EVOLUTIONARY ECONOMICS, THE PHILLIPS CURVE AND THE INCREDIBLE DISAPPEARING NATURAL RATE OF UNEMPLOYMENT

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ABSTRACT

The real economy is evolving under the impact of continuous technological changes, which are determined endogenously by agents groping into an uncertain future in search of profits but not able to establish unique profit maximizing lines of behaviour. The kinds of technological shocks that are observed in the technology literature cannot be modelled as random variations generated by a stationary process. Instead, the shocks themselves tend to come in irregular waves and to have very different effects with each new transforming technology. In models that capture such behaviour, there are no operational meanings for an optimal allocation of resources, nor stationary static and dynamic equilibria. The Evolutionary theory that captures this type of behaviour is used to shed light on some old controversies and to call into question some accepted concepts.

In the early 1950s, most British economists believed in a trade off between unemployment and inflation. Although Phillips merely put numbers on this relation, his curve was rejected by most of the Keynesian establishment at Cambridge. Some of the attacks made on the Phillips curve and Keynesian economics by the New Classical economists are critiqued, particularly the theory that firms routinely misinterpret the price signals that they receive. Although Keynesian economics and the Phillips curve survived the new Classical attacks, evolutionary economic theory predicts that both the responsiveness of wage costs to demand variations as shown by a Phillips curve (or some more sophisticated equivalent) and the existence of a unique natural rate of unemployment should *not* be universal characteristics of a market economy. Whether or not they will exist in any particular decade will depend on the nature of its specific technological shocks. In particular, it matters if technological change is altering the structure of the demand for labour in the direction of more jobs in the middle range and less at the extremes, as was true in the first seven decades of the 20th century, or in the direction of more high and low paying jobs and less in the middle, as has been happening more recently. In the later case, the natural rate may not exist so that wide ranges of income, employment, and unemployment are compatible with a stable more or less fully anticipated inflation. This is consistent with the evidence of the recent behaviour of several economies, including the Canadian.

EVOLUTIONARY ECONOMICS, THE PHILLIPS CURVE AND THE INCREDIBLE DISAPPEARING NATURAL RATE OF UNEMPLOYMENT

FORWARD

From 1970 to 1981 I taught graduate stabilisation policy and undergraduate macro economics at Queens University. At the end of that time, I decided that the new-classical macro-economics with its surprises-only aggregate supply curve and its accompanying real business cycle theory was a blind alley. Not wanting to spend time on the controversies that would inevitably surround the developments of these theories, I migrated to the C.D. Howe Institute in Toronto where I was privileged to play a part in the formation of the Canada-U.S. Free Trade Agreement and the NAFTA. Then in 1990, I became a Fellow of the Canadian Institute for Advanced Research (CIAR) and devoted the next decade to setting up their program "Economic Growth and Policy", to reading widely in the literature on the structure and effects of technological change, and to developing my own ideas about long term economic growth that is driven by technological change.

About a year ago, I agreed to take part in these sessions on Keynesian economics. Almost immediately I forgot about it, until a few weeks ago when an email asking me for my title. I had been working on a three volume set of readings on the Phillips curve for Edward Edgar but my co-editor (who has now left the project) was doing the later material while I concentrated on precursors and early developments. So I chose the title that was first listed in the program: "The curious case of the Phillips Curve Phoenix." I then had to do what I had vowed not to do: read some representative material on macro developments over the last 35 years ─ other than new Keynesian economics of which I had maintained some modest awareness. However, when I came to write a paper under my original title, I found that what really seemed interesting to me was the light that might be shed on some macro economic controversies by looking at them afresh through the eyes of evolutionary theory − a theory that emphasises endogenous technological change at the micro level. This literature long predates Lucas and Romer's introduction of endogenous technological change into macro economic models and differs from it in looking at technology as being highly structured rather than as being flat as is implicit when it is represented by one or two composite variables (often one for physical and one for human capital) in an aggregate production function or as its pre-multiplier for such as function. Then to my surprise, I found that looking at the economy in the light of this much more realistic view, shed light on some otherwise anomalous recent data, and in doing that, shed doubt on the existence of a long accepted pillar of macro economics, the natural rate of unemployment. Hence the new title of my paper: "Evolutionary Economics, the Phillips Curve and the Incredible Disappearing Natural Rate of Unemployment".

I. INTRODUCTION

How can economists best understand the macro behaviour of the economy in aspects other than its long run growth experience? What advice can we give about the efficacy of policies designed to influence that behaviour? Two main bodies of theory attempt to provide answers to these and other similar questions: the New Keynesian and the New Classical, both of which have roots extending a long way back in time. In this paper, I consider two main issues: first, the relation between unemployment and the rate of inflation and, second, the generally assumed existence of what has variously been called the natural rate of unemployment, and the non-inflationary rate of unemployment (NAIRU). I will refer in this paper to the natural rate and to its corresponding level of real national income, which I symbolize respectively as U^N and Y*.

One of my main objectives is to look at these issues in the light of evolutionary economic theory. Although this theory was developed mainly to deal with issues concerning long term growth, I direct it here at short term issues.[1] Since evolutionary economic theories are less well-known than either New Classical or new Keynesian theories, I first devote space to setting out those of its characteristics that are relevant. Then, I discuss briefly the debates on inflation and unemployment that occurred at the time that the Phillips curve was first introduced. Then I discuss the alleged refutation of Keynesian theory as a result of the stagflation of the 1970s, and some characteristics of New Classical theory, particularly the doctrine that the only real effects of monetary shocks occur when they are surprises. Although I may be accused of flogging some dead horses in this discussion, it seems to me that it is important for the history of thought to see how well some of the propositions that were influential in redirecting the subject stand up when looked at with hindsight. Then, I go on to consider the theory concerning the existence of a U^N, the current evidence for its demise, and an evolutionary theory that explains why it is *not* a ubiquitous characteristic of modern economies.

II. EVOLUTIONARY ECONOMICS[2]

Evolutionary economics studies economies that are evolving continuously along path dependent trajectories that are largely driven by technological changes generated endogenously by the competitive behaviour of agents who make R&D decisions under conditions of uncertainty. Since continuous technological change is a fact of ordinary observation, since it drives long term growth in the sense that without it growth would slowly peter out (as the classical economists long ago understood), and since it continually transforms our economic, social and political relations, theories that ignore it must be treated with caution.

Risk and Uncertainty Distinguished

To begin our discussion of evolutionary economics we need to consider the economics of risk and uncertainty. As defined by Frank Knight (1921), risky events cannot be foretold with

[1] For some examples of formal macroeconomic evolutionary theories of long run growth see Lipsey Carlaw and Bekar (2005: Chapters 14 and 15) and Carlaw and Lipsey (2006 and 2008).

[2] This section depends heavily on the first few chapters of Lipsey Carlaw and Bekar (2005). There is also a voluminous literature both on evolutionary models and on empirical observations of technology and how it evolves. Two of the best of the latter are Rosenberg (1982) and (1994).

certainty but they have well-defined probability distributions and hence well-defined expected values. Standard economic analysis has no trouble handling risk. Risk neutral agents merely maximize expected values — rather than the actual values that they would maximize in a world of perfect certainty. *Thus a key characteristic of decisions taken in risky situations is that two agents possessed of the same objective function, the same information set and presented with the same set of alternative actions will make the same choice — the one that maximises the expected value of the outcome.*

In contrast, uncertain events have neither well-defined probability distributions nor well-defined expected values. *Thus a key characteristic of decisions taken under uncertainty is that two agents possessed of the same objective function, the same information set and presented with the same set of alternative actions may make different choices and there is no way to determine which is the better choice in advance of knowing the results.*

Uncertainty, Invention and Innovation

Because invention and innovation require doing something not done before, they always involve uncertainty. When major technological advances are attempted, it is typically impossible even to enumerate in advance the possible outcomes of a particular line of research. Time and money are often spent investigating specific avenues of research to discover if they are blind alleys or full of immensely rich pots of gold. As a result, massive sums are sometimes spent with no positive results, while trivial expenditures produce results of great value. Furthermore, the search for one objective often produces results of value for quite different objectives. All this implies that agents will not be able to assign probabilities to different occurrences in order to conduct risk analysis as conventionally defined. So when two profit-seeking firms are making choices concerning R&D, one may back one line of investigation while the other backs another line, *even though both know the same things, both have the same objective function and both are searching for the same technological breakthrough.*

Uncertainty is involved in more than just making some initial technological breakthrough. As new technologies diffuse, their specifications are improved and sometimes altered beyond original recognition. Their range of applications is also expanded in ways that are impossible to predict. Furthermore, initial innovators do not know how long their new technologies will go on being useful.

Uncertainty does not just arise from a lack of information that one might feasibly obtain given enough time and money. It arises from the nature of knowledge. Until one obtains new knowledge about some researched phenomenon, no one can know what the nature of that knowledge will be. (To know this is to have the knowledge already.)

