

The History of Macroeconomics from Keynes's *General Theory* to the Present

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The History of Macroeconomics from Keynes's *General Theory* to the Present

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Abstract

This paper is a contribution to the forthcoming Edward Elgar *Handbook of the History of Economic Analysis* volume edited by Gilbert Faccarello and Heinz Kurz. Its aim is to introduce the reader to the main episodes that have marked the course of modern macroeconomics: its emergence after the publication of Keynes's *General Theory*, the heydays of Keynesian macroeconomics based on the IS-LM model, disequilibrium and non-Walrasian equilibrium modelling, the invention of the natural rate of unemployment notion, the new classical attack against Keynesian macroeconomics, the first wave of new Keynesian models, real business cycle modelling and, finally, the second wave of new Keynesian models, i.e. DSGE models. A main thrust of the paper is the contrast we draw between Keynesian macroeconomics and stochastic dynamic general equilibrium macroeconomics. We hope that our paper will be useful for teachers of macroeconomics wishing to complement their technical material with a historical addendum.

Keywords: Keynes, Lucas, IS-LM model, DSGE models

JEL classification: B 22, E 10, E 20, E 30

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Introduction

Our aim in this paper is to introduce the reader to the main episodes that have marked the course of macroeconomics. We start by explaining the emergence of modern macroeconomics as a new sub-discipline arising in the aftermath of John Maynard Keynes's *General Theory*. Next, we discuss Keynesian macroeconomics, which had its heyday in the 1950s and 1960s. At the end of the 1960s, it came under attack, first from Milton Friedman and later, in a more radical way, from Robert Lucas and his associates such as Robert Barro, Thomas Sargent and Neil Wallace. These economists, new classical macroeconomists as they were called at the time, were able to dethrone Keynesian macroeconomics in a move that had all the trappings of a scientific revolution. In turn, Lucas's work triggered the rise of a series of new Keynesian models aimed at rebutting his claim, while adopting his neoclassical language. The next stage of the history of macroeconomics occurred when the baton was passed from new classical to real-business-cycle (RBC) theorists, in a move initiated by Finn Kydland and Edward Prescott. These economists transformed Lucas's qualitative model into a quantitative research programme into which they enrolled a large chunk of the macroeconomic profession. The latest stage in the history of macroeconomics is the internal evolution of RBC models towards dynamic-stochastic general equilibrium (DSGE) modelling, whereby central elements of Keynesian macroeconomics, in particular monopolistic competition and sluggishness, are reintroduced into the real business cycle framework.¹

In this entry, we shall only devote a small amount of space to the content of the *General Theory* since this is fully covered in another entry. We will also neglect macroeconomics as it existed before Keynes under the name of monetary theory (on this subject, we refer the reader to Laidler (1999) or Dimand (2008)). In addition, our study is limited to mainstream macroeconomics (for a study of non-mainstream approaches, the reader may consult King (2002) or Fine and Milonakis (2008)).

The emergence of modern macroeconomics

Without the Great Depression, Keynes's *The General Theory of Employment, Interest and Money* (1936) would not have seen the light of day. Keynes's aim in writing this book was to elucidate the causes of the mass unemployment that affected all major economies at that time, and to suggest policy measures that could be taken to solve the problem. This was a time of great disarray with no remedy at hand to fix the ailing economic system. In most countries, the unemployment rate was soaring and deflationary policies had failed. There was little room in economic theory for unemployment. The notion of frictional unemployment had started to be evoked but it had little theoretical content (see Batyra and De Vroey 2011). So, faced with

¹ While usually applied to this last generation of models, the DSGE label can equally be applied to the entire stream of modelling initiated by Lucas.

the looming presence of the Great Depression, Keynes realised that monetary theory was blatantly wanting, and needed to be reformed.

The *General Theory* is a complex book, intertwining different types of arguments developed at distinct levels of abstraction. Most commentators agree that Keynes's aim in the book was to demonstrate the theoretical existence of involuntary unemployment. This, he recognised, was a phenomenon whose real-world existence was compelling, yet for which economic theory had, at that time, no room. The line he took to fill this lacuna was to state that involuntary unemployment resulted from a deficiency in aggregate demand, itself the result of insufficient investment.

Keynes's book got an enthusiastic reception, especially from young economists. Dissatisfied with the existing situation, they were crying out for a new theory that would justify abandoning the laissez-faire doctrine, and Keynes's work delivered. As Axel Leijonhufvud said, it was received as a "liberating revelation" (1968, p. 31). Dissenting views, focusing on the shortcomings of Keynes's reasoning, were expressed, but the pressure to produce a new theoretical framework that might account for the obvious dysfunctions in the market system was such that they were hardly listened to. Nevertheless, confusion over the central message of Keynes's book was great, even amongst his admirers.

