The origins and future of the natural rate

Edmund Phelps

The idea of the natural rate of unemployment was born out of the path of the unemployment rate, challenging the idea of effective demand, and demand management. The doctrine held that the unemployment rate was governed by neoclassical considerations. In the new Keynesian framework, a point on the unemployment rate curve was governed by neoclassical considerations.

Modelling of the natural rate idea led to a conclusion from the model sketched in Figure 2. Management of monetary demand to lower the unemployment rate other than the natural rate would generate a continuing disequilibrium - generating a continuing disequilibrium - then collapse. Management of monetary demand to keep the actual inflation rate above the expected rate; but each such rise would leave the disequilibrium undiminished.

The other proposition was implied by this. Rather a similar thesis was forcefully argued in a paper (Friedman, 1968). Monetary policy is focused only to nominal variables: a policy to generate the inflation rate will generate only disequilibrium unemployment rate relative to the path. In particular, the actual unemployment rate, rather a shock, is constantly homing in on disequilibrium - makes this the stronger. I believe the former without having much confidence.

Some of these terms need defining, in different senses. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests. 'Equilibrium' here means, as the name suggests.
unforeseen shock; ‘disequilibrium’ means a gap between expectations and outcomes. Under the maintained assumptions, each equilibrium path of the unemployment rate (indexed by its starting point) converges to the path of the natural rate - conceived as a path independent of monetary policy, at least approximately. The current natural rate may be defined as the current stationary rate: the level of the unemployment rate such that it would be unchanged for the moment as least. For analytical convenience the natural rate was taken to be a constant, hence equal to the equilibrium stationary state level. The first proposition assumes that in the stated circumstances there is a tendency for expectations to narrow the disequilibrium unless policymakers keep people off balance. The second proposition assumes that the tendency to equilibrium is general. Then the actual unemployment rate converges to one of the equilibrium ‘glide paths’, all of which converge to the natural rate path. Strikingly, this message that economists took away from the natural rate discussions of the late 1960s - the neutrality of money and inflation and the homing in - was less a theory of employment determination than a set of axioms that we might require of such a model independently of what substantive building blocks the model is made from. Indeed, the concept of the natural rate, as I have on occasion acknowledged, had existed for decades prior to the arrival on the scene of Milton Friedman and myself. The postulate that inflation was neutral for the equilibrium path of output, employment and some other ‘real’ variables was introduced by Abba Lerner in the 1940s and by William Fellner (a great teacher of mine) in the 1950s. Perhaps my 1967 paper and Friedman’s were more emphatic and explicit about homing in to the natural rate (on which I was more cautious in my 1968 paper).

There was a tendency among quite a few scholars, myself included, to forget that my 1968 paper on equilibrium unemployment sketched a substantive model of the determination of the size of the natural unemployment rate and the course of the equilibrium unemployment rate path which leads to it. The 1968 paper by Friedman also had a substantive side, though it sketched departures of the labour force (to which employment was equal) from its equilibrium path: unemployment does not appear.

The present commentary on the natural rate begins by looking back: to what my model of equilibrium unemployment was, and how that model arose. The second section argues that the full implications of this model and kindred sequels all featuring what I prefer to call ‘incentive wages’ have not, until very recently at any rate, been grasped. The discussions of 1968 hit upon one implication of central consequence for Keynesian thought, the scope of monetary policy. But, I will maintain, there are other ramifications of this kind of model of equilibrium unemployment - implications for fiscal policy and other non-monetary impulse.

Background to the original model

It might be thought that the late 1960s model, a byproduct, the natural rate grew out of general inflation/unemployment control, published expectations-augmented quasi-Phillips curve (p - p₄ = φ(u) + pₑ,p₄ - p₄, equivalently p = φ(u) + pₑ), where p is the money price level being set, pₑ is the expected rate of inflation, u is the unemployment rate. But there was no role for the function φ. Furthermore, the money supply was passive partner of the price level rather than the true and most practitioners supposed. A misspecification of the relation between inflation and unemployment.