Because firms are making R&D choices under uncertainty, there is no unique line of behaviour that maximises their expected profits — if there were, all equally well-informed firms would be seeking the same breakthrough made in the same way.[3] *Because of the absence of a unique best line of behaviour, firms operating in a dynamic growth framework, are better*

[3] For example, competing Japanese and American firms often make different R&D decisions when searching for the next advance in some product over which they compete. Sometimes, as with the fifth generation computer chip, the one that makes the more adventurous attempt finds, after the event, that the technical difficulties are too great and massive investments are written off. At other times the firm that takes a conservative tack looses out dramatically when a technological breakthrough is made with surprising ease by its competitor.

understood not as maximizing profits, but as groping into an uncertain future in a purposeful and profit-seeking manner. [4]

Profit seeking involving R&D in the presence of uncertainty, rather than profit maximizing in the presence of risk, implies that technological trajectories are non-unique and path dependant. They are non-unique because if we could return to the same initial conditions and play the innovation game again, there is no guarantee that we would retrace our steps exactly. They are path dependant because (i) scientific and technological advances build on each other: what is discovered and/or innovated today influences what can be discovered and/or innovated tomorrow and (ii) those technological advances that firms decide it is potentially profitable to search for today depend on their current capabilities and these in turn depend on what they have decided to search for in the past, and on how successful they were in these endeavours; so what has happened in the recent past strongly influences what will happen in the future.[5]

Optimum Allocation of Resources: Not an Operational Concept

When technology is evolving endogenously under uncertainty there is no operational meaning to the concept of an optimum allocation of resources. For example, there is uncertainty about how much of climate change is the result of human action and what kinds of new technologies will most efficiently reduce the human contribution. (There is a sustainable minority of scientists who believe that most, possibly all, climate change is the result of natural forces.) Fifty years from now it may be clear that if we now knew what is known then we should have devoted much more or far fewer resources to new technologies designed to reduce the human contribution to climate change. Right now, although there is a majority opinion, there is genuine uncertainty and we cannot determine through economic analysis the optimum amount of resources that should be devoted to developing new techniques that will reduce the human contribution to climate change, nor can we say which of the various technological possibilities will prove to be the most efficient at doing the job, if the job needs to be done at all. So we cannot determine through optimality analysis how much of our total resources should be devoted to climate related R&D in general, how these should be divided between different possible technological breakthroughs, and/or which firms are offering the best line of enquiry for any one hoped-for advance. After the event, we will almost certainly wish that the various allocations had been different in one way or another, but *ex ante* any views and decisions are subject to genuine uncertainty. So if we define the optimal allocation of resources with respect to dealing with these issues as the one that produces the highest expected value of the future outcome (evaluated by some generally agreed objective function), this is not an operational concept for making decisions today about an uncertain future.

Stationary Equilibrium: Not an Operational Concept

It follows from the characteristics of endogenous technological change that the economy is never in a stationary state. Instead it is constantly evolving in ways that can to some extent be

[4] This approach to the firm behaviour has a long lineage going back at least to Herbert Simon. Later it was pioneered in relation to growth and technical change in the seminal work of Richard Nelson and Sidney Winter (1982).

[5] See Lipsey Carlaw and Bekar (2005: 77-82) for a discussion of the relevance of path dependence and a reply to those who doubt its importance.

foreseen, at least as probabilities, but to some extent stem from genuine uncertainty and hence create genuine surprises. Here are two small examples. First, cell phones were initially thought to have a very limited market in commercial spheres. No one initially guessed either the extent of their diffusion or the increasingly complex, multi-purpose functions that they came to handle. Second, the internet and email, which have transformed economic, political, and social relations, were originally thought to be of limited use mainly to the military.

A simple interpretation of a stationary equilibrium in neo-classical models is where the economy would settle when sufficient time is allowed for all adjustments to be made so that all agents want to do tomorrow what they are doing today. For example, given an unexpected once-for-all increase in the money supply, real variables are altered in the short term but eventually all return to their original values. If, during the process of adjustment, an arbitrarily determined sub-set of endogenous variables were frozen at their current values while the others were allowed to adjust fully, the result would be of little value to those wishing to generalize about the effects of policy shocks. It would depend on which items were frozen and the specific time at which this was done.

A stationary equilibrium is not an operational concept in an evolutionary model because the economy is evolving continuously due to endogenous technological changes made under conditions of uncertainty. What agents want to do today depends on what they did in the past ─ in particular what they discovered and innovated, both on purpose and accidentally. So what they want to do tomorrow depends among other things on what happened today. For such an economy to settle into a static state, all technological change must stop at some point. But technologies are interrelated in a linking that stretches backwards and forwards over long periods of time with later ones being invented and innovated in response to problems and opportunities created by earlier technologies and building on knowledge embodied in them. Freezing all technical change at some point in time would be analogous to the above discussed freezing of an arbitrarily determined sub-set of the endogenous variables in a neoclassical model during an adjustment process and the allowing the rest to adjust. Agents would not want to do tomorrow what they were doing today.

What about an endogenous, evolutionary, dynamic equilibrium? When economies are evolving under conditions of uncertainty, there is no such thing as an optimum allocation of resources and, given path dependence, there is no reason to suspect that if some period of time were replayed, the results would be the same. The laws of motion that drive the evolution of such an economy can be understood since agents are doing the best they can in an uncertain world but it cannot have an equilibrium growth path to which it will return if disturbed. Such a path requires that the past be repeatable and that disturbances leave no trace once their effects have been worked out. In contrast, a disturbance which affects the immediate path of technological development can have lasting effects in the sense that the economy will never return to the path that it would have taken in the absence of that disturbance. Think, for example, of a policy change that stops the invention and innovation in country *A* of a major new transforming technology, often referred to as a general purpose technology (GPT). Now let different policies in country *B* enable it to make the invention and innovation. Much historical evidence shows that the future development of both *A* and *B* can be permanently affected by such an event. Furthermore, the initiating shock need not be a real one. For example, the imposition of a very tight monetary policy in *A* could temporarily reduce *A*'s available R&D funds just enough to allow *B* to take the lead in the technology's development.

Not only does the thought experiment of stopping all technological progress at a point in time not produce an equilibrium (either static or dynamic), it is useless as a predictive device because the adjustment of all other real variables to such an imperfectly adjusted set of technologies would produce reactions and stable values of the variables that would be irrelevant to anything found in the real world.

Competition is Action

Given constant technological change, static conceptions of the economy are not used in evolutionary economics. Thus the neoclassical concept of competition as the end state of the competitive process in which there is no competition in the normal sense of the word is replaced by the Austrian concept in which competition is an active process taking place in real time: In this view:

> "...firms jostle for advantage by price and non-price competition, undercutting and outbidding rivals in the market-place by advertising outlays and promotional expenses, launching new differentiated products, new technical processes, new methods of marketing and new organisational forms, and even new reward structures for their employees, all for the sake of head-start profits that they know will soon be eroded." (Blaug, 1997: 255)

Such competition encompasses rivalrous situations among both large and small groups of firms. Simple passive price taking behaviour is not involved. Rather, behaviour takes the form of active struggling of firm against firm each seeking a temporary advantage over the others. In this type of competition, technological innovations are a major tool by which firms strive to gain competitive advantages and it thus evolves endogenously, following path dependent trajectories that *cannot be described as random fluctuations drawn from a stationary distribution.* Since none of the advantages gained in this active form of competition are permanent, none will show up in long run equilibrium. As a result, long run equilibrium analysis of the competitive process is not just irrelevant, but misleading because firms that are competing through innovations will cause technology to change endogenously long before any long run tendency based on fixed technology and tastes is manifested in observed behaviour.

Pervasive Technological Change

Technological change is rampant at the micro economic level and its impact is much more than can be measured by changes in such macro variables as GDP or TFP. For example, with little change in productivity or GDP, the rust belt in the US is being transformed by the decline of old manufacturing industries with some jobs being replaced by new industries, some by self employment and some by early retirement. This is a massive technologically driven change whose economic (social and political) impacts cannot be seen by studying macro data on employment, unemployment, GDP or TFP.

Technological change occurs at all levels of complexity. There are myriad small, mainly unnoticed, improvements that have been estimated to account for close to half of all increases in aggregate efficiency. There are more noticeable inventions and innovations, such as cell phones, and Ipods. There are some very large and more important ones, such as satellite transmissions,

and there are occasional dramatic ones now called 'general purpose technologies" (GPTs) that transform the whole economic, social and political fabric of society.[6]

General Purpose Technologies

GPTs begin as fairly crude technologies with a limited number of uses and evolve into much more complex technologies. As they diffuse through the economy, their efficiency is steadily improved. As mature technologies, they are widely used for multiple purposes, and have many spillovers. They do more than just reduce the price of some service that they provide, more importantly, they enable myriad things that were technically impossible with the previous technology. For example, no steam engine could have been attached to a carpet sweeper to turn it into a vacuum cleaner and, similarly, for any of the other electrically powered gadgets that transformed household work in the 20th century.

More generally, GPTs rejuvenate the growth process by presenting new agenda for R&D directed at finding new applications of the main technology and new technologies based on, or derived from, that main technology. These in turn create other new opportunities, and so on in a chain reaction that stretches over decades, even centuries. In Lipsey Carlaw and Bekar (2005:4-5) we cite the following typical example:

> "The invention of the dynamo in 1867 allowed for the practical generation of electricity. The use of electricity allowed a separate power source to be attached to each factory machine (rather than being driven by a central power source through a system of shafts and belts as in the steam-powered factory). The 'unit drive' electric motor allowed the machines in the factory to be rearranged to coincide with the rational flow of production through the factory. In turn, this arrangement allowed Henry Ford to mechanize production with a moving assembly line. In Ford's hands, the assembly line, together with standardized parts (themselves the result of another key invention in the machine tool industry), enabled the mass-produced, affordable automobile. The model T, and its successors, transformed American (and later European) society in myriad ways. It allowed people to move about more quickly and more cheaply than ever before. It provided high paying work to many immigrants who could not easily converse in English. It helped to create the suburb, the shopping centre, the domestic tourist industry, and the motel. It helped to alter sexual mores (as courting couples were freed from the eyes of parents and chaperons) — to mention only a few of its far-reaching effects."