Progress (although some readers of the *General Theory* may consider it a step backwards) occurred when a session of the Econometric Society Conference was devoted to the book. James Meade (1937), Roy Harrod (1937) and John Hicks (1937) gave three separate papers aiming at bringing out the gist of Keynes's book (see Young, 1987). All three took as their first task the reconstruction of the classical model in order to assess whether Keynes's claim that his model was more general than the classical one was sustainable. They all concluded that it was not. Although their interpretations were rather similar, one of them, Hicks's piece, was to have an extraordinary future, containing as it did the first version of what was to become the IS-LM model. In order to compare Keynes's views with those of classical economics, Hicks transformed Keynes's verbal presentation into a simple system of simultaneous equations. He also introduced an ingenious graph allowing the joint outcome of two different markets to be represented on a single diagram. The IS-LM model became the workhorse of Keynesian macroeconomics, to the point that one wonders what would have become of the *General Theory* had Hicks's interpretation never appeared.

The third and final stage in the emergence of macroeconomics consisted of transforming qualitative models into empirically testable ones. One person who played an important role in this respect is Jan Tinbergen. Like Keynes, he was a reformer, motivated by the desire to understand the Great Depression and to develop policies that would prevent it happening again. Tinbergen's (1939) League of Nations study of business fluctuations in the US from 1919 to 1932 can be pinpointed as the first econometric model bearing on a whole economy.

All in all, Keynes was dismissive of Tinbergen's work, as he was of the opinion that little was to be gained from trying to test theoretical models empirically. Too much arbitrariness was involved in such an exercise, Keynes argued (see Bateman (1990) and Garrone and Marchionatti (2004)). Keynes's reservations were to no avail. Lawrence Klein was of the view that the *General Theory* 'cried out for empirical verification', and under his influence a second wave of model construction began. In 1950, Klein published *Economic Fluctuations in the United States 1921-1941*, for the Cowles Commission. The main impetus, however, came from Klein and Goldberger's 1955 monograph, *An Econometric Model of the United States 1929-1952*, which introduced the celebrated Klein-Goldberger model.

This is how macroeconomics came into existence as a new sub-discipline of economics. It soon thrived. The offspring of the Great Depression, its overarching aim was to highlight market failures that could be remedied by state action. So, from the onset, it had a decidedly reformist flavour. Unemployment — and in particular involuntary unemployment — was its defining element.

The heydays of Keynesian macroeconomics

From the 1950s onwards, Keynesian macroeconomics established itself as a new sub-discipline of economics. It was taken up both in universities and in public institutions such as central banks. Modified by Franco Modigliani (1944) and popularised by Alvin Hansen (1953), the IS-LM model becomes its baseline tool. This model comprises two distinct sub-models, the Keynesian and the classical system. Hence, strictly speaking, it should not be considered Keynesian. But at the time of its dominance, most economists were convinced that the Keynesian variant corresponded to reality while the classical system was viewed as a foil.

One shortcoming of the elementary IS-LM model was its fixed prices assumption. The Phillips curve, drawn from Bill Phillips's study of the relationship between changes in wages and unemployment in the UK from 1861 to 1957 (Phillips 1958), did the job. It quickly found its place in the macroeconomic corpus. The fact that it was based on a solid empirical relationship, valid over a long period, was viewed as an advantage. Moreover, it had a Keynesian flavour since it incorporated the idea of a wage floor. An additional step taken by Paul Samuelson and Robert Solow (1960) was to suggest that the Phillips curve pointed to the possibility of a trade off between inflation and unemployment — that is, government could 'buy' a decrease in the level of unemployment by accepting an increase in the inflation rate.

The most impressive progress took place on the empirical side. As already noted, the appearance of the Klein-Goldberger model prompted the development of a new large-scale research programme. A model of an average size, in its first version it comprised 15 structural equations and 5 identities. The objective was, first, to make predictions about economic

activity, and, second, to simulate the effects of alternative policy measures. Klein has always insisted that its inspiration came from the IS-LM model. But significant transformations were needed. Above all, the static character of the initial model had to be replaced with a dynamic framework. Capital accumulation and technical progress had to be introduced. Some price and wage adjustments were also introduced, although only on a limited scale, so that states of general excess supply were always present. As a result, the models always encapsulated the economy as being in a Keynesian state (Deleau, Malgrange and Muet (1984)). Nonetheless the general architecture remained loose enough to allow a quasi-unlimited diversity of specifications. The hallmark of these models was their pragmatism. When it came to introducing additional specifications, this usually resulted from observations about reality rather than from theoretical considerations.

The next important stepping-stone was the Brookings model, which appeared in the middle of the 1960s. Its size was impressive, comprising close to 400 equations — at the time the view that the more complex a model, the better, prevailed! This development would of course have been impossible without the expansion of the computer industry. Supported by a wide consensus, these models reigned over the economic profession well beyond the dismissal of Keynesian theoretical macroeconomics.