With the benefit of hindsight the puzzle reduced to a few basic problems: was the natural rate of unemployment, particularly in conditions of chronic unemployment, in order? How could the unemployment rate reach this ‘natural level’? In such an infra-natural state, was one’s expected nominal wages go on spiralling upward? In my model the Lerner-Fellner acceleration hypothesis of monetary policy, say, kept the unemployment rate below...
increase of the average wage would steadily increase? I had only a foggy notion at best of the answers to any of these questions. However, I did have the sense that the way to the answers was somehow to lay out a model - not a complete system of differential equations but nonetheless a serviceable description of a highly stylised hypothetical economy.

There were bits of labour economics that I started from with each new attempt at a model. I had a little of Dunlop and Slichter, the Harvard labour economists, Paish, the LSE economist, and Wallich, my colleague over several years at Yale. From them I took away the impression that when the economy is pressured, at least for a time, into operation at a level in excess of its equilibrium steady state level, the low unemployment rate poses various inconveniences for firms, which try in turn to cope by setting higher wage rates. I also had a more recent memory of the dynamics of employment arising from employee turnover behaviour as it was modelled by Richard Lipsey in an otherwise econometric paper of his on wage inflation and employment (1960). Yet these insights, however necessary, were missing something fundamental, it seemed to me. They did not put us into the mind of the firm, or its personnel manager. Man is a thinking, expectant being! What was needed was a model of a sequence: the firm's expectations, its subsequent actions and those of the others, the discovery of the others' actions, the formation of new expectations, and so forth.

I had also read the (1964) paper on wages and employment, replete with econometric estimates, by Sargan of LSE. This paper postulated a required nominal wage level that is an increasing function of the employment rate (hence decreasing in the unemployment rate), given expectations of the price level. I took from this paper the rather important point that the rate of increase of nominal wages is a function not just of the level of unemployment but also the change of employment. It also encouraged my impression that when firms plan to increase employment they offer an increased wage simultaneously; the wage is not completely described as a function of the firm's relative wage. For simplicity, the unemployment rate determine the quit rate. If the unemployment rate is dropped, the firm raises its wage in the expectation of an increase of employment in order to induce a moderation of the quit rate. If one firm outbids the other the result can only be the discovery of expectations of the money wage level. Equilibrium in the labour market rate large enough to dissuade the employee to a higher money wage if they could pass along the implied money wage increase, the wage rates at all the other firms.

The model was then reconstructed: the expected level of the quit rate large enough to dissuade the employee to a higher money wage if they could pass along the money wage increase, the wage rates at all the other firms.

$$w - w_{i} = \phi(u) + w' - w_{i},$$

where $w$ denotes the money wage level, $u$ the unemployment rate, which makes $\phi(.)$ a function of the expected wage level. Monetary policy keeps on yanking up the expected money wage level; if it is to induce firms to go on employing beyond equilibrium, it must be a succession of such wage increases. Yet these expectations, however necessary, were missing something fundamental, it seemed to me. They did not put us into the mind of the firm, or its personnel manager. Man is a thinking, expectant being! What was needed was a model of a sequence: the firm's expectations, its subsequent actions and those of the others, the discovery of the others' actions, the formation of new expectations, and so forth.

One day, though, it struck me that so many features of this model were invariance of labour market equilibrium. The result was a sensational aspect. This
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... substantive interest on the part of economists in whether a steady inflation of, say, 6% per year, might make for tighter labour markets than 5%. As I suggested at the start of this chapter, the fascination lay in the implication that Keynesian aggregate demand management - through monetary policy, at least - could not achieve an arbitrarily chosen unemployment rate within some admissible and reasonable range. Keynesian forces could only make transient departures from the gravitational pull of the natural rate.

A second feature was that the unemployment existing at the natural rate, and indeed virtually everywhere on any equilibrium path, was involuntary not just in Keynes' sense of the term but in the everyday sense that the unemployed could not get a job by offering their labour for less than the going wage. As far as I can recall, this point was not well understood by me at the time of writing, nor for some time after. But eventually it became clear to me why the model implied that an unemployed worker could not obtain a job that way: if the firm were to accept such a worker at a lower wage, though that worker did not apparently differ from employed workers with regard to the likelihood of quitting, the firm would have to assume that the worker's quit rate would be higher as a result; but that trade-off would be sub-optimal for the firm to accept since it had already calculated the optimum on the wage-quitting opportunity locus.

Another feature - an 'optional extra' - of the model was the property that, starting from unemployment in excess of the natural level, the equilibrium path would approach the natural rate only gradually. The argument was simply that firms will not jump their employment rolls to the natural level since they face rising marginal cost of imparting firm-specific training, or induction programmes, to new recruits. Whether a specified unemployment rate today will generate unexpected inflation thus depends on the rate yesterday. The augmented Phillips curve became

\[ w - w_{-1} = \phi(u, u_{-1}) + w^e - w_{-1}. \]  

Hence there was an equilibrium path of the unemployment - a path along which the expected wage is always matched by the actual wage, hence a path given by \( \phi(u, u_{-1}) = 0 \) - that approaches the natural rate only asymptotically. This was the notion of 'persistence'. In contrast, the idea of 'hysteresis', as used in my 1972 book, at any rate, referred to the effect of unemployment history on the natural rate, either a permanent effect or a long-lasting one.

In another respect, however, the spirit of the model was uncomfortably remote from the behaviour of aggregate data: the setting evoked by the paper suggested that firms would raise their wages - up or down immediately in response to a shock, then learn what the general wage was doing once the data for that week or month was solicited and released. But in reality, though the production of their wages by discrete amounts, instantly, over a weekly time-series of the average wage rate at least, was continuous - without large increases no one could perceive the shock. This modelling process was an apparently artificial device of imposing a response of its wage; implicitly there was no daily or weekly wage. In the last section, a verbal discussion of the importance of imported the model that would allow for overlapping non-synchronous and regular manner, as altered version of that paper prepared for which the (1970) conference volume was to make it closer to the companion sketched the algebra of the wage rate lay in a special case in which unemployment is in work remained for the 1970s in New Keynes Guillermo Calvo and myself.

As a result of synchronous wage-setting or an auction market for goods, the modern rational, instead of adaptive as I had supposed, generate what could be regarded as a disaster forecast errors by the firms about the upcas it took for the wage data (or other prox were in, wage rates would jump the remain economy again on an equilibrium track. (1972) model, based on my parable of in the early 1970s, Friedman problem arrived to give one sort of reply fixed natural rate, the central bank went always the same probability of ending with employment will be above natural as long wage-setters will not have treated its con will drop below its natural level in the fir regaining the natural level gradually. So just weekly vibrations. The other reply, e independently and collaboratively by Ro 1980s was the argument that expectation in a world in which the correct model (or of continuing disagreement. Then your role is to make a non-trivial forecast, unless we are fellow travellers...
same model’s road. Then the economy can take a non-equilibrium path for a long time, even indefinitely. (Even in the 1968 paper, I might add, a certain ambiguity arises over whether the economy assuredly approaches the natural rate path - hence the distinction between the concept of the natural rate and the natural rate hypothesis.8)

There was another missing feature - trade unions. In the economics of those days, the fashion had been to suppose that the necessity for so high an unemployment rate in order to contain inflation was ultimately a consequence of the presence of labour unions, which grew aggressive whenever the labour market became tight. I took a different view, and in a paper where so little had been eliminated in the interest of simplicity and tractability, I felt it was necessary to draw the line somewhere. Labour unions were banished. Since then, there has been a considerable amount of modelling of unions. It has become clear what unions can add to the story. But a rough idea of the quantitative importance of that addition is not yet in hand.

One last comment. The above account glosses over the confusions and ambiguities that were present in my mind over the months of writing the paper and for months afterwards. The worst of these was the unfortunate remark early in the exposition that it would be necessary to think of the labour force as heterogeneous in order to make sense of positive unemployment as an equilibrium phenomenon. In fact, though, heterogeneity of workers plays no role in the defensive upward push of the product wage in response to the turnover problem that is the driving force behind the creation of unemployment in the model; it is the heterogeneity of firms in the minds of workers that underlies labour turnover. Worker heterogeneity merely plays a supporting role as one of the contributors to the marginal cost of hiring; it is needed to underpin firms’ concern about the quit rate only if marginal hiring costs do not include any firm-specific on-the-job training costs, which ultimately I came to depend on more. The next-worst confusion was created by the property of rising marginal hiring costs on which the existence of continuous equilibrium paths depended; it led to a variable vacancy rate, which played a role alongside the unemployment rate as a determinant of the rate of wage inflation. Some readers mistook the resulting model as generalization of an excess demand model of wage dynamics (in which excess demand was measured by the excess of vacancies over unemployment).

If I have gone on rather lengthily about this now rather old piece of work, it is because it will be useful to have a good idea of what that model of the natural rate was for grasping the simple propositions of the next section on the determinants of the natural rate and hence the possible causes of its long-term swings and shifts.

Further developments

Natural rate models, to repeat, are so complex that even the simplest variables at all, the equilibrium path from 'money' and to the purely monetary presence of non-synchronous wage-employment variables into equilibrium near-term become problematic, and that a small change may produce a transient difference for the path of the rate. This doctrine warrants comment. There has been a crying need, then, to treat it as a parameter rather than a variable.

The question arises: what are the key variables? There has been a crying need, then, to treat it as a parameter rather than a variable. The 1968 paper observed that fast pull? My 1968 paper observed that fast rates produced a higher natural rate through this evolution of real conditions while out of the 'control' of the natural rate doctrine has come to be regarded as a parameter rather than a variable.

There has been a crying need, then, to treat it as a parameter rather than a variable.
If we view the natural rate path as endogenous, pushed like other economic variables by non-monetary forces, and take on board the rest of natural rate doctrine - actual unemployment tending soon to equilibrium, and all equilibrium paths approaching the natural path - we arrive at a new paradigm: a non-monetary equilibrium theory of unemployment movements - an endogenously moving natural rate theory of movements in the actual rate of unemployment.

Over the past several years I have managed to develop to a rudimentary, working stage a general equilibrium theory of this kind in the form of a family of intertemporal micro-macro models. Each one revolves around a distinct kind of asset acquired by the firm that is of importance for its hiring decisions: the trained employee, the customer and fixed capital equipment. Collectively these models provide a structuralist story of how the equilibrium unemployment path is determined and thus disturbed by changing parameters and conditions. The evidence so far encourages me to believe that this theory does rather well at explaining the shifts and long swings of the unemployment rate in the postwar experience of the Western industrial countries. A detailed exposition of this approach, with a statistical and historical investigation of its explanatory power, is presented in my recent monograph (Phelps, 1994). It is possible, though, to give a glimpse of what the approach has to offer by taking up two themes regarding the closed economy.

One of these themes concerns the effect of shocks to the technology. Consider a one-time shock to the level of labour augmentation appearing in all production functions. In the admirable rendering of the natural rate by Steven Salop (1979), the implication in this regard went unnoticed. Such a productivity shock had no effect on the natural rate path and, accordingly, on the equilibrium path from the initially given unemployment rate; the shock was followed instantly by a neutralising increase of the real wage at each firm, hence no change in the quit rate, and no reason for firms to speed or slow their hiring of labour, the wage having offset the increased productivity of employees. This was a comforting result from one point of view since it meant that secular progress did not have the counterfactual implication of an ever-decreasing unemployment rate; but it likewise implied that there was no near-term disturbance to the employment rate either. This result was a consequence of the wage-wage view of labour turnover behaviour of my 1968 paper on which Salop built. In the later, utility-theoretic formulation by Carl Shapiro and Joseph Stiglitz (1984), the contrast was complete. Such a labour-augmenting shock, in driving up the economy-wide real wage, decreased the propensity to quit, causing the supply wage to shift up less than the demand wage.
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domestic assets and of wealth operate to amplify or ultimately to tend to correct the early effect on unemployment.