The introduction of a transforming GPTs causes extensive changes in what Lipsey Carlaw and Bekar call the "facilitating structure", which includes such things as the organisation of work, the management of firms, skill requirements, the location of industry, and supporting infrastructure.[7] The typical history of a GPT is that it enters into a structure designed to

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[6] A brief history of the major transformations that have occurred over the last 10,000 years is given in Lipsey Carlaw and Bekar (2005; Chapters 5 and 6)

[7] They define the facilitating structure as "the actual physical objects, people, and structures, in which technological knowledge is embodied." According to them it is comprised of the following broad categories: (i) all physical capital, (ii) consumers' durables and residential housing, (iii) people, who they are, where they live, and all human capital that resides in them and that is related to productive activities, including tacit knowledge of how to operate

accommodate the technology that it is challenging. Then slowly the structure is changed to accommodate the new technology. This is typically a period of low productivity growth and much conflict as old ways of doing things prove dysfunctional and new ways have to be developed through a slow learning process. Once the structure has been adapted to fit the new technology, a period of secular boom occurs; productivity rises and many new technologies that depend on the new GPT are developed within a structure now designed to accommodate them. For example, the computer began to enter the economy in big ways during the 1970s but the structure was designed for the previous paper-based system. It took more than a decade for the development of new structures of design, production, distribution and management that were adapted to the new electronic technology, after which, starting in the early 1990s, a period rapid development occurred with new applications appearing almost every day.

Schumpeterian-Style Real Business Cycles

Evolutionary economics has its own real business cycle theory. It is due to Joseph Schumpeter who saw technological advances occurring in cycles with a burst of innovation associated with a new technology causing a boom period of rising sales, profits, and employment that carried the older technologies marked for replacement on the flood tide of boom along with all else. Then, when the pace of technological advance slackened, a recession began and those older technologies that were slated to be superseded were discarded in a bunch that accentuated the depth of the slump. Because Schumpeter's theory was associated with the older tradition of long wave Kondratieff cycles whose regularity was not obvious in the data and that was devoid of a theoretical explanation, it lost favour. Recently, however, the theory of general purpose technologies (GPTs) discussed above has provided an explanation of why technologically driven booms should come in waves, although not with a regular periodicity.

Freeman and Perez (1988) refer to the whole interlocking system of a GPT, the technologies it enables and the supporting infra-structure as a "techno-economic paradigm". Using this concept, Freeman and Louca (2001) provide strong evidence that technological developments have, over the last two centuries, come in bunches that caused alternating bouts of boom and slump (but that do not need to have a regular periodicity). One may argue about why this happens, but the historical evidence about the facts is hard to dispute. So there are now consistent evolutionary theories for such long term fluctuations. Supporters of the GPT driven "cycle" point to the secular boom of 1945-75 associated the application of new technologies innovated earlier in the century, then to the slacker period from 1975 to the early 1990s when the new ICT revolution was undergoing its early development and much of the deadwood associated with the older technologies was being eliminated, followed by buoyant conditions of the mid 1990s to now (at least until the sub-prime mortgage crisis in the U.S.) when the new ICT technologies were being exploited in a structure more or less fully adapted to them.

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existing value-creating facilities, (iv) the actual physical organisation of production facilities, including labour practices, (v) the managerial and financial organisation of firms, (vi) the geographical location of productive activities, (vii) industrial concentration, (viii) all infrastructure, (ix) all private-sector financial institutions, and financial instruments, (x) government owned industries (xi) educational institutions and (xii) all research units whether in the public or the private sector.

Employment and Unemployment

Modern real business cycle theory models technological shocks as random fluctuations drawn from a stationary distribution. Much folklore sees technological change as altering skill requirements uni-directionally. Students of technological change disagree with both of these beliefs. First, technological shocks are not random, but instead are path dependant. The overall magnitude of technological shocks varies over long periods and as shown by Freeman and Louca (2001). They tend to ebb and flow as new GPTs replace older ones, then spawn a period of derivative inventions and innovations, and then are superseded by newer competing GPTs. Second, the structure of skill demands varies with each new technology, sometimes raising the demand for middle skill jobs and sometimes raising the demand for very high and very low skill jobs, in each case impacting differently on the distribution of income. For just one example, machines in steam driven plants were sufficiently unreliable that operators had to be skilled enough to spend several hours a day maintaining and repairing the machines that they tended. Then with electrification of factories, the new machines were so reliable that maintenance and repair were devolved onto a small group of specialists while operators needed only enough skill to tend their machines. Later in the century automation of factories increased the skill requirements of the (few) who remained employed on the shop floor as less skilled work was increasingly done by machines.

Evolutionary economics permits involuntary unemployment in the following senses. First, in the transition from one major technological regime to another there is a time when the facilitating structure is being adapted in a "conflict ridden process",[8] and productivity is rising only slowly if at all and profit expectations are not high. Investment in new technologies will be slow while employment is expanding less fast than the labour force. Second, and more important, at any stage of the innovation cycle, an industry whose employment (but not necessarily its output) is declining as a result of technological change in that industry or elsewhere will be shedding workers in various skill classes while still keeping others in that same class employed. The displaced workers would like to be reemployed but firms will not take them on. But firms also do not reduce the wages of those who remain employed sufficiently to clear the local market for that class of worker. This is structural unemployment caused by technologically driven changes in the structure of the economy.

It takes time for the displaced workers to realise that they will not find work in the activity for which they have been trained, to discover what other work is available, and often to do the retraining needed for that new work. Some of those who became structurally unemployed find jobs in other industries that require their current skills, others retrain for other skills, others move down the skill ladder to take 'hamburger flipping jobs' and yet others retire from the labour force. While these 'discouraged workers' are no longer recorded as unemployed, they could return to the labour force if the jobs for which they are trained were available. Some who remain in the labour force make the adjustment smoothly and quickly; others take much time. Some judge correctly where new jobs are being created; others make mistakes and spend time training for jobs that then turn out to be unavailable. All of this takes time and at any one moment there is a pool of structurally unemployed who would rather have stayed in their previous type of job at wages currently paid to others who are currently occupying similar jobs, but who are forced to adjust because of changes in the structure of the economy. It does not hurt

[8] This is Freeman and Perez's highly descriptive term.

to call this 'search unemployment' but it is involuntary in the sense that the displaced workers would like but cannot obtain work for which they are qualified at the wage rate paid to others who are currently employed in such work. Arguments about whether to call this voluntary or involuntary unemployment are essentialist and of no substantive importance as long as it is understood that such unemployment exists whatever it is called.[9]

III. SOME EARLY HISTORY[10]

I need to discuss two commonly held views of early Keynesians. First, they all believed that the business cycle could be dampened by active stabilisation policy. Fiscal policy was believed to be more important than monetary policy but the latter had some effect, except in severe depressions when the liquidity trap might become manifest. Second, they believed that the economy could be managed at various levels of what came to be called the output gap (Y*-Y where Y* is some measure of 'normal income' that later became associated with a corresponding U^N and Y is actual income). In this view, there was no unique equilibrium level of Y towards which the economy was effectively propelled.

Most Keynesians argued for operating the economy in the range of a modest negative gap, accepting mild inflationary pressures as the price of a high level of employment and rate of economic growth. Others, of which Frank Paish, then professor at the London School of Economics, was probably the most prominent, argued for operating the economy in the range of a positive gap with mild deflationary pressures and higher (but still modest) levels of employment as the price of obtaining a more efficient and growth-prone economy. Paish's was an implicit stick theory of technological change with the more intense competition that would ensue when there was some slack in the economy causing more rapid technological change.[11] The Keynesians relied on a carrot theory that the buoyant profits associated with a high level of aggregate demand would provide both the funds and the incentive to invest in growth creating investment. Also they argued that because prices and wages were sticky in the downward direction, necessary adjustments in *relative prices* would be more easily accomplished in the contexts of a gently rising price level, where no *money price* would actually have to be reduced. The important point is that everyone then believed in a macroeconomic trade off. The economy could be managed such that national income could fluctuate over the cycle around various alternative average levels of income with consequent varying amounts of mild inflationary or deflationary pressures to which everyone would have become adjusted.

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[9] An essentialist argument is one in which everyone agrees as to what is being described but disagrees about what to call it. Let *B* be a full statement about a matter of interest such as in the text description of structural unemployment and A_1 and A_2 two different names for *B* so that for some A_1 = B and for others A_2 = *B*. As long as we agree that we are all talking about *B*, it does not matter whether it is referred to as A_1 or A_2. There is a danger, however, if either A_1 or A_2 have some meanings other than B, say *C* and that statements that are correct for *B* are assumed to apply to *C* by the incorrect linking of $B = A_2 = \mathbf{C}$.

[10] I have discussed this history in much more detail in Lipsey (1977 & 2000).

[11] As a PhD student and then staff member of the LSE in the 1950s, I heard these views debated at length in the various seminars, in particular Lionel Robbins then famous Wednesday seminar at which Frank Paish gave several presentations.

Enter Bill Phillips

In the early 1950s Phillips' main concern was to model the Keynesian theory that was being expounded in the universities in the latter 1940s. It is hard today to understand the world of economic theory of that period when explicit mathematical models of the economy were unknown to most economists, where graphical analysis was the main theoretical tool, and where verbal presentations of Keynesian theory were confused and confusing. Phillips great accomplishment with his machine was to present a working Keynesian circular flow model of the economy.[12] In his first major paper (Phillips 1954), he formalised the model and applied it to short run stabilisation policy. His purpose was to persuade Keynesians that the simple advice that stemmed from their static models: "raise aggregate demand when there is a positive GDP gap and lower it when there is a negative gap" was hopelessly naive for it took account neither of what alternative indicators were to be used in setting the "stabilisation policy" nor of the lags with which the policy would work. He showed that it mattered a lot whether the authorities responded to one or some combination of (i) the level of the gap, (ii) its rate of change and (iii) its cumulative past amount (which implicitly is done if the level of foreign exchange reserves is a target in a fixed exchange rate regime). In his second article (Phillips 1957), he used more complex and apparently more realistic lags, he became quite pessimistic about the ability to fine tuning to dampen rather than accentuate cyclical fluctuations.

Early Keynesian theories either explicitly or implicitly used the kinked, upward-racketing aggregate supply curve to relate the real part of the economy to the price level (referred to as the problem of closure). Below full-employment income, the price level was fixed so that fluctuations in desired expenditure caused fluctuations in income and employment. If desired expenditure exceeded full-employment income, prices would rise. The operation of the monetary adjustment mechanism would then shift the LM curve to the left, raising the interest rate and lowering desired real expenditure until it equalled full-employment output. Since the price level was rigid downwards, a further reduction in desired expenditure would lower income and employment at the new higher price level. This was the upward ratcheting, kinked, aggregate supply curve where the kink occurred at full-employment income and the perfectly elastic part was always at the current price level.

When Phillips built his first stabilisation models he was not content with that stylized behaviour and instead introduced what may be called a price Phillips curve that gave a negative relation between the GDP gap and the rate of price inflation: the larger the negative gap, the higher is excess demand and the more rapidly the price level rises.

Then, on the advice of his colleague Henry Phelps Brown, he obtained data for wage rates and unemployment in the United Kingdom going back as far as 1860 and discovered what looked like a stable relation between wage changes and the level of unemployment. It was in this form that the curve became famous. Phillips did not invent the trade off he merely gave a

[12] Professor Colin Harbury writes: "As a student at LSE in 1947-50 I remember clearly Bill Phillip's demonstrations. We poor students had been almost forced to read the enigmatic papers in the Economic Journal by Keynes and Robertson who argued bitterly about the determinants of the key variable, the rate of interest. Robertson posted the 'classical' view that the rate was determined by savings and investment; Keynes that the supply and demand for money were its determinants. The proof provided by the water machine was so simple. It rested on understanding the difference between stocks and flows in economic theory. Looking at the machine you could *actually see* the rate of interest, measured by the height of water in a tank, being affected by *both* its size and the volume of water (*stocks*)as well as by *flows* of water into and out of the tank."

quantitative estimate to a relation that most economist of the time took for granted but probably in more fuzzy terms as a band rather than as a precise curve.

The curve aroused great hostility. The Keynesian establishment at Cambridge, Joan Robinson and Richard Khan, among others, rejected the curve completely. Nicholas Kaldor, when he finally came to accept the existence of the correlation, gave it an alternative explanation.[13] Unfortunately, these economists never put their objections into writing so we cannot be sure about the reasons for their rejection. Others accepted the curve but challenged its position. The main concern here was that Phillips' estimate that 2½% unemployment was all that was required to achieve price stability would make the policy of raising *U* to control the current inflation look attractive to Conservatives.

Beginning in the late 1950s, a simple form of the Phillips curve slowly replaced the kinked aggregate supply curve as the preferred U.K. method of closures. To do this, one needed to transform the Philips curve from "wage-adjustment/unemployment" space in which it became famous to the "income/price-adjustment" space, which is where Phillips located it in his early papers. The transformation is trivial under the following circumstances: unemployment is assumed to be a function of national income; the rate of productivity growth is assumed to be exogenous; and money wages rise at a rate equal to productivity growth plus a demand component that is proportional to the difference between actual and "full employment income". Prices are determined by a mark up on wages and other costs which are dominated by import costs. The simplicity of this transformation may explain why it was so seldom expressed formally. The $\dot{P}/Y$ Phillips curve then determined how fast the price level changed and hence how fast the LM curve shifted when the current positions of the IS and LM curves created either an inflationary or deflationary gap.[14] (Dots over variables stand for percentage rates of change.)

Phillips himself never talked of his curve as revealing a long run policy trade off. The only policy statement in his article was that, assuming the existing UK experience of wage changes, stable prices were consistent with about 2½ % unemployment, at which level wages would be rising about as fast as productivity. This statement is, of course, equally consistent with the belief either that the Phillips curve described long run policy alternatives or that is was only a short run phenomenon that gave fluctuations around a vertical long run Phillips curve located at the U^N.

Although many Keynesian economists used some form of the Phillips curve to close their models, we have earlier noted that many others including most of the Keynesian establishment at Cambridge England did not accept it. Thus to say, as Lucas and Sargent did (1978:56) that "a key element in any Keynesian model is a 'tradeoff' between inflation and output" was just wrong. There is no way that the Phillips curve was part of the Keynesian core ─ to suggest otherwise at Cambridge England in the late 1950s or 1960s would have invoked derision from those who regarded themselves as the upholders of the Keynesian tradition.

Stagflation and the New Classical Economics

According to the orthodox New Classical macro economists' view, the 1970s provided the decisive test of Keynesian macro economics. Lucas and Sargent spoke of "the spectacular

[13] An explanation that Lipsey and Steuer(1961) tested empirically and rejected.

[14] This form of the Philips curve closure of the IS-LM model is laid out, among other places, in Lipsey (1977).

failure of the Keynesian models in the 1970s" (1978: 54) and asked what could be salvaged from the "wreckage". Whatever else, there was no doubt in these author's minds that irretrievably burred in the wreckage was the Phillips curve.

In fact, the stagflation of the later part of the 1970s and early 1980s resulted from a supply shock that raised prices but lowered unemployment. This seemed a mystery to all contemporary observers, whether Keynesians or Friedman-style monetarists, since neither of these then-competing theories predicted the coexistence over several periods of high and rising inflation and high and rising unemployment.

This stagflation was, however, soon explained within the corpus of Keynesian economics by emphasising supply as well as demand. Also the Phillips curve was maintained as a short run adjustment equation by adding a price expectations term to produce what came to be called an 'expectations-augmented Phillips curve'. For text book treatments, the equations of the IS an LM curves were combined into an equation defining the so-called aggregate demand curve. Together with a new short run aggregate supply curve, these determined the short run values of the price level and income. If the resulting income and employment deviated from the U^N, and its associated level of income, Y*, the Phillips curve determined how fast prices rose in the case of a negative GDP gap and fell in the face of a positive one. Since the Phillips curve was expectations augmented, no level of Y other than Y* could be sustained in the long run without an accelerating inflation or deflation. But the Phillips curve was not necessary for this model. All that was needed was (1) that price inflation was the sum of expected inflation and a demand component that made prices rise in the face of a negative gap and fall in the face of a positive one, how fast being determined in any one of many possible ways and (2) that expected inflation was an increasing function of actual inflation.

In this model, supply shocks such as the first and second OPEC shocks were shown by an upward shift in the AS curve that produced a stagflation. Given that prices tended to fall in the face of a positive output gap, this would eventually be self-correcting as the fall in the price level raised the real money supply thus shifting the AD curve slowly right and eventually restoring Y* and the U^N. But because the downward adjustment of prices was assumed to be slow, policy intervention in the form of a monetary expansion might speed up the adjustment process and so lower the cumulative loss of output during the adjustment period.

One may or may not like this analysis, but it is a travesty to say that Keynesian economics was decisively refuted by the experiences of the 1970s. First, many influential Keynesians of the old school continued to reject the Phillips curve altogether. Secondly, those who accepted the curve soon extended the Keynesian model to explain the anomalous observations of the 1970s and to yield new predictions about supply side shocks. (This is behaviour that Imre Lakatos uses to identify what he calls a progressive research program.) Otto Eckstein's book *Core Inflation* (1981) laid out this model in detail and showed that it could fit the data. The analysis of stagflation in terms of an AD and AS curve soon found its way into the text books, the first two being Baumol and Blinder (1979) and Lipsey and Steiner (1981)[15]. That explanation is still there in the macro part of introductory text book and in the short run section of many more advanced macro texts. So much for the "wreckage".

[15] Normal publication lags and the differences in these two presentations support the view that this two treatments were written independently of each other.

The Surprises-Only Aggregate Supply Curve and Policy Ineffectiveness

No one doubts today that if an inflation persists, agents will come to expect it and adapt to it ─ the more fully the longer it persists. But from that acceptance it is a long jump to the proposition that agents can have rational expectations about the future behaviour of the economy. When, as is so often the case, economists have major disagreements about such behaviour, why do some of those same economists assume that other agents know more than they do. Not only do evolutionary economists argue that agents lack such super human divining power, they argue that in an evolutionary growth context disturbances are generated by non-stationary processes that not even experts can reverse engineer to discover their full nature.

According to New Classical economics, agents have rational expectations and so can anticipate the effects of any policy shock. As a result, a publicly announced and widely understood monetary expansion should be met by a rapid jump to the new long run equilibrium with an altered price level but no changes in the real economy. This gives rise to the surprises-only aggregate supply curve whose name is associated with Robert Lucas but that can be traced back at least as far as Milton Friedman and Edmund Phelps.

Criticisms from within neo-classical economics

Akerlof (2001: 372-5) offers some cogent reasons for doubting this policy ineffectiveness theory. While not disagreeing with his arguments I offer here some additional reasons for rejecting this theory.

Anticipated once-for-all vs continual: In his Nobel address, Friedman (1977:456) stated that: "Only surprises matter. If everyone anticipated that prices would rise at, say, 20 percent a year, then this anticipation would be embodied in future wage (and other) contracts..." He then goes on to contrast that with unanticipated changes that can have real effects in the short term. But this dichotomy is too simple. We need to distinguish between (i) changes that have been going on for a long time and are fully anticipated, (ii) once-for-all changes that are anticipated, and (iii) changes that are unanticipated. It is that middle category that is important for much monetary policy since such policy often consists of ad hoc reactions to evolving situations. If a modest inflation goes on long enough, everyone will adjust to it and it will no longer have major real effects. In contrast, surprises can have real effects. But what about the middle ground? A publicly announced and well understood *ad hoc* cut in interest rates designed to increase the high powered money supply does not come under either of the extremes (i) and (iii) mentioned above.

The argument that a once-for-all change in monetary policy has no real effects might make sense if the new money, let us say it is a 10% increase, were distributed in proportion to the amounts held by existing holders. In practice, however, a new money supply is fed into the system by the central bank selling short term securities to drive down the short term interest rate and increase the high powered money supply in the hands of the commercial banks. These banks then increase lending to their customers. This increases demand, not in equal proportion everywhere, but, in the first instance to those who sell to those who receive the new loans. If those who initially encounter this increase in demand merely say to themselves: "the price level will eventually rise by 10% so I will raise my prices by 10% now" this is not profit maximizing behaviour. Profit maximization dictates that those who first gain an increase in the demand for their products should raise output (and possibly prices) even if they know that eventually the prices of everything else will rise and they will be induced to go back to their original level of

output at a 10% higher price. So signals need not be misread. All that is needed is that the monetary impulse takes time to work itself through the economy ─ and no one has ever identified a real economy where this is not so. As Milton Freedman long ago observed, it takes up to 18 months on average for such an impulse to work its way through the economy and this happens with different lags in each monetary expansion since the initial impact of cheaper money will be vary depending on the economy's micro characteristics each time a monetary expansion occurs.

Absolute prices are all that matter for profit maximizing firms: In his Nobel address Friedman (1977) is clear in one place that labour seeking to estimate their real wage over the next period needs much more information than firms do when seeking to decide on their best output. Labour needs to estimate "... the purchasing power of wages not over the particular good they produce but over all goods in general." (547), while a firm needs to estimate the "...real wage that matters to him [which] is the wage in terms of the price of his product..." (457-8). The current values of these variables are readily available to firms and their knowledge of the relevant markets puts them in a much better position to estimate the near future course of these variables than someone who is trying to estimate all prices. At other places in his address, Freedman slips into the position that most subsequent new-classical theorists expounded, that the firm needs to know the full set of relative prices of its products compared to all others: "the relevant information [for all agents] is about relative prices of one product relative to another..."(467). This slight of hand shifts attention from what really matters to firms (absolute prices of their outputs and inputs), to what does not matter, relative prices of all the economy's outputs. It is characteristic of how the New Classical economists shifted emphasis from what it is easy for firms to know to what it is difficult for them to know, hence allowing them to misinterpret the price signals that they see.

Part of the reason for getting away with this slight of hand was that New Classical economics shifted the goods-market focus from the Keynesian assumption that it was dominated by oligopolistic firms to the assumption of perfect competition in a general equilibrium setting, which seemed to put the relative prices of products into the firm's behaviour functions. Indeed, the relative prices of products have appeared in GE market demand and supply functions ever since Walras' first formal statement of a GE model. But these functions are not meant to describe the behaviour of individual firms who actually respond to the money prices of their inputs and their outputs.

In the standard theory of the firm that has been taught since Alfred Marshall's day and is found in most microeconomics textbooks, all the information that each firms needs is the money prices of its inputs and its output. Since the input and output prices are all divided by the price level to make them real variables, the determination of the firm's profit-maximizing output is the same whether it is carried out in real or in nominal terms, and whether the actual or anticipated price level is used to calculate real values. Although the profit-maximizing firm needs to take into account its output price relative to its input prices, it need not be concerned with the prices of its products relative to the prices of all other products.

By making the correct maximizing behaviour of firms depend on a mass of knowledge external to their direct experience, namely the prices of all other products, the New Classical approach denies one of the fundamental advantages of the price system that has been emphasised for centuries: *a relatively efficient allocation of resources can be obtained when each agent acts in response to only a small amount of easily accessible information, all of which is within the*

agent's own experience. It seems to me that one of the great anomalies in the New Classical programme was between the errors-only explanation of variations in aggregate output and the received theory of the firm. In the former, each firm's action is in response to a misperception of relative product prices; in the latter, each firm only need know its own demand and cost curves, all defined in nominal prices, neither knowing nor caring about the prices of other products.

Criticisms from evolutionary economics

According to the evolutionary description of the economy, the system has no stable unique general equilibrium from which it departs only if agents make avoidable mistakes. Instead, agents are, as already stated, groping into an uncertain future in a profit oriented but not profit maximizing manner. No one knows who will win out in the next round of long haul commercial jets, Boeing or Airbus, or if it will be a draw, or if some other firm will out-compete them both. No one knows what the future course of oil prices will be and how much effect those prices will have on the overall level and details of economic activity. No one knows what the oil producers will do with the unimaginable wealth that will accrue to them as the price of oil rises towards $200 a barrel ─ so that one week's profits would allow Saudi Arabia to buy the largest of U.S. multinationals. No one knows how fast and with what new energy sources fossil fuels will be replaced and which nation will be leader in the development of more environmentally friendly fuels. No one knows when the next GPT-generated secular boom will occur; indeed, economists are divided as to whether or not such technologically generated (not RBC) secular booms and slumps even exist. This and many other key bits of knowledge are not just unavailable now; they are unknowable because the economy is evolving under conditions of uncertainty. Also economists are not even sure what publicly available statistics really tell us. For example, does TFP measure the overall volume of technological change, as some believe[16], or does it merely measure some of the externalities associated (but not necessarily tightly) with such change, as others argue?[17]

So to evolutionary economists those agents who can foresee the course of some once-for-all announced monetary shock and react to it by changing real variables under their control only if they make mistakes are figments of theorists imagination. This imagined behaviour has, they argue, no relation to what is found in the ever-changing world in which we live and where it is impossible to know even the impact effects of each and every policy shock, even purely monetary ones. Furthermore, no one can be as sure of the final result of a policy shock in the way that theorists can know when manipulating a model with a stationary equilibrium.

New Keynesian Economics

Throughout the late 1970s and 1980s research continued on what came to be called the new Keynesian economics. Studies of the labour market showed many reasons why they did not clear. As Hall said in his 1980 review, "There is no point any longer in pretending that the labour market is an auction market cleared by the observed average hourly wage. In an extreme case,

[16] See for example, the discussion in Mankiw and Scarth (2001:554-5)

[17] As argued by numerous investigators starting with Jorgenson and Griliches (1967), TFP measures at best the externalities associated with technological change and not the amount of change itself. In the limit, there can be massive technological change but no measurable externalities and hence zero changes in TFP. For elaboration see Lipsey and Carlaw (2004).

wages are just instalment payments on a long-term debt and reveal essentially nothing about the current state of the market.".

Those in the new Keynesian tradition went on to develop models in which Philips curve relations were implicit in such behaviour as lagged reactions of prices and wages. They often referred to the single Phillips curve that related wage changes only to aggregate unemployment and expected prices as the "naive curve" and to their relations as being less so because the reaction of wages and prices to changes in *Y* and *U* depended on the behaviour of the entire model. This is not surprising. When a simple highly aggregated model in the IS-LM tradition is used, there is only room for the simple "naive" curve. But when a more disaggregated model is specified, the reaction must depend on how the whole adjustment process works out.

Others working in the new field of incomplete information developed what they came to call a new paradigm in economics.[18] They rejected the neoclassical competitive, market-clearing model of the economy and replaced it with theories that offered explanations of, among other things, the existence of involuntarily unemployment, the efficacy of monetary policy, and the failure of defilations to accelerate when unemployment is high.[19] Central to this new view was the broadly understood theory of efficiency wages, which analysed many reasons why the labour market does not respond precisely and quickly to market signals..

IV. DID KEYNESIAN ECONOMICS REALLY DIE?

Keynesians always intended their theories mainly to cover the short run because they believed than the long run adjustments took too long to be of interest to policy makers. It seems clear that for short run analysis of policy, Keynesian economics never died. What is the evidence of this assertion?

1. Most models used by Finance Departments and Central Banks use Keynesian-style income flow models with some important and valuable alterations clearly influenced by more modern research. In particular, the simple Keynesian propensity to consume is replaced by sophisticated relations based on theories of households' maximizing decisions. The models all contain either explicit Phillips curve relations in the form of wage adjustment equations or implicit Phillips-style relations that can be teased from the more complex forms of relations but which all imply that monetary impulses take time to work through the system due to various lags and that the speed of adjustment is to some extent related to the magnitude of the output gap.
2. Most first year text books use some variant of an IS-LM model plus some form of an expectations-augmented a Phillips curve to introduce macro economics with little mention of new-classical type models.[20] More advanced books such as Mankiw and Scarth (2001) use New Classical models, including real business cycle theories, to

[18] See in particular the 2001 Nobel prize lectures of George Akerlof, Michael Spence and Joseph Stiglitz.

[19] This is a part of Akerlof's full list.

[20] When preparing each U.K., Canadian and U.S. editions of my first year text books, I enquire of reviewers if I should also cover the New Classical macro economics that is found in most intermediate macro books and am told "no, students need to be introduced to these Keynesian income flow models first."

study long run behaviour and Keynesian style models for the short run, justifying the latter on the grounds that prices are "sticky".

3. Most central banks, in spite of long standing advice from old fashioned monetarists and New Classical economists, regard monetary policy as a tool for influencing national income and employment as well as the price level. What has changed since the early days of Keynesian economics is that the price level is taken as the main goal of monetary policy, but when inflation is within some acceptable band, policy is also used in an attempt to alter the level or rate of change of the current output gap. Statements from the Bank of Canada, The Bank of England and the Federal Reserve System clearly show this dual concern.

4. Much policy discussion takes place in terms that would make sense to Keynesians or monetarists in the 1960s. For example, the policy reaction in the US to the sub-prime crisis has used progressive cuts in interest rates in an attempt to influence the real behaviour of the economy, not just the price level, while fiscal policy has been used in an attempt to stimulate expenditure. Interestingly, the discussion of the fiscal stimulus package stressed that the tax rebates were to be understood to be temporary. Friedman would have argued that this would not stimulate demand. Whether or not it does and whether or not it is large enough to matter much (almost certainly not), it is clear that these polices depended on analysis in which Keynesians would be at home while owing nothing to new-classical economics. Of course, it can be argued that this merely shows the lag between acceptance of new ideas by academics and by policy makers, but it is interesting that few if any economists publicly argued that monetary policy should not be used for such purposes or that fiscal policy was *per se* ineffective.

5. Much of the New Classical critiques of monetary policy were developed in models in which the monetary authorities followed explicit rules, which private agents could deduce and then react to. But much monetary and fiscal policy is *ad hoc*, taken in response to unexpected situations such as the sub prime mortgage crisis in the U.S. No one knew how the Fed or the Congress was going to react. Indeed both reactions were in doubt until the last moment as arguments waxed and waned about who would benefit and who would suffer from major interest rate cuts and bail outs of financial institutions. Furthermore, since professionals disagreed on the possible effects of both the fiscal and the monetary stimuluses, it does not seem reasonable to assume that private agents know any better.

V. THE INCREDIBLE VANISHING U^N

The existence of a unique long run equilibrium level of income, Y^*, and unemployment, the U^N, is an article of faith among many, probably most, economists. The tendency towards this equilibrium is established by the price adjustment mechanism in which the prices of all goods and services, including wages, rise when $Y > Y^*$ and fall when $Y < Y^*$.

I say it is an article of faith for the following reasons.

1. Even in the artificial world of Arrow Debreu general equilibrium theory, the existence of equilibrium requires a string of unreal assumptions, including that

positive amounts of each and every commodity are always consumed (demand curves never cut the axis) and that in all markets all future contingencies can be known and insured against.

2. The uniqueness of such an Arrow Debreu equilibrium has been shown to require even more restrictive assumptions.

3. The only existing general equilibrium models of the whole economy are those requiring perfect competition or Dixit-Stiglitz style monopolistic competition that uses the symmetry assumption that even Chamberlin long ago abandoned in his debates with Nicholas Kaldor. This assumption is that new entrants into a monopolistically competitive market take demand away equally from all existing firms or, in other words, that all monopolistically competitive goods of any one generic type are equally good substitutes for each other. There is no general equilibrium model of an economy that contains the mix of market structures found in the real world: (i) perfect competition, (ii) oligopoly, (iii) monopoly and (iv) monopolistic competition in which goods or any one generic type are spread out in characteristic space so that some are closer substitutes than others as, for example, two different fuel efficient compact cars are closer substitutes than are either one of them compared to a full size gas guzzler.[21] No one knows how a model of such an economy would behave out of long run equilibrium (even with technology assumed as exogenous). Would it have an equilibrium and, if so, if it would be unique?

4. As a result of the absence of a general equilibrium model that covers anything like the economy we know, there is no theory that predicts the existence of a unique U^N and what its value should be. It can only be estimated from empirical data and such estimates have given a value that has altered several times during the last several decades.

5. When Keynesians accepted the expectations augmented short term Phillips curve, they mostly accepted the assumption of a vertical long run curve located at a unique U^N. Some theory was developed to suggest that the U^N might not be independent of the path by which it was approached (hysteresis). But by and large few questioned that there was at any one time, one and only one level *Y* and *U* at which the inflation rate could remain constant over time (at any positive or negative rate to which agents were fully adjusted).[22]

Evolutionary theory has no equivalent concept since as was observed earlier there is no operational concept of either a static or a dynamic long run equilibrium in which agents wish to do the same thing next period as they are doing this period. In practice it is agreed that at least since the Industrial Revolutions of the late 18th and 19th centuries Western (and with 20th century globalization most of the rest of the world's economies) have been evolving more or less

[21] For a full analysis of the importance of this symmetry assumption see Eaton and Lipsey (1989).

[22] I made many of these points in Lipsey (1977). In particular I said (66 and 67): (1) "...to the best of my knowledge, however, no one has demonstrated existence and uniqueness [of an U^N which I there called U^N] in such an amended 'Walrasian" model [as Friedman alludes to in his presidential address of 1968]" and (2) "...the accelerationist hypothesis, must meet some formidable empirical objections...natural rate theorists cannot explain why the accelerating deflations predicted by their theories have not occurred, in spite of several quite long periods in which we clearly had $U > U^N$

continually under the impact of endogenously changing technologies ─ some minor, some major and a few revolutionary in the sense that GPTs are. Thus evolutionary economists argue that there is no reason in either theory or practice to believe that there is such a thing as a unique U^N.

Akerlof (2001:376-7) questions the existence of the U^N using an analogy from diet theory, which is not as far fetched as it might sound. I question it on other grounds concerning its unsupported assumptions about the behaviour of the labour market. A unique U^N requires a labour market that is highly sensitive to small variations in aggregate demand around the assumed U^N. Indeed, the economy must be poised on a razor's edge in that for levels of *U* higher than the U^N wages rates fall indefinitely and for lower levels of *U* they rise indefinitely. To see this, note that there cannot be a sustained inflation driven by rising prices and profits alone with labour costs held constant. If input prices are unchanged, profit margins can increase somewhat to allow for some increase in the price level not accompanied by increases in wage costs. But there is a limit to how much profits can rise as a result of rising prices with constant labour costs. So if levels of *U* below the U^N are to be associated with an ever rising and eventually accelerating price level, the level of wages *must* do more or less the same thing.[23]

New Keynesian theory explains why labour markets are not auction markets that respond sensitively to every variation in the demand for and the supply of labour. Evolutionary theory explains why such responses that do occur will vary with the current nature of technological change because the willingness of labour to press for wage increases that exceed the inflation rate will vary with the effects that technological changes are having on the structure of the demand for labour. If technological change is destroying higher wage jobs faster than they are being created and doing the reverse with lower wage jobs, as it was during most of the last 10-15 years, those who remain in higher wage jobs will be reluctant to press for wage increases lest they be the next ones to lose their jobs. In contrast, when technological change is creating high wage jobs faster than it is destroying them, labour will be confident and willing to push for higher wages whenever the labour market becomes relatively tight, as was the case during most of the period 1945-75. So the current state of the demand and supply for labour matters less in determining wage inflation than does the outlook for jobs in the near future as determined by current trends in technological change.[24]

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[23] The inability of inflation to be sustained by increases in profits alone is sufficient for our argument. But a little more theory might help to convince. Let firms have horizontal short run marginal cost curves as is attested by much theory and empirical evidence. Let firms be price makers faced with negatively sloped firm demand curves for their products, as are most producers of goods and services. Let wages be the only element of endogenous costs (all other inputs are imported). Let firms operate with possibly small but significant amounts of excess capacity (as firms typically do in order to meet unexpected alterations in demand). Let the economy be located at some assumed U^N and fully adjusted at the micro level to the associated amount of aggregate activity. Now let there be a demand shock generated by say a credit financed business expansion. The demand curves for the affected firms shift to the right and firms expand output to a new point further out on their short run marginal cost curves. At the new equilibrium, there is more output at the same prices but no tendency for a sustained inflation, let alone an accelerating one, *unless wage costs rise.* If we replace the assumption of flat marginal cost curves with a rising marginal cost curves, then there is a once-for-all increase in prices but no continuing demand induced inflation *unless labour costs begin to rise*.

[24] This theory can be formalized but in many ways that require a separate paper not just a paragraph here. The intuition of one of the many possible such formalizations is that if high paying jobs are being destroyed faster than they are being created and individuals are being selectively laid off, those who are lucky enough to still have such jobs can be seen as buying an increased chance of preserving them over a specific future period by forgoing wage increases that they might otherwise demand when output expands.

If there is a range of *Y* and *U* over which there is no tendency for wages to react to modest changes in demand, then the razor's edge of the natural rate no longer holds. Instead, there is a range of output consistent with stable wages. Within that range, labour can be fully adjusted to any existing modest inflation rate of say between 1% and 4%. Within that range, wages will be rising more or less in tandem with the price level and inflation will be stable, while output, employment and unemployment can be anywhere within that range. All that this requires is that wage rates are not tightly and negatively responsive to changes in the level of unemployment within some range of say two or three percentage points on either side of what might be estimated to be the natural rate.

The figures presented at the end of this paper show the recent unemployment-inflation performance of several countries but we have space only to consider Canada in any detail. The period 1980 to 1983 was the end of the recession that was initiated by the Bank of Canada's determination to break the entrenched inflation of the 1970s and 1980s. Then in the period 1984 to 1989 unemployment fell from 11 1/2% to 7 1/2% while inflation stayed within a very narrow band around 4%. Next, in the recession of the early 1990s, unemployment rose dramatically with inflation *rising* in 1991 and then falling in 1992 to well below the 4% band that had become the expected rate in the previous decade. From 1992 to 2000, inflation stayed within a narrow band around 2% while the economy expanded with *U* falling from 11 1/2% to below 7%. (The one exception was 1994 when inflation fell to almost zero.) Finally from 2000 to 2005 inflation continued to stay in the narrow band between 2 and 3 percent while the unemployment rate fluctuated between 6 ½ and 7 ½ percent.

These observations seem inconsistent with a natural rate theory that would have the inflation rate either accelerating or decelerating at *any* level of *U* other than the natural rate. Wherever the natural rate is assumed to be, it cannot have been achieved for more than a small number of years within this whole period when the actual rate varied between over 11% and under 7% while the inflation rate stayed within a narrow band first around 2- 4% without any observed tendency to accelerate or decelerate continuously.

The observations are, however, consistent with a combination of evolutionary and neo-Keynesian theory plus the assumption that agents hold realistic inflationary expectations. Evolutionary theory provides an explanation of why wages will respond differently at any given level of *Y* and *U* depending on what technological change is doing to the distribution of jobs with varying degrees of attractiveness. So according to these theories, during in the 1990s the expectation of high rates of inflation had been removed by the fierce action of the Bank of Canada. During the 1990s agents, including labour, developed an expected inflation rate of around 4% and that became a stable rate consistent with large range of *U* and *Y*. Then, when the Bank of Canada made it clear that it regarded 4% as too high for a long run target and monetary policy became consistent with a 2% rate, expectations quickly adjusted to that rate. Once again, the new rate became consistent with a wide range of unemployment rates rather than the one rate assumed in natural rate theory. Through that period, labour was adjusted to expected inflation rates first of 4% then of 2%. Wages rose to compensate for the inflation but did not respond strongly to any tightening of the labour market because the micro shifts were causing labour to be more concerned about losing good jobs than exploiting a tightening labour market by pushing for higher wages. There is no irrationality here. Just the prediction that labour will adjust to any rate of inflation that becomes engrained in expectations but may not respond to variations in

overall demand for labour if micro shifts in the structure of demand are threatening to replace "good" jobs with "bad" ones.[25]

It is important to note that evolutionary theory does not predict that such docile labour markets will always exist. For example, in the secular boom that followed the second world war, technological change was creating high paying jobs faster than they were being destroyed and labour was confident enough to press for higher wages whenever labour markets tightened. But in the late 1990s and 2000s things were entirely different as technological change created a widening of the income distribution with more very high and more modest incomes than had existed in the immediate post war period. So the message of evolutionary theory is that to predict inflationary pressures as the economy fluctuates from year to year within the context of a stable monetary policy, one needs to know (as well as such potent cost push variables as import and energy prices) the dynamic impact on labour markets that is being exerted by current technological change.

Akerlov, Dickens and Perry (2000) go even further and suggest the existence of a long term trade off between inflation and unemployment. They use the old Keynesian argument about it being easier to adjust relative wages in a mild inflationary context than in one of relatively stable prices because of the (rational) resistance to cuts in money wages. So when inflation is high enough the relative wage adjustments that are needed for a relatively well functioning labour market can be accomplished with no cuts in anyone's money wages. Unemployment will then be lower than when all of the necessary adjustments cannot be made quickly and easily because the inflation rate is so low that cuts in some money wages are needed.

So we may be back to the pre-Phillips curve world of Frank Paish and his Keynesian contemporaries where the behaviour of the economy was assumed to be compatible with a range of more or less fully anticipated inflation rates combined with a wide range of unemployment rates. We may even be back, if Akerlof et al are right, to one of a long run trade off. In either case, it has been a long journey but one in which much has been learned, even if as an overall judgments on inflation and unemployment we are back to where we were in 1950! Well not quite back there, since evolutionary theory tells us that much depends on the nature of current technological changes. In some technological regimes, such as those of 1945-75, wages will be responsive to variations in the tightness of labour markets and something like a short run Phillips curve will exist. In under other regimes, such as the one that has existed for the last decade or so, labour markets will not be responsive, and a wide range of Y and U will be compatible with a stable inflation rate (with the existence of a long run trade off still open to question).

END OF TEXT

[25] Akerlof, Dickens and Perry (2000) have argued this same point by developing a theory that when inflation is low, future anticipated changes in the price level are ignored in wage bargaining. But because wages have more or less followed the price level in the period under consideration, I prefer the explanation that labor becomes adjusted to the steady inflation rate and takes it into account without much thought, while it is not sensitive to variations in aggregate demand for the reasons associated with the nature of current technological changes, as argued in the text.

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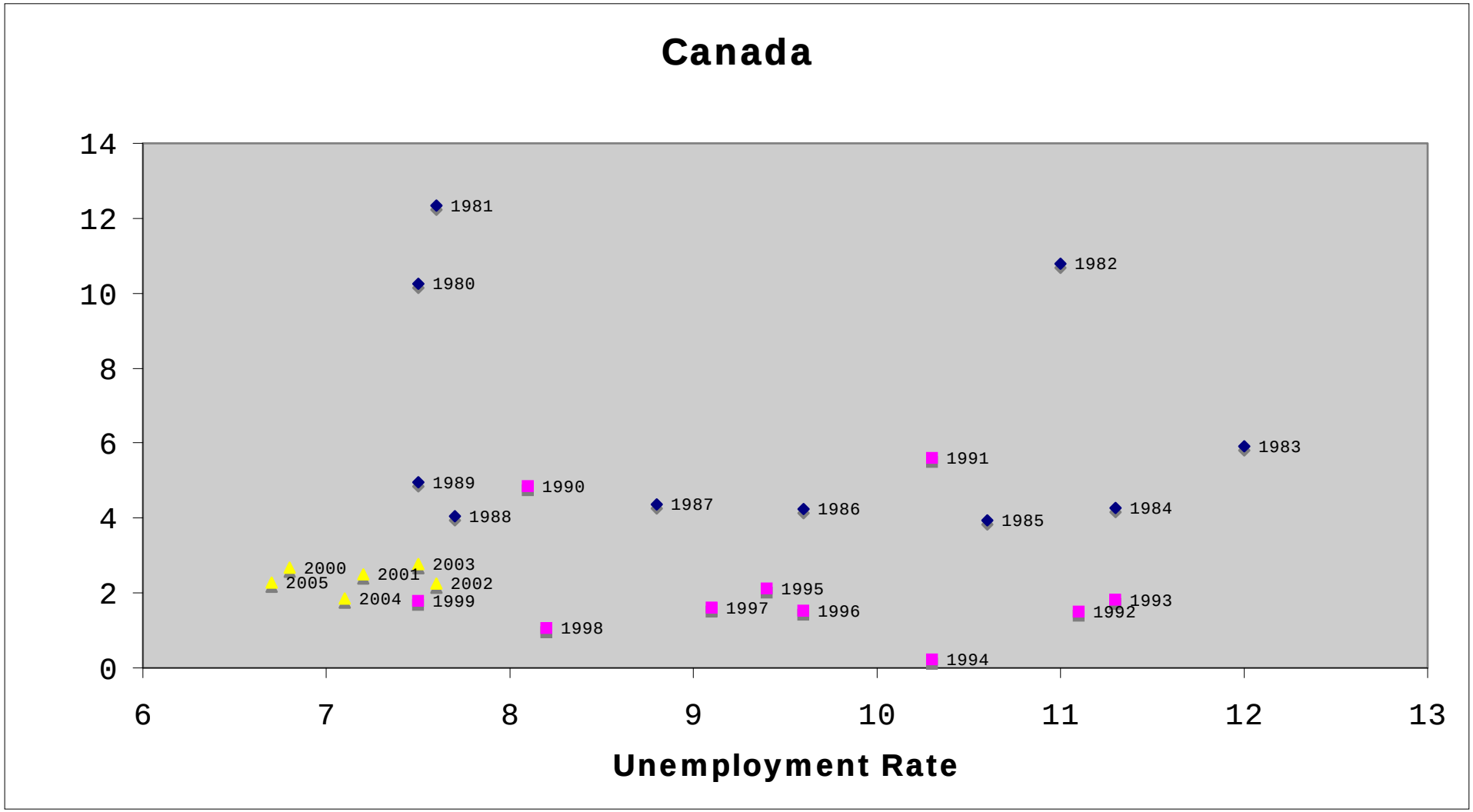
Figures Plotting Annual Percent Unemployment Against Annual Rate of Inflation (CPI)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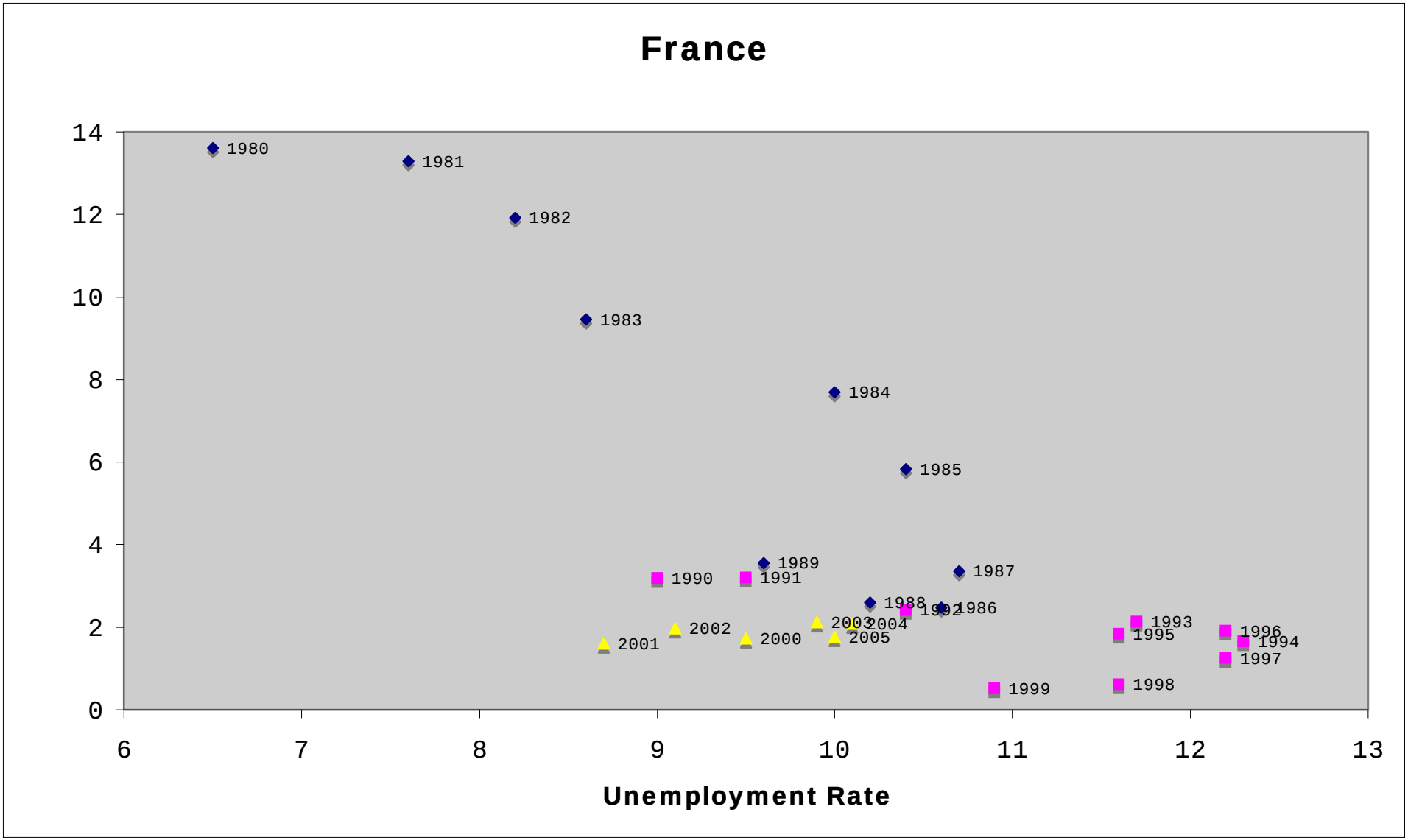
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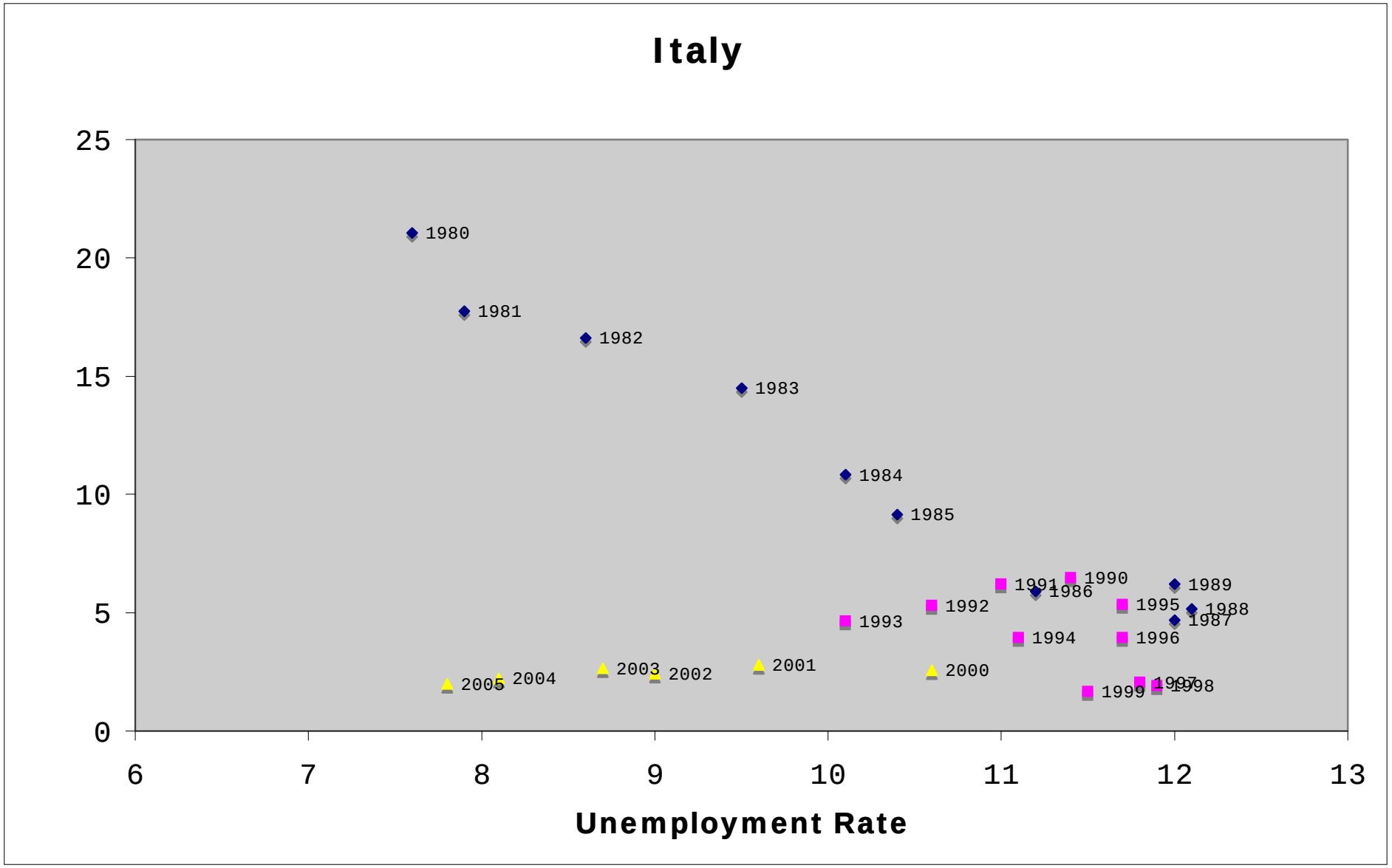
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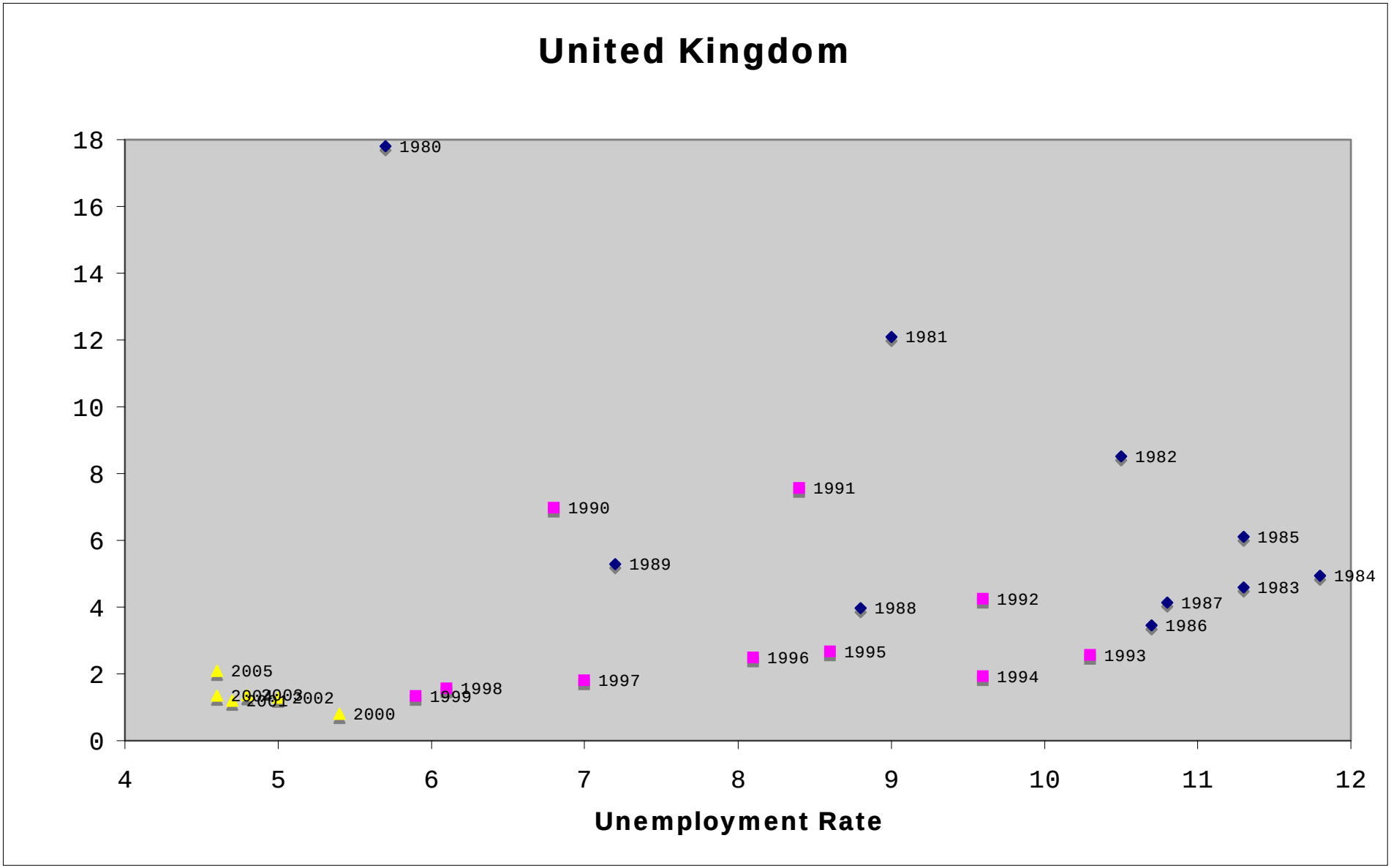
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