The success of the IS-LM model cannot be due to mere luck. It has two main virtues. The first is its ability to model economic interdependence in a simple and intuitive way. In this respect the IS-LM approach is unrivalled. Even in its most elementary form, it lends itself to drawing cogent real-world inferences. The second main virtue of the IS-LM model is its plasticity. It constitutes an architecture that is general enough to allow a more-or-less unlimited diversity of specifications. This plasticity also extends to policy implications, since friends and foes of Keynesian policy alike can use it to promote or refute policy prescriptions.

But the IS-LM model also has important shortcomings. First among these is its conceptual sloppiness. Macroeconomists never bothered to define the central notions of their paradigm, in particular involuntary unemployment and full employment, in any precise way. While Keynes himself liked to reason in terms of agents making choices, this microfoundational dimension received little emphasis. The initial IS-LM model was static and little attention was given to expectations. Later on, this state of affairs was slightly improved by taking the variables' past and present values as a proxy for expectations. The ability to capture the interdependence across sectors of the economy that characterised the elementary model was generally not transposed into empirical econometric models, which were therefore nothing more than half-baked general equilibrium models. Last but not least, the IS-LM model has been unable to achieve the proclaimed aim of Keynesian theory, to explain involuntary unemployment as a systemic market failure.

For some twenty-five years after the end of the Second World War, the IS-LM model dominated macroeconomics. With the advent of new classical macroeconomics in the early 1970s that dominance was at first challenged and then broken. Yet the IS-LM model still lives on. While no longer central to the graduate training of most macroeconomists or to cutting-edge macroeconomic research, it continues to be a mainstay of undergraduate textbooks, finds wide application in areas of applied macroeconomics away from the front lines of macroeconomic theory, and, until the last decade, remained at the conceptual core of most government and central banks macroeconomic models.

Disequilibrium and non-Walrasian equilibrium modelling

While the IS-LM model with its pragmatic spirit dominated macroeconomics, some economists were nonetheless of the opinion that macroeconomics needed a stronger microfoundational anchor. The main names to be evoked here are those of Don Patinkin, Robert Clower and Leijonhufvud. Patinkin devoted two chapters of his book, *Money, Interest and Prices* ([1956], 1965) to casting Keynesian theory in a Walrasian framework, arguing that the only way in which involuntary unemployment could be introduced into a general equilibrium framework was by assuming that it was confined to the period of adjustment towards equilibrium. Clower ([1965], 1984), for his part, wrote an influential article introducing the ‘dual decision hypothesis’, which he viewed as a new way of understanding Keynes’s assumption that consumption is a function of income. According to this hypothesis, if labour suppliers happen to be rationed in the labour market, when participating in the goods market they will express a constrained (or ‘effective’) demand that is lower than their ‘notional’ (i.e. Walrasian) demand. As to Leijonhufvud (1968), he criticised traditional Keynesian macroeconomics for having lost the main message of the *General Theory*. To him, the “Keynesian Revolution got off on the wrong track and continued on it” (1968, p. 388). Keynes’s theory, he claimed, was different and richer from its IS-LM transmogrification; hence the need for a return to it. Moreover, while most of the interpreters of *The General Theory* have ended up viewing it as mingling incompatible theoretical claims, in contrast, Leijonhufvud strove to show that the various components of the *General Theory* were all pieces of a single jigsaw puzzle. Brilliantly written, his book was an instant, and well-deserved success. Both the depth of Leijonhufvud’s insights and his mastery of the intricacies of Keynes’s argumentation were impressive. To Leijonhufvud, the central message of the *General Theory* was that the market system could fall prey to a failure of intertemporal coordination, an inability of the rate of interest to coordinate saving and investment, and that this was further compounded by the absence of any signal allowing this state of affairs to be detected. Clower soon joined forces with Leijonhufvud to propose a Marshallian general

equilibrium approach focusing on the equilibrating process rather than the end state of the economy.

In the next stage, these pioneering works triggered ‘non-Walrasian equilibrium’ models associated with the names of Robert Barro and Herschel Grossman (1971,1977), Jean-Pascal Benassy (1975), Jacques Drèze (1975) and Edmond Malinvaud (1977). Their aim was the same as that of their disequilibrium predecessors, i.e. to vindicate Keynes’s insight that the market system could experience market failures. However, they wanted to produce rigorous mathematical demonstrations of this point and they wanted their model to describe situations where agents were behaving in an optimising way (although under special constraints). Therefore the change in label from ‘disequilibrium’ to ‘non-Walrasian equilibrium’ theory was anything but trivial.