Here the theory is an echo of pre-Keynesian doctrine in sounding the theme of slump through 'undersaving': public debt and other fiscal stimulus to consumer spending are seen as contractionary. Yet the results have in common with Keynesian doctrine the theme of slump through 'underinvestment': in particular, government armaments purchases (and in all but special cases manpower builds too), as occur in wartime, and more generally any government spending on goods produced by the capital goods sector of the economy are implied to be expansionary - without any reference to the liquidity of a money economy, which is crucial to the Keynesian analysis.

The pre-Keynesian part follows from a very simple mechanism. An increase of consumer demand, whether the response to a spontaneous increase of the rate of pure time preference or the artefact of a recent increase of public debt, creates an excess of consumption demand over consumption supply, with the result that real asset prices have to drop and real interest rates rise in order to eliminate that excess demand. The repercussion of these changes in financial prices is an induced decrease in the amount of investment of the various types that firms are willing to undertake. The effect in turn is a decline in the equilibrium path of the employment rate.

The Keynesian part arises from the property that an increased demand by the government for the capital good serves to pull up the relative price of the good whose production is the more labour-intensive and thus to pull up the demand wage in the aggregate employment-wage plane. As an empirical matter, however, it is not clear that this effect is generally strong; it may be confined to a small sub-set of capital goods.

Introducing the interactions of open economies adds further twists to the story. It is found to be theoretically possible that a consumption-demand stimulus in an open economy, if small enough, will have an expansionary effect at home - a result more Keynesian than that obtained by some Keynesian models - while having a contractionary effect abroad (in proportion to its size). This is the same 'Locomotive' in reverse, or 'crowding out' at a distance, previously found in the part-monetary models of Fitoussi and Phelps (1988). The argument is that the fiscal largesse of the country on its own citzenry drives up the domestic real interest rate and thus the world real interest rate, which entails a real exchange rate depreciation abroad, the effect of which is to push up the natural unemployment rate abroad.

The empirical sections of the monograph suggest that this theory of equilibrium unemployment succeeds to an important degree in shedding light on the contrasts between the long period of extraordinarily high economic activity from the early postwar years of the two nearly global slumps in the 1970s it offers is not far from the mark either of the equilibrium approach to slumps and booms.

Some reservations

The thrust of these reflections is clear. The powerful concept for macroeconomic analysis of the natural rate in the work of Salop, Stiglitz, and Newell and Symonds, to mention only a few, do a great deal more work than it was capable of.

Yet it would be remiss of me not to call attention to the edifice that has been going up. How much of the theory can be captured by a theory that emphasises the role of monetary factors and channels and downgrades the role of real factors, and that is based on the natural rate on incentives for shirking, adverse selection?

The claim that money and inflation are more important than the monetary authorities receive. The monetary authorities are obsessed with the sort of linearity that we imply in our models, and the normal range of the economy, measuring changes of 1% increase or decrease of the money supply; a change of 15 or 25 per cent, however, may be sufficient to move the economy out of the neighbourhood of such a disturbed range. An increase of the money supply may make a large difference. It is in fact as early Irving Fisher got a hold of this point, and Keynes and most Keynesians did not.

Fisher's point may be important for understanding the high unemployment of recent years. The recession of the 1990s is not altogether a holdover from the 1980s, which has left households with larger levels of real indebtedness than in the past, and much of this debt in previous years. By
be that some of the 1980s’ slump - particularly the high unemployment rates still lingering toward the end of the decade - is also to be explained by this phenomenon of ‘debt deflation’, in Fisher’s term. Very likely the bulging levels of real debt overhang had a sobering effect on households and firms contemplating their customary accumulations of real assets and financing them by the customary mix of debt and equity. If hypothesis is true and quantitatively important, it means, as I see it, that the natural rate hypothesis is not as good an approximation of reality as it first seemed to us in the 1960s. However, no purpose would be served by conceding this small but valuable piece of territory to the resurgent monetary forces until the econometric scouts have confirmed that the insurants have solid control of it. At the time of writing, the relevant econometric tests have not yet been performed. Scraps of circumstantial evidence and supporting observations are useful but not conclusive.

The reliability of convergence to the natural rate path is, in my view, no less serious an issue. It is one thing to suggest a broad tendency toward equilibration (not in any exact way, of course) over a range of circumstances and histories, and quite another to close the door to the intuition, ventured by Keynes and a few others, that there are apt to be episodes in which the economy lingers away from equilibrium or moves back and forth past the correct expectations to have. Research by Roman Frydman and myself, some of it collaborative, has sought to identify some conditions that may block convergence to equilibrium. On the other hand, if my recent econometric work implementing the variable natural rate theory (mentioned on p.26 above) is basically right, there is - on average, at any rate - a tendency for the unemployment rate to approach the natural rate path. A question very much left open, however, is whether, following a shock, there is a systematic tendency for a stampede, culminating in overshooting - a phenomenon perhaps traceable to expectational errors or perhaps to a desire of each enterprise manager not to be seen having taken fewer precautions than other managers even if the situation of the enterprise does not call for them.

Finally, is the labour market really a matter of incentive pay and nothing else? Of course not. Students should understand that seeing N papers in a row without a mention of the word ‘union’, say, or ‘insiders’ end ‘outsiders’, should not be taken to indicate that the author always preferred, and as between equally convenient models, the one in which the writer has a vested interest is selected.

The insider-outsider theory greatly enriches the dynamics of employment, and it has interesting implications for the real wage response to shocks. Some models by Andrew Oswald and by Assar Lindbeck and

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Notes
1 The process of rising inflation would cause sellers of money would find no takers, more of a role. The process of rising deflation would be such that sellers of real wealth claims would have come to dominate all non-monetary
2 This definition of the natural rate seems true. In a purely theoretical paper it might be more
to define the natural rate as the equilibrium steady state path.

3 Clearly the thrust of the doctrine would survive if the natural rate became a path instead of a constant, even an endogenous path provided it is invariant to monetary policy.

Dahrendorf would say that the proposition belongs to critical rather than to theoretical economics; see Dahrendorf (1993).

5 These papers were widely known. Lerner's, in the Review of Economics and Statistics (1949), was the stimulus to Friedman's famous complaint that, contrary to what Lerner had implied, inflation had some real allocative maleffects, namely the time-consuming efforts of people to economise on cash balances.

Among those who zeroed in on this aspect of the model were Dale Mortenson and some of his colleagues at Northwestern, Donald Gordon, then at UBC, and Arthur Okun at Brookings.

7 The first wave of new Keynesian models, developed at Columbia in the latter half of the 1970s, is discussed in Phelps (1991).

8 I could not be certain that the distinction was really there were it not that I remember some readers having called attention to it, William Nordhaus for one.

9 Another effect works the other way, as the deficiency of capital relative to the long run means that non-wage income is decreased relative to the wage, which tends to decrease the propensity to shirk in the model and thus to reduce the supply wage (or incentive wage). As a consequence of this contrary tendency, there is no theoretically unambiguous result regarding the unemployment effect of a permanent shock to the level of labour augmentation and of a change in the initial capital stock.

10 Appendix A to the 1970 version of my paper has some equations bearing on the dynamics of employment under the explicit presence of rising marginal hiring cost. Without doubt that discussion is somewhat confused, having been written in late 1966, well before the significance and real meaning of the model I was working on had become more or less fully clear to me.

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