credit economy, where the only kind of money in circulation consists of balances with the banking system (see [1926] 1949, pp. 52-53; [1928] 1940, pp. 40-41; 1963, p. 363), which he considered close to reality. As claimed by Robertson in *Money* (p. 28), the Cambridge equation brings out the fact that the value of money is determined by supply and demand, just like the relative value of other things. More importantly for the purposes of this paper, according to Robertson the phrase "quantity of money available" or "in existence" should encompass, like with other goods, the expected amount of money in the future. As pointed out in the first edition of *Money*,

> The market price of wheat or cotton is influenced not only by the quantity of wheat or cotton in existence at the moment, but also in greater or lesser degree by people's estimates of the quantity likely to be called into existence in the near future... Exactly the same principle operates with regard to the value of money... Meanwhile it must be put on record that the phrase "quantity of money available" is to be so interpreted as to allow for the influence of expected changes in the near future in the quantity of money in existence (Robertson, 1922, pp. 36-37).

That passage was not kept in further editions of *Money*, but the notion that the price level is affected by expected changes in money supply is conspicuous in later editions as well (see, e.g. [1922] 1948, pp. 116, 123, 157-158; see also 1963, p. 344). A similar idea can already be found in Robertson's description in the *Study* (pp. 229, 247-48) of the effects of an exogenous increase of the supply of gold on an economy beset by deflationary price expectations in the depression. According to Robertson ([1915] 1948; italics in the original), "the influx of gold and the fact or expectation of a higher level of prices" has an influence in raising the volume of production from its depression level, since "the mere existence of large gold reserves and a low rate of discount leads people to *think* that prices are about to recover, and so to be less afraid first of buying other's people's goods, secondly of consenting to *immediate actual* reductions in the price of their own, which they believe will only have to be temporary, and thirdly of making for stock." That was Robertson's explanation for the "steady fall in the unemployment" in Great Britain in the late 1890s, when the increase in gold supply was "purely sedative and medicinal" and affected mainly output instead of prices (see also [1922] 1948, p. 205, n.1).

In the first editions of *Money*, written just after World War I, Robertson focused instead on a paper money economy. He suggested that "the knowledge, on the part of somebody, that [the Treasury Notes] *could be created if necessary* was an essential condition of the expansion of bank loans which gave the initial thrust to prices" during the inflation of 1917-1920 (Robertson [1922] 1948, p. 116; italics in the original). Under these conditions, "when the supply of money is expanding rapidly in this way, and prices are consequently rising and expected to continue to rise", real wages fall and labour demand increases until old money-wage contracts are due for revision. Prices for future delivery in wholesale markets will be justified "not by the existing supply of money but by what it is expected to become by the time delivery is made". During such a process, the ever-expanding volume of loans appears to banks as a result, not as a cause of the rise in prices, "while we, sitting up in the clouds, can see that the confident expectation that they *would* expand their loans was the essential condition for the occurrence of so great a rise, and that if they were to act otherwise than is expected of them the rise could not be sustained" (pp. 157-58). According to Robertson (1922, pp. 158-59), that is exactly what happened during the deflationary episode of the early 1920s, when an unanticipated stabilization of the money supply brought about falling prices and higher unemployment. The level of prices in the spring of 1920 "was a level justified not so much by the quantity of money actually in existence as by the quantity

believed to be likely to come into existence... It follows that a mere refusal to go on manufacturing additional money was bound to involve some actual relapse of prices, and not simply a stabilization of the level already reached". A gradual and partly expected stabilization of the money supply (as opposed to "at one fell swoop") would give a "breathing space to revise contracts and adjust expectations", but it would hardly be neutral in the short-run given old contracts in the labour and credit markets.[12]

Robertson discussed inflation acceleration in the 1920s and again in the 1950s as the outcome of an increasing rate of growth of the money supply, which is consistent with his approach of forward looking expectations. In his book on *Banking* (pp. 72-79) Robertson examined the determinants of the rate of change of the price level necessary to equalize "lacking" (which, as we discussed in section 2 above, comprises voluntary, automatic and induced lacking) and investment. The most important factor is the influence of expected rising prices and money supply on the demand for money and, therefore, on the induced lacking mechanism. Inflationary expectations bring about "dis-hoarding" by the public (that is, a reduction of the Cambridge "K"), which leads to an even higher rate of inflation to equilibrate the demand and supply of lacking. Furthermore, "if the expansion of the supply of money proceeds to extravagant lengths, the public lose confidence in the money altogether", which increases its velocity of circulation even more and imposes a limit to the extent to which entrepreneurs can "extract from the public " the lacking required to maintain the current or projected volume of their output, as illustrated by the "collapse of the monetary system" in the German hyper-inflation in the 1920s (Robertson [1922] 1948, p. 118; [1926] 1949, pp. 79, 94).

In the late 1940s and throughout the 1950s, as a reaction to the adoption of "full employment" as the main objective of macroeconomic policy, Robertson came back to the topic of the limits to the extraction of forced saving from the public. This time he focused on the problems associated with attempts to reduce permanently the rate of unemployment below its "normal" level through "cheap money" and a shift to the right of the saving curve. According to Robertson ([1949] 1952, p. 91) money-wage claims are influenced by the workers' and employers' expectations about the future money supply. In the "bad old days of the gold standard", wage negotiations "were conducted "within a steel framework not absolutely rigid indeed, but known not to be indefinitely extensible; it was fairly evident to everybody that if an exorbitant level of wage-rates was demanded, the money would simply not be there to pay the wage-bill". Under the new monetary regime of paper money and full-

employment policy, the money supply becomes endogenous if the monetary authorities "are always prepared to create without question whatever *flow of money* is needed to discharge whatever wage-bill is needed to reconcile full employment with whatever wage-rate is demanded by the Trade Unions" (ibid; italics in the original). In the business cycles of the "bad old unenlightened days" (as discussed in Robertson, 1934), the rises in money-wages at the end of the boom accompanied by higher rates of interest played an important role in keeping "the ambitions and optimism of entrepreneurs within bounds". However, in the "new enlightened days" such rises in money-wages are regarded with apprehension "not because they carry a threat of unemployment, but precisely because they do not, or rather because the unemployment of which they carry a threat is not the relatively mild type usually associated with a trade recession, but the much more frightening type associated with a breakdown of the standard of value" (p. 92; reproduced in 1963, p. 448).

Robertson ([1955] 1956, p. 120) disputed the view put forward at the time by S. H. Slichter (1952) and others that a policy of a slow rate of inflation in order to get full employment was the only (and preferable) alternative to a policy of preventing money-wage claims by means of an increase of the unemployment rate (see also Hutchison, 1968, chapter 3, for the context of Robertson's 1955 article). As put by Robertson (ibid; italics in the original), " 'stability' almost seems to have been *re-defined* in terms of a 2 or 3 per cent annual rise" in the price level. Such an expectation of a continuous - but uncertain, for the rate of growth of money supply in the future is unknown - rate of inflation will affect the confidence with which individuals accept to undertake contracts in money, and leads to the introduction of the device of the sliding-scale as a means of protection against future changes in the value of money ([1955] 1956, p. 122; [1922] 1948, p. 13).

> It is at this point that doubts about the *merits* of the programme of slow uncreep coalesce with doubts about its *practicability*. For if its inequalities can only be softened...by the excogitation of a whole battery of contracting-out devices, it is surely to be expected that those sections of the population who are at present the leaders in, and the beneficiaries of, the present comparatively dignified inflationary procession will all the time be endeavouring to preserve and restore their threatened leads. Thus in practice the rescue operations so carefully planned would probably be far from completely effective...But what that means is that the planned orderly fall in the value of money would be in danger of turning into a landslide, generating not a conformable condition to

> "full employment" but a hectic and disorderly muddle, which could only be checked, at the cost of much disemployment and distress, by the re-establishment of drastic monetary discipline ([1955] 1956, pp. 124-25).

Robertson was not alone in his conclusion that the "full employment pledge" (p. 126) could only be kept at the cost of accelerating inflation caused by the adoption of escalator clauses (see e.g. Reder 1948, pp. 52-53; Friedman [1958] 1969, p. 183), which would eventually defeat the cheap money policy and bring the economy back to its long-run equilibrium rate of unemployment.[13] Whether the economy is able to return to its long-run equilibrium without an overshooting of the rate of unemployment depends on the ability of the central bank to influence the price level expectations of workers and firms through the announcement of its money supply. As pointed out by Robertson (1963, p. 23) in his Canadian memorandum of 1962, "the Authority may be rewarded by seeing a good deal of the steam vanish out of the wage-push simply as a result of the change in atmosphere and without the occurrence of those alarmingly high percentages of unemployment which some of its (self-appointed) economic advisors will probably have been predicting. In my judgment this is very much what happened in Britain in 1957-58" (see also the *Lectures*, pp. 450-51, and Robertson's 1961 "Marshall Lectures", pp. 36-38). Robertson's treatment in the 1950s and early 1960s of inflation acceleration and the role of anticipated changes in money supply are, therefore, fully consistent with his previous analysis of price level determination in *Money* and with the concepts of "normal" rates of interest and unemployment put forward in the 1934 *EJ* article.[14]

6. The Cambridge Equation and the Rate of Interest

Robertson did not change his views about the concept of a "natural" or "normal" rate of interest after the publication of *The General Theory*. However, Keynes's criticism led him to discuss further some aspects that are not explored in any detail in the 1934 article. A case in point is the effect of expected changes in the price level on the rate of interest. Robertson (1936, pp. 178-79) pointed out that, as part of a process of rising prices caused by excess investment, "any given proportion of wealth or income idle in the form of money is being diminished by the expected depreciation of money, and dishoarding takes place".

Furthermore, an expected rise in prices tends to increase the rate of interest through its effects on the demand and supply of loanable funds - the so-called "Fisher effect", which Keynes (1936, p. 142) dismissed. The important point, made by Robertson in a letter of March 1935 to Keynes, is that the rate of interest will not rise in equilibrium to the full extent of the expected rise in prices. As explained by Robertson (see Moggridge, 1973, p. 522) the rise in the rate of interest "will be damped down by the tendency of the owners of stores of money (a) as *interest* rises, to take money out of store and lend it thus increasing the supply of loanable funds, (b) as *prices* rise, to take money out of store and invest it themselves in labour or commodities, instead of adding to the demand for loanable funds for those purposes". Both factors (a) and (b) contribute to diminish the Cambridge *K* and to reduce the long-run value of the "real" rate of interest. This is an adumbration of Robert Mundell's (1963) famous result that the Fisherian real rate of interest falls under anticipated inflation because of the reduction in real money balances. Investment and saving are both higher than in an equilibrium without steady anticipated inflation - money is not "superneutral". Such an analysis fits very well with Robertson's notion of "induced lacking" as an equilibrating mechanism able to turn initially involuntary ("automatic") saving into a voluntary decision in the course of the business cycle (cf. Laidler, 1999, p. 96). As pointed out by Robertson in his letter, Keynes's discussion of the Fisher-effect was marred by his habit of expressing liquidity preference in nominal terms instead of in real terms. Hence, contrary to Keynes, there is nothing contradictory about people holding a larger nominal amount of money at a higher (nominal) rate of interest, since they are in fact holding a diminished quantity of *real* balances.

The influence of the rate of interest on money demand is mentioned in Robertson's 1934 article (p. 652) in connection with the reaction by the banking system to an excess supply of bonds in the loanable funds market. An increase of the bank rate of interest will "stimulate the mobilisation of *past* savings existing in the form of bank deposits" (that is, the Cambridge *K* goes down), which means that part of the excess demand for loanable funds is now covered by "dishoarding" instead of an increase in money supply and the rate of growth of the price level is reduced accordingly. Robertson (1934), however, did not consider the possibility that an increased rate of saving (caused by an increase of "thrift"), which is not itself hoarding but takes the form of an increased demand for securities, could lead in the short run to a progressive shrinkage in aggregate money income despite being accompanied by a fall of the rate of interest. After the publication of *The General Theory*, Robertson (1936, pp. 187-90; 1940, pp. 18-19, 34-35; 1963, pp. 383-86) took into account the fact that, under

these circumstances, the fall in the rate of interest "tempts some people to sell securities and to hold increased money balances instead"; this checks the fall and prevents part of the increase in saving from finding its way on to the markets for capital goods. "Thus owing to the existence of this sliding or trap", an increase in saving brings about some fall of the rate of interest, accompanied, though, by a fall of money incomes and employment. This is how the phrase "liquidity trap" was born (Robertson, 1940, p. 34). In terms of the Hicksian IS-LM diagram, a shift to the left of the IS curve brings about some fall in the rate of interest and a reduction of money (and real) income, in proportions determined by the slope of the LM curve. The appropriate monetary policy, from the point of view of the "natural" rate of interest concept, is to counteract such short-run perverse effects of an increase in savings by raising the supply of money (see Robertson, 1936, p. 189). Robertson, however, disputed the notion that "liquidity preference" could influence the determination of the rate of interest in the long run, when the full effects of falling prices and money-wages are taken into account. Since, as pointed out by Robertson to Keynes in the letter quoted above, liquidity preference (even in its "speculative" form) is a demand for real (not nominal) money balances, the dependency of money demand on the rate of interest does not itself imply that the equilibrium rate of interest depends on the quantity of money (see also Patinkin, 1965, ch. XV).

> What that schedule [of liquidity preference] expresses is a desire not to hold so much money, but to hold, in the form of money, command over so many real things. Temporary fluctuations either way in the rate of interest will produce in the long run such movements in the level of prices and of money incomes as to destroy themselves, and to assign to the 'liquidity preference schedule', as its permanent role, a share in the determination not of the rate of interest at all but of the price level (Robertson [1938] 1940, pp. 151-52).[15]

From the perspective of Robertson's "neo-Marshallian" theory, the exogenous variability of the Cambridge K in the short run is more important for the understanding of the business cycle than its dependency on the rate of interest (see Robertson, 1937, p. 435; 1963, p. 390). An increase in confidence will bring about a decline in K and lead people to "desire to devote an increased proportion of resources to real investment and so raises the demand for investable funds" (1963, pp. 397-98; see also [1938] 1940, p. 150), which tends to raise the rate of interest. This is a case of an increased demand for goods at the expense of a reduced demand for real money balances, leading to both a higher price level and a higher interest rate

in the new equilibrium. Hence, such a change in K is not neutral, as Robertson ([1953-54] 1956, p. 62) observed under the influence of Patinkin (1950-51) - a change in K is neutral only if it has been at the expense of bonds and commodities together, so that the "liquidity" of bonds has changed in the same proportion as K. Robertson (1963, pp. 398, 430) also discussed the consequences of an increase in K at the expense of a reduction in the demand for goods due to a failure of confidence. The "comparative statics" result is a reduction of the price level and of the long-run rate of interest, but the short-run dynamics - determined by the existence of money-wage contracts and by the effects of deflationary price expectations - is of "pronounced depression", such as the depression of the early 1930s (see Robertson [1930] 1931, pp. 119-21). Under these conditions, the central bank should attempt to counteract the increase in K by the expansion of M, bringing down the rates of interest even below their currently low level, "which may themselves be below that 'natural' rate which would have kept a stable economy stable, but which, since fluctuation has set in, has disappeared as a guide to immediate policy" (1963, p. 430).

After Pigou (1943), Robertson ([1959] 1963, p. 390) took into account the possibility that, under certain circumstances, the natural rate of interest that equilibrates saving and investment in long period ("full-employment") equilibrium might be negative. However, under the assumption that money can be held at no cost, the money or market rate of interest set by the banking system cannot be negative. Such an "existence" problem does not arise in the 1934 diagram because of the way the full-employment saving curve is determined by the interaction between the rate of interest and the pure rate of time preference only. However, under Pigou's (1943, p. 346; cf. Robertson, [1958]1963, p. 235) assumption that saving is not made solely for the sake of future income but also for "the desire for possession as such, conformity to tradition or custom and so on". This means that saving may be positive at a zero (or near zero) rate of interest, which opens the possibility that the full-employment savings curve and the investment demand curve have no intersection point at non-negative interest rates, as opposed to figure 1 (see section 2 above). Robertson dealt with this in his *Lectures* (pp. 390, 442-43) along the lines of the so-called Pigou-effect and of his own "induced lacking" mechanism. If the process of capital accumulation and declining rate of interest has brought the economy to such a situation ("Keynes's Day of Judgment", as it was called by Pigou, 1936), money income starts to fall continuously because of excess saving. Nevertheless, such a deflationary movement will be checked by the reaction to the progressive increase in the real value of the money stock in absolute terms and in proportion

to real income. “And in accordance with ordinary monetary doctrine the community will not sit down under this, but will seek to restore K to its old level. If capital outlay is ruled out by the fall in the rate of return on real investment to zero, the community will spend on consumption goods” (Robertson, [1959] 1963, p. 443). Therefore the effect of falling prices and money-wages on real balances is theoretically able, under conditions of a glut of capital equipment, to eliminate excess supply in the labour market through a change in the composition of demand in favour of consumption goods. That is different from an ordinary cyclical depression associated with a market rate of interest higher than its “natural” equilibrium value and “incorrect” or disequilibrium prices of capital goods relatively to consumption goods. Differently from the case of “secular stagnation”, falling prices and money-wages in the cyclical depression constitute a potentially equilibrating factor through their continuous downward pressure on the interest rate in the market for loanable funds. Nevertheless, a negative natural rate of interest may also be a feature of cyclical depressions if deflationary expectations are strong enough, as pointed out by Robertson ([1922] 1948, p. 177; [1926] 1949, p. 81; [1930] 1931, p. 121) in his discussion of the role of fiscal policy in the downturn.

7. Concluding Remarks

The connection between the long period (or “natural”) equilibrium values of the rates of interest and unemployment put forward by Robertson in the 1930s encapsulates the main features of his approach to monetary dynamics and the business cycle. Such a “Robertson connection” illuminates the assessment of his contribution to the debates that followed the publication of Keynes’s *General Theory* and helps to clarify Robertson’s discussion of the interaction between the aggregate markets for goods, money, bonds and labour before and after his 1934 article. As documented above, that article does not by itself exhaust the discussion of the Robertsonian approach. Some important ideas not mentioned or fully explored in the 1934 article - such as the effects on aggregate supply of confusion between absolute and relative prices, the conditions for an acceleration of the rate of change in prices, the influence of expectations of changing prices on the long period value of the rate of interest - are, however, perfectly consistent with its basic framework. A study of the “Robertson connection” brings to the fore the main difficulty of economic policy in Robertson’s opinion,

that is, "the difficult art of getting the best of both worlds, the world of progress and the world of stability" (1936, p. 187). The overall purpose of Robertson's research program in monetary macroeconomics was to shed some light on that difficult choice between the conflicting claims of "Progress and Stability" (see Robertson, 1958; cf. 1963, pp. 437-39). Ramsey's (1928) model of optimal saving (Robertson, 1958, pp. 8-9; 1963, pp. 240-41, 251-53; see also the question posed in the last paragraph of the *Study*) provides a useful framework, but, in Robertson's view, is not able to exhaust the determination of the optimal rate of growth, which raises the issue of the relation between economic stability and progress from a normative perspective. A crucial stage in such an investigation is to try to establish analytical foundations for the relation between cyclical changes in prices, output and employment, and their long period equilibrium values over time, which was the task faced by Robertson.

Notes

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1. Robertson's *Study of Industrial Fluctuation* was published in 1915 and reprinted with a new introduction in 1948. The first edition of *Money* came out in 1922, followed by new editions in 1928 (with one new chapter) and in 1948 (with two further chapters). *Banking Policy and the Price Level* appeared in 1926, with a revised edition in 1932 and a reprint (with a new preface) in 1949. The *Lectures on Economic Principles* came out in three volumes between 1957 and 1959, with a paperback edition in one volume in 1963. We shall also refer to Robertson's collections of articles: *Economic Fragments* (1931), *Economic Essays and Addresses* (with A. C. Pigou, 1931), *Essays in Monetary Theory* (1940), *Utility and All That* (1952) and *Economic Commentaries* (1956). For a general overview of Robertson's economics and biographical background see Presley (1979) and Fletcher (2000).

2. Robertson ([1938] 1940, pp. 142-43; 1963, part III, ch. II) discussed elsewhere the conditions for monetary equilibrium outside the context of the business cycle, under the assumption of steady growth in population, capital, productivity, or some combination of them.

3. As pointed out by Robertson (1963, pp. 93-94), "it may be that in a [changing] world long-run equilibrium is *never* attained. It is the state of affairs which *would* be attained if all the forces at work had time to work themselves out; but it may be that in any particular case they never *will* have time to work themselves out, since other events, altering the whole set-up, will have occurred before they do... It seems to me that anybody who rejects these two ideas, that a system can move towards equilibrium and that it may never actually get into it, has not only failed to understand Marshall's teaching but has made it extremely difficult for himself to interpret the course of events in the real world". See also Harcourt (1992). Short-period equilibrium, as stressed by Robertson (pp. 144-45), is also something which "tends to happen". He was critical of the tendency "to forget this in some modern work" and to treat short-period equilibrium theory as a "satisfactory substitute for the dynamic analysis of processes

of change" (see also his criticism of Keynes in that regard in [1938] 1940, pp. 138-39, where he defended the Marshallian notion of "market equilibrium" as a first step into economic dynamics).

4. This assumption is justified by Robertson (1963, p. 242) on the grounds that the "elasticity of desire for consumption" (representing for an individual the declining marginal utility to him of consumption as his consumption increases) tends to be greater and the pure rate of time preference tends to be less, for a richer man than a poorer man, respectively.

5. "Not only does a once-for-all installation suffice to meet the repetition, year by year, of the new raised rate of demand, but - worse than that - many kinds of fixed capital are of such a lumpy and discontinuous character that , if they are installed at all, they must be installed on a scale which will suffice to cater out not only for existing demand but for the probable *increment* of demand over a number of years... I have always felt that it is to the acceleration principle, interpreted in this broad way, that one should give pride of place in one's thoughts about the cycle" (1963, pp. 413 and 425; cf. [1915] 1948, part I, ch. I and II).

6. In his memorandum of April 1930 to the Macmillan Committee on Finance and Industry, Robertson ([1930] 1931, p. 127) called attention to real wage rigidity instead of money-wage rigity. "I am inclined to attach less importance than some people do to the alleged rigidity of *money* wages under all conditions, and more to the increased determination of the working classes, backed by powerful Trade Unionism and universal suffrage, to secure under all conditions a handsome share of the *real* income of the country".

7. The definition of the natural rate of unemployment as the "average" rate of unemployment over a number of periods can be found in the elaboration by Blanchard and Fischer (1989, pp. 346-50) of a model by Howitt (1988). Under the assumption of a marginal cost of hiring for each firm (which is an increasing function of its level of hiring and a decreasing function of unemployment) in a descentralized labour market, the size of the average rate of unemployment is determined by reactions to technology shocks. Furthermore, as shown by Lilien (1982), in an economy with two or more sectors a shift in relative labour demands reduces total employment if labour mobility across sectors is not perfect, which is also consistent with the Robertsonian framework. As pointed out by Robertson ([1926] 1949, p. 95, as comment on the argument for public works after the upper turning point of the business cycle, "if labour were completely mobile between industries, there would be very little to be said for artificial attempts to annul prematurely the natural consequences of the revaluation which the business world, on the morrow of the boom, has rightly made of the advantage of acquiring instruments". Workers are "condemned to walk the streets in search of employment in time of depression" (p. 21). Interestingly enough, the idea of a "normal" rate of unemployment as a search phenomenon can be found already in Swedish newspaper articles and pamphlets by Knut Wicksell, who, of course, introduced the concept of a natural rate of interest in economic theory (see Boianovsky and Trautwein, 2001, section 2).

8. It is sometimes implicit in Robertson's writings that the immediate effects of excess saving on the level of activity varies according with the assumption made about the degree of price flexibility. Excess saving is "dissipated in consumption at unexpectedly low prices or checked by the curtailment of production" ([1930] 1931, p. 117).

9. The concept of "elasticity of demand for income in terms of effort" is crucial in the framework of Robertson's *Study* and *Banking* (ch. II), since Robertson started by investigating how changes in relative prices can bring about changes in aggregate production in a hypothetical economic system of "independent producers" without money (see Presley, 1979, pp. 41-45; Presley and Sessions, 1997). In his early books Robertson usually assumed an elastic demand for income in terms of effort (that is, a rise in the effort-price of income leads to a rise in the aggregate of effort expended), except if the change in relative price is "sudden or violent" or if the demand for capital goods has reached "saturation-point" ([1915] 1948, pp. 133, 210; [1926] 1949, pp. 14, 17). In his *Lectures* (pp. 312-13), on the other hand, Robertson remarked that the evidence about the sign of the slope of the labour

supply curve against real wages is "conflicting", but suggested that it is likely to be backward-rising in the short period. For the longer period "this is much less likely to be true, since leisure is apt to become boring unless you have money to spend in it, while given time the standard of wants is apt to adjust itself... to a change in income. Thus immediate decisions of individuals to work harder may be reversed later". Generally speaking, the so-called "Lucas's surprise supply function" (see Lucas, 1972) is reminiscent of Robertson's notion that changes in effort and aggregate supply may be induced by a confusion between relative prices and the price level. Keynes's (1936, p. 290) remark that entrepreneurs may be deluded by rising prices into increasing employment beyond the profit-maximization level probably reflected an influence of Robertson's insight, although similar ideas about the effects of "monetary confusion" can be found already in J. S. Mill (see Negishi, 1989, pp. 172-76).

10. According to Robertson ([1915] 1948, pp. 200, 205, 210, 240-41), "general overproduction", even in an economy without money, could result from an attempt to expand investment beyond the point of saturation, that is, "actual over-investment" with overproduction of capital goods because of an incorrect evaluation of the relative price of capital goods. The representative individual is, under these conditions, "over-producing goods *relatively to his past and present efforts and sacrifices* - that is, getting less utility per unit of labour and waiting incurred than he expected" ([1929] 1931, p. 141; italics in the original). Robertson was critical of the tendency of the 'monetary' school of trade cycle to overlook the significance of the "*inelasticity*, in time of slump, of the demand for certain important things which are being relatively over-produced", especially capital goods. Hence, "any attempt to expand output on the part of these trades would, even under barter, furnish an inducement to other trades to *restrict* output". The upshot is that a situation of "general overproduction" (in this sense) will cause the "business classes" to reduce their effort in larger extent than the "working-classes", who "tramp the streets striving to rid themselves of the blessings of leisure" ([1923] 1931, p. 133).

11. In his discussion of the historical evidence, Robertson ([1915] 1948, pp. 226-27) suggested that the process of falling money-wages and prices (after contracts are eventually renegotiated) may actually intensify the depression because of its effect on "monetary misapprehension". "It should be observed, however, that the final and most acute stage of depression tends to occur after a considerable readjustment of wage-rates has taken place (e.g. in 1878-9, 1886, 1904): indeed the impulse given to production by the removal of the tax [that is, relatively high money-wages] upon businessmen actually enhances the purely monetary and illusory inducements to restriction".

12. Expectations about future money supply depend on the information provided to the public by the central bank. "We are dependent on Governments and banks for the money which we must use in every business transaction; yet they will not tell us what the worth of money is supposed to be, nor even what they would like it to be...[The problem of stability] is far more difficult than it would be if our financial authorities had a clear policy about what the general level of prices should be and made a determined attempt to enforce it" ([1923] 1931, p. 143). Robertson also applied his quasi-rational expectations approach to the determination of the rate of exchange in an open economy with paper money. "The actual rate of exchange is largely governed by the *expected* behaviour of the country's monetary authority; and if that authority behaves in a way which is not expected, the rate will ultimately alter" ([1922] 1948, p. 123; see also Humphrey, 1992, p. 76).

13. Actually, the notion of inflation acceleration in disequilibrium was discussed in Cambridge in the 1930s by David Champernowne (1936), who acknowledged in a footnote discussion with Robertson. The real wage rate that workers would demand if they forecast future prices correctly is called the "basic real wage", and the corresponding unemployment level is the "basic unemployment" rate (Champernowne, 1936, p. 203), which is not far from Robertson's 1934 "normal" rate of unemployment. If actual unemployment is lower than its "basic" rate, workers will demand higher money-wages as their "oversight" is gradually repaired and they start to anticipate rising prices. "We see that a period of monetary employment will be accompanied not merely by rising money-wages and prices, but moreover by *money-wages and prices rising at a rapidly increasing rate* "(p. 205; italics added), which will cause the central bank to increase the rate of interest to its long-run equilibrium

level and, by that, bring about a reduction of real wages and an increase of the rate of unemployment back to its "basic" level. And vice-versa for the deflation (see also Boianovsky, 2000). Robertson did not adopt Champernowne's adaptative expectation mechanism, but it can be shown (see Simonsen, 1983, pp. 109-13) that, under the assumptions of lagged indexation and rational expectations, the relation between the rate of inflation and the rate of unemployment is the same as a standard Phillips relation with adaptative expectations.

14. In a debate at the 1959 Conference of the International Economic Association on Inflation, Robertson referred to Phillips's (1958) conclusion that a rate of unemployment of 2.5% should be able to preserve price level stability as "very favourable to the optimists". In Robertson's opinion, the original element in Phillips's article was not the negative correlation between the rate of growth in money-wages and the rate of unemployment, but rather its contention that the relationship between these two variables was stable. Robertson, therefore, pointed out that "one could not put much reliance on the results because it assumed there was a fixed psychological function relating the attitude of trade unions to the level of employment over a whole century" (Hague, 1962, p. 456). Interestingly enough, as Conrad Blyth (1975, p. 306) has pointed out, Robertson (as a Professor at the LSE) played a significant role in influencing Phillips to add the determination of prices and wages to the traditional Keynesian mathematical model of the early 1950s.

15. According to Robertson (1940, p. 25; 1963, p. 388), Keynes's notion of "speculative demand" for money offers an explanation of the divergence between the current rate of interest and its normal (in Keynes's sense) or expected value, but it does not explain the level of the normal rate itself. "If we ask what ultimately governs the judgment s of wealth-owners as to why the rate of interest should be different in the future from what it is today, we are surely led straight back to the fundamental phenomena of Productivity and Thrift", that is, Robertson's natural rate of interest. Furthermore, Robertson (1940, p. 26) found the "neo-Marshallian" approach superior to Keynes's, since the relation between the demand for money and the rate of interest is elevated to the "dignity of a long-period phenomenon, not dependent on the temporary expectation of change in a particular direction, but only on those chronic uncertainties of personal and business life which, while they may find no place in 'equilibrium analysis' of the Continental type, have never been ruled out from the looser Marshallian concept of the long period".

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