After an enthusiastic beginning, the new approach subsided. While the pioneering articles succeeded in setting out a new framework, it seemed that there was no precise vision about what to do next, no specific research programme able to mobilise a wider group of economists. Many of the young researchers who started their career in this line of research soon moved to other areas. However, the main reason for the downfall of non-Walrasian equilibrium models ought to be looked for in what happened in other areas of macroeconomics. The 1970s were years of high theory. The reappraisal of Keynesian theory led by disequilibrium and non-Walrasian equilibrium theorists was not the only new theoretical development in macroeconomics. At more or less the same time, the ‘rational expectations’ school or ‘new classical macroeconomics’ emerged under Lucas’s lead, and it proved to be a daunting rival. It shared some features with non-Walrasian equilibrium modelling, such as the desire to base macroeconomics on choice-theoretical foundations, and the adoption of advanced mathematical methods. Although the two approaches both started from the Arrow-Debreu framework, their purposes were poles apart. While non-Walrasian equilibrium economists used neo-Walrasian theory as a foil, Lucas aimed to extend its domain of relevance to the business cycle. As will be seen, if this confrontation is pictured as one round in a wider battle about the course of macroeconomics, Lucas was the winner. The theoretical reorientation that he carved out won the day and succeeded in dethroning Keynesian macroeconomics. Non-Walrasian macroeconomics was a collateral victim of this (temporary) fall.

The natural rate of unemployment

The Phillips curve had become a central piece of Keynesian macroeconomics; however it was not long before it was attacked, with far-reaching consequences. Two economists, the veteran critic of Keynesian policy, Milton Friedman, and a younger economist, Edmund Phelps, were at the heart of the offensive. Although Phelps’s two papers (1967, 1968) provided the most

subtle and theoretically innovative argumentation, Friedman's Presidential Address to the American Economic Association in 1967 (Friedman 1968) got most of the fame for the new development. Both were honoured with a Nobel Prize, Friedman in 1976, Phelps thirty years later. For lack of space, our discussion is limited to Friedman's paper.

Friedman's Presidential Address had a critical purpose. It attacked two central policy tenets of Keynesianism. The first was the view that governments should press central banks to keep the interest rate as low as possible, a prescription that Keynes made in Chapter 24 of the *General Theory*. In Friedman's eyes such a policy cannot be sustained in the long run. His second target, the only one that we shall discuss, is the view that a trade-off exists between inflation and unemployment, i.e. the idea that a government can decrease unemployment in a sustainable way by creating money. Such a trade-off requires a stable Phillips curve. Friedman readily admits that money supply has real effects in the short term. His claim is that no justification for a money creation *policy* ensues because these real effects only occur when the changes in money supply are unanticipated. To make his point, Friedman assumes a difference in perception between firms and workers. While firms' expectations are correct, those of workers are mistaken. Friedman shows that in such a context an increase in money supply is non-neutral. A displacement along the Phillips curve takes place. But this is only a short-run effect. In the next period of exchange, workers realise their earlier mistake, and integrate the rise in prices into their expectations. This triggers a displacement of the whole Phillips curve to the right. In order to maintain the rise in employment, the money supply needs to be increased at an accelerated rate, so that workers are fooled again. If this process continues, inflation is transformed into hyperinflation, a threat to the functioning of the monetary system, which compels the monetary authorities to abandon their expansionary policy. While the short-run Phillips curve is downwards sloping, in the long term it is vertical at a level of unemployment that Friedman dubbed the natural rate of unemployment, a terminology that became widely accepted. Friedman's conclusion is that it is useless to try to reduce unemployment below its natural level. His recurrent plea for monetary rules is thereby reinforced. Managing the money supply is not a task that should be left to the discretion of the central bank authorities, and even less to that of Ministers of Finance. On the contrary, they should function under strict monetary rules.

Friedman's argument was shrewd because he based his attack on Keynesian theory on one of its pillars, the Phillips relation. Keynesians could have retorted that his case against monetary policy rested on a situation in which there was no rationale for engaging in it to begin with. But such a view was only brought out much later, after the main debate had moved to other topics. Moreover, while Friedman's argumentation was a mere sketch (and for that matter a rather sloppy one), the course of events, it has been widely claimed, verified its prediction. The emergence of the stagflation phenomenon (the joint existence of a high rate of inflation

and a high rate of unemployment), came to be invoked as a quasi-real-world confirmation of the correctness of Friedman's claim.

Friedman's criticism of the Phillips curve was hardly a frontal attack on Keynesian macroeconomics. Unlike Lucas at a later date, Friedman had few qualms about Keynes's method; they shared a common Marshallian lineage. Likewise, he had no problems in principle with the IS-LM model *per se*, his target being rather the policy conclusion that Keynesian authors drew from it. The difference between Keynesians and monetarists, Friedman claimed, was mainly empirical. His plea was that the classical sub-system of the IS-LM model, assuming wage flexibility, was the 'good' model and not the Keynesian sub-system, assuming wage rigidity.

Our study of Friedman's contribution prompts us to return to the issue of the meaning of the 'Keynesian' adjective. It turns out that it can designate two distinct objects: a conceptual apparatus, the IS-LM model, on the one hand; and the policy project (the view that, for all its virtues, the market economy can exhibit market failures, which state intervention, in particular demand stimulation, can remedy) in whose service this apparatus is used, on the other. So, we can speak of 'Keynesianism in the methodological sense' as opposed to 'Keynesianism in the policy-viewpoint sense'. While Keynesian macroeconomics would be Keynesian on both scores, Friedman's theory turns out to be a hybrid combination of methodological Keynesianism and an anti-Keynesian policy standpoint.

The new classical all-out attack on Keynesian macroeconomics

As just seen, Friedman had few qualms about the Marshallian–Keynesian conceptual apparatus. His anti-Keynesian offensive was mainly a matter of policy. This was no longer true for the next wave of attack against Keynesian theory led by Lucas and others, and inaugurated 'new classical macroeconomics'. While the new approach was evidently collective, we shall focus our attention on the work of one individual, Lucas. He was the leading character in the movement, and commandingly assumed the role of its methodological spokesperson.

The transition from Keynesian to new classical macroeconomics deserves to be viewed as a Kuhnian scientific revolution. This expression refers to an episode in the history of a discipline where a period of normal development is disturbed because of the persistence of unsolved puzzles which trigger a drive to change the agenda, the conceptual toolbox and the research methods in radical ways. This is often accompanied by thundering declarations of war (e.g. Keynesian theory is dead), a confrontation between younger and older generations of researchers, the rise of new stars in the profession, and the eclipse of the previous stars.

We will begin by presenting the criticisms levelled by Lucas against, first, the path that Keynes took in the *General Theory* and, second, the methodology of subsequent Keynesian theory. Next, we consider another attack on the view associated with Keynesianism that the government should hold discretionary power over the management of the economy, Kydland and Prescott's time inconsistency argument.

Lucas's assessment of the General Theory

To Lucas, Keynes ought to be honoured for the role his ideas have played in the expansion of socialism rather than for his theoretical contribution. The latter, Lucas wrote, "is not Einstein-level theory, new paradigm, all this" (2004, p. 21)². In Lucas's opinion macroeconomics started off on the wrong foot by being Keynesian. He should have tried to make Walras's static model dynamic, as Hayek had suggested (before changing his mind), instead of tackling the easier task of demonstrating the existence of unemployment at one point in time, i.e. in a static framework.

A related criticism is that Keynes discarded what Lucas calls the 'equilibrium discipline', a basic premise by which Lucas felt that economists should abide when constructing theories. It consists of two postulates: (a) that agents act in their own self-interest and (b) that markets clear (Lucas and Sargent, [1979] 1994, p. 15). These postulates are deemed to constitute a universal requirement, rather than being linked to the specific purposes of particular models. In other words, they are viewed as constituent parts of neoclassical theory, which in turn is equated simply with economic theory. The counterpart of the equilibrium discipline is the rejection of the disequilibrium notion on the grounds of its lacking micro-foundations (Lucas, [1977] 1981, p. 221) and its association with 'unintelligent behaviour' (Lucas, [1977] 1981, p. 225). According to Lucas, by betraying this equilibrium discipline, Keynes gave an example of "bad social science: an attempt to explain important aspects of human behaviour without reference either to what people like or what they are capable of doing" (1981, p. 4). Lucas admitted that Keynes's lapse from the equilibrium discipline was understandable in view of the apparent contradiction between cyclical phenomena and economic equilibrium, but it remains true, he claims, that in retrospect it prompted a long detour in the progress of economic theory.

Turning now to Lucas's assessment of Keynesian economics, as distinct from the economics of Keynes, the following points should be brought out. First of all, Lucas praised Keynesian macroeconomics for having engaged in econometric modelling and empirical testing, in contrast to Keynes's reasoning in prose.

² "I think Keynes's actual influence as a technical economist is pretty close to zero, and it has been close to zero for 50 years. Keynes was not a very good technical economist. He didn't contribute much to the development of the field. Keynes's influence was more political, is more an image of what sort of things an economist should be doing, and what kind of life an economist should live" (Lucas's interview with Usabiaga Ibanez 1999, p.180). See also Lucas (2004).

The Keynesian macroeconomic models were the first to attain this level of explicitness and empirical accuracy; by doing so, they altered the meaning of the term ‘theory’ to such an extent that the older business cycle theories could not really be viewed as ‘theories’ at all (Lucas [1977] 1981, p. 219).

Second, Lucas took a strong stance on the Phillips-curve controversy. This opposed Keynesians and monetarists *à la* Friedman: Keynesians defended the stable Phillips curve allowing for a trade-off between unemployment and inflation, while monetarists argued for the natural rate of unemployment hypothesis. The 1970s stagflation episode, Lucas claimed, demonstrated the failure of Keynesian activation policy, while confirming Friedman’s predictions. Lucas’s distinct contribution to the debate was to provide stronger foundations for Friedman’s insight in his path-breaking article, “Expectations and the Neutrality of Money” (Lucas [1972] 1981).

The most influential of Lucas’s judgments about Keynesian theory is the famous ‘Lucas critique’ (Lucas [1976] 1981). This asserts that the econometric models of the time, all derivatives of the Klein-Goldberger model, could not serve their avowed purpose of comparing alternative economic policies because the coefficients of the models were estimated by econometric methods (rather than being derived from theory), and their numerical values were independent of any changes in institutional regime that might occur. Therefore the model-builder will miss the fact that agents could change their decisions when faced with a policy change. As a result, a model of the economy estimated at a period during which a particular institutional regime held sway, could not but provide inadequate information for assessing what might occur under a different regime. According to Lucas, only deeper, ‘structural models’, i.e. derived from the fundamentals of the economy, agents’ preferences, and technological constraints, were able to provide a robust grounding for the evaluation of alternative policies.

Lucas’s critique was part and parcel of the rational-behaviour hypothesis introduced by Muth (1961). It was meant to capture the idea that economic agents ought to be ascribed the ability of guessing (on average) the outcome of the market in which they are participating, conditional on the information available. That is, their subjective expectations about any coming event should coincide (on average) with the model-builder’s objective expectations. The change involved is radical, a move away from a backward looking towards a forward-looking depiction of economic agents.

Kydland and Prescott’s intertemporal inconsistency claim

One of Friedman’s claims in his Presidential Address was that agents couldn’t be fooled on a recurrent basis. In an influential article, Kydland and Prescott (1977) re-expressed this idea in a more rigorous way by building their argumentation on the rational expectations hypothesis. This article became an important element in the rules versus discretion debate, on the ‘rules’

side. At stake was the issue of governments' policy declarations of intention. Kydland and Prescott's bold claim was that a benevolent well-informed government would repeatedly repudiate its promises unless it was constitutionally impeded from doing so. A standard example is that of a government aiming to boost investment and so announcing that an increase in the interest rate was going to occur in a year's time, thereby triggering firms to hasten their investment plans. The snag is that, a year later it may well turn out that it is in the government's interest to forego this increase because of its deflationary effects. However, if it does so, its credibility will be harmed, and its future announcements may no longer be taken seriously.

Kydland and Prescott's credibility argument was scarcely original — earlier versions can be found in the writings of dynamic games theorists — but they introduced it into the macroeconomic debate. Its implication is a drastic narrowing of governmental discretion. In effect, once the credibility dimension is taken on board, policy announcements will be deemed credible by private agents only if they can be sure that, when the proper time arises, the government will have a firm interest in (or no way out of) implementing the policy.

New classical macroeconomics: a different research programme

The 'new classical macroeconomics' term applies only to the works of Lucas and his allies. The paradigm that they had inaugurated soon underwent an inner evolution that led to the emergence of real business cycle modelling under Kydland and Prescott's lead. A second transformation, leading to the emergence of dynamic stochastic general equilibrium (DSGE) modelling, followed. These three modelling strategies should be considered as phases within the same research programme the main features of which were present from the first instalment onwards (see note 1). Therefore the comparison between Keynesian and new classical macroeconomics that we shall now undertake has a more general bearing.

Drawing a contrast between two paradigms is a matter of selecting criteria against which they can be compared and assessing how they measure up to them. Table 1 summarises the results of such an exercise. For lack of space, we will content ourselves with only commenting on a few of these items.

Table 1. Contrasting Keynesian and new classical macroeconomics

	Keynesian macroeconomics	New classical macroeconomics
1. The overarching aim of macroeconomics	explaining unemployment	explaining the business cycle
2. Basic model	the IS-LM model	the Lucas-Rapping supply function
3. Relative role of supply and demand	emphasis on demand	emphasis on supply
4. The wage-employment relationship	stable Phillips curve allowing the policy exploitation of the inflation/ unemployment inverse relation	no possibility of a policy exploitation of the inflation/ unemployment inverse relation
5. Micro/macro relationship	under the mantle of the neoclassical synthesis; macroeconomics is concerned with its disequilibrium short-period leg	rejection of the neoclassical synthesis; its equilibrium long-period leg can provide all the explanation necessary
6. Expectations	adaptive expectations	rational expectations
7. Econometric modelling	Keynesian macroeconomic models are complex systems of equations, whose parameters are fixed by economically-estimated coefficients	Models are simplified general equilibrium models which ought to be based on 'deep structural' parameters based on the calibration method
8. Methodology	Marshallian	Walrasian
9. The nature of the business cycle and policy conclusions	the business cycle is viewed as a market failure — the policy aim is to bring the economy towards full employment through demand activation	fluctuations express agents' optimising reaction to exogenous shocks — no activation policy should be undertaken

The first point to be stressed is the change in the research agenda that occurred. The central object of study of Keynesian macroeconomics was unemployment — in a wider sense, the search for the malfunctioning of markets. In the span of a few years, the unemployment theme ceased to be an important preoccupation of macroeconomists; the business cycle took its place at the top of the agenda. Of course, variations in economic activity are a central item in the study of economic fluctuations, but in the new paradigm they are accounted for in terms of hours worked without consideration of the split between the employed and the unemployed.

Another stark difference concerns the way in which the business cycle issue is addressed. The challenge Lucas set himself was to construct an equilibrium theory of the business cycle, where the fluctuations of economic variables can be traced back to optimising decisions made by economic agents. Instead of entering into a detailed description of how he progressed in this enterprise we shall just say the following. According to the Keynesian approach, variations in employment result from changes in aggregate demand. The underlying picture is that labour suppliers are passive, employment decisions being made unilaterally by firms.

Moreover, this approach tended to consider the supply of labour and the labour force as the same thing, taking for granted that any difference between the total labour force and the level of employment is involuntary unemployment. Lucas's hunch (and Rapping's because the so-called Lucas supply function emerged in Lucas and Rapping's joint work (Lucas and Rapping [1969] 1981)) was that changes in the supply of labour, viewed as a result of optimising decision-making, play a central role in explaining fluctuations. His take, borrowed from capital theory, is that the decision to participate in the labour market or to produce on a self-employed basis are a matter of allocating leisure (and hence labour) both within a given period of time and over time. Economic agents ought to be depicted as comparing the wage rare at one point in time with the wage rate they expect to prevail later in time, say today and tomorrow. If the former is more advantageous than the latter, they will decide to work more today and less tomorrow.

This intertemporal substitution phenomenon, Lucas contended, is decisive in explaining variations in the level of activity over time. On this insight, he constructed a model of the business cycle where variations in activity over time are due to two factors: exogenous monetary shocks, on the one hand, and agents' imperfect information, on the other. In this model, agents receive one signal incorporating two distinct pieces of information. On their own, these two pieces of information would trigger opposite reactions, changing or not changing the total hours worked. Needing to engage in signal extracting, the optimal solution agents will adopt is to mix the two opposite reactions in some weighted way. Hence the hours worked departs from what they would have been with perfect information. Here, Lucas claimed, rests the explanation of the variations in hours worked over the business cycle. Monetary shocks have real effects but, as argued by Friedman, the government cannot exploit them since they occur only when the changes in money supply are unanticipated.

A totally different picture of the business cycle emerges. Earlier, the business cycle was viewed as the disequilibrium phenomenon *par excellence*, the manifestation of a market failure. The mere assertion of its existence was seen as an invitation to the state to take steps to make it disappear. In the new approach, the business cycle expresses the optimising reactions of agents to outside shocks affecting the economy. In other words, business fluctuations are no longer viewed as market failures, and governments should refrain from trying to prevent their occurrence. Nor is there any rationale for acting upon them.

The new Keynesian counter-offensive

Lucas's all out attack on Keynesianism was not left unanswered by those economists who, for one reason or another, felt that Keynes had been right. There were two types of reaction. The reaction of traditional Keynesians is typified by the observation made by Lipsey that what occurred was the "replacement of messy truth by precise error" (Lipsey 2000, p. 76), thus

claiming that the direction opened up by Lucas and his fellow economists should be radically rejected. In contrast, the other reaction amounted to admitting that many of Lucas's criticisms were well founded, and could not be dismissed with a sweep of the hand. This was the standpoint of the so-called 'new Keynesian' economists. These wanted to re-habilitate Keynes's insights, in one way or another, while accepting the central tenets of the new views (i.e. strong microfoundations and, when needed, the rational expectation hypothesis). Within a decade, several such new models blossomed. The main ones, in the order of publication of their inaugural papers, are: implicit contract models (Baily 1974, Gordon 1974, Azariadis 1975); staggered wage-setting models (Fischer 1977, Phelps and Taylor 1977, Taylor 1979); search and coordination failure models (Diamond 1982); imperfect competition models (Hart 1982) efficiency wages models (Salop 1979, Shapiro and Stiglitz 1984); menu costs and near-rationality models (Mankiw 1985, Akerlof and Yellen 1985a and 1985b); coordination failures (Roberts 1987)³.

All these models shared the same purpose of amending, if not reversing, new classical conclusions, thereby reviving Keynes's mitigated view of the market system. The price to be paid for this endeavour was a stricter adherence to basic neoclassical principles and the abandonment of many traditional Keynesian notions. With a few exceptions, these models adopted the imperfect competition framework. Moreover, except for the staggered wage-setting model, they all were static models. These communalities aside, new Keynesian models developed in many different directions, to the effect that we can hardly speak of a new Keynesian school. Among the several dividing lines traversing new Keynesian models, the following two seem central to us. The first is between the authors aiming to rescue the notion of involuntary unemployment from Lucas's stern attack by providing it with microfoundations, and those who had little interest in such a task preferring to react to Lucas and Sargent and Wallace (1975) on the issue of the efficiency of monetary policy. Most of the models mentioned above followed the first of these two approaches, the exception being menu-cost and staggered contract models. The second dividing line is between the theories pursuing the rigidity or stickiness line, be it real or nominal, and those whose builders felt the need to retain the flexibility of prices and wages assumption. The majority of new Keynesian models took the first line, the exception being Diamond's (1982) search model, Roberts' (1987) coordination model and Hart's (1982) imperfect competition model.

New Keynesian models were as conceptually innovative and technically clever as the new classical models they wished to refute. Nonetheless, they failed to alter the new course of macroeconomics that Lucas had initiated. As far as the defence of involuntary unemployment was concerned, the emergence of search and matching models vindicated Lucas's claim that the topic of unemployment could be sent back to labour economics instead of remaining at the

³ Many of these papers were collected in Mankiw and Romer's (1991) totemic book, *New Keynesian Economics*.

centre of macroeconomics. Moreover, most of the new Keynesian models operated within a static framework while the dynamic stochastic perspective was becoming more and more dominant. Gradually, it dawned on new Keynesians that, if they wanted to have an impact on the development of the field, they needed to use the new language. This was to happen a few years later.

Real business cycle models

While Keynesians were trying to challenge Lucas, others were trying to implement the research programme he had initiated. Kydland and Prescott's "Time to Build and Aggregate Fluctuations" (1982) and Long and Plosser's "Real Business Cycles" (1983) are the two papers which started the real business cycle line of research. Both tried to model business fluctuations as the result of real shocks to the economy (rather than monetary shocks, as in Lucas's model). Kydland and Prescott's paper had the additional feature of wanting to move from the model to the facts, so inaugurating a new methodology. As Greenwood ([1994] 2005, p.1) remarked, real business cycle modelling took the neoclassical growth model to the computer.

Kydland and Prescott's model is, like Lucas's, neo-Walrasian. The equilibrium discipline, rational expectations, a dynamic-stochastic environment, and a central role for intertemporal substitution are all present in both types of model. But there are also striking differences. First, Kydland and Prescott shifted towards real technology shocks. Second, they abandoned the imperfect information line of research. Third and most important, Kydland and Prescott's work was quantitative. In Woodford's words:

The real business cycle literature offered a new methodology, both for theoretical analysis and for empirical testing. ... It showed how such models [of the Lucas type] could be made *quantitative*, emphasising the assignment of realistic numerical parameter values and the computation of numerical solutions to the equations of the model, rather than being content with merely qualitative conclusions derived from more general assumptions (Woodford 1999: 25-26).

Woodford was right. However, merely asserting that a qualitative model was transformed into a quantitative one may fail to convey the full measure of the change. While models *à la* Lucas could recruit only a tiny fraction of the macroeconomic profession, Kydland and Prescott were able to devise a research programme that became the bread and butter approach for legions of macroeconomists, both top-notch and average, for decades to come. This is the sign of a successful revolution.

The aim of Kydland and Prescott's 1982 model was to show that economic fluctuations could be explained as a consequence of economic agents' optimising adjustment to exogenous

technological shocks. Their starting point was Ramsey's (1928) and Cass's (1965) models of optimal growth, which were extended to a stochastic economy by Brock and Mirman (1972).⁴

To the outside observer, what is striking in Kydland and Prescott's endeavour is the contrast between the model they build and its avowed purpose, to shed light on the development of the US economy from 1950 to 1975. Their model economy is summarised in one utility function and one production function. The production function is subject to stochastic technology shocks. The variables considered are, for production, capital, the level of employment (number of hours worked; not the number of people employed as opposed to those who are unemployed) and productivity, and for household preferences, consumption and investment. Two additional variables are involved: the hourly real wage and the real interest rate. Kydland and Prescott used two sources to parameterise the functional forms of the models: first, steady state conditions and, second, calibration. Calibration, a technique borrowed from computational general equilibrium analysis, consists of assigning values to the model's parameters by using information from panels, national accounts and other data banks. If such data are unavailable, the model-builder ascribes values based on theoretical reasoning.

The validation of the model occurs by comparing the moments (volatilities, correlations and auto-correlations) that summarise the actual experience of the US economy with the equivalent moments from the model economy. The model succeeds if the simulation mimics the empirical observations. To a large extent, this is true for Kydland and Prescott's model. It satisfactorily reproduces both the low variability of consumption and the high variability of investment. It also reproduces the pro-cyclical character and persistence of most of the variables considered. However, as readily admitted by the authors, the model is wanting on two scores. It is unable to account for the variation in hours worked. In the real-world data, these hours are closely correlated with output, but they vary significantly less in the model. Another weakness concerns changes in the wage rate and the interest rate; in the model, these are pro-cyclical, but in reality wages are only weakly pro-cyclical (almost a-cyclical) while the interest rate is anti-cyclical.

All in all, Kydland and Prescott's results are impressive. They were able to successfully mimic several important empirical traits of the fluctuations in the US economy over a quarter of a century, on the basis of the most rudimentary possible model. Before their paper appeared, the general opinion was that such an enterprise was impossible! Nevertheless, a large number of criticisms have been levelled at Kydland and Prescott's model. Answering these lead to a series of wide-ranging improvements, which we cannot enter into here. With time, Kydland and Prescott's initial real business cycle model grew into a simplified

⁴ Ramsey studied the intertemporal optimising programme of a representative agent over an infinite horizon, subject to a budget and a technology constraint calculated by a benevolent and omniscient planner.

canonical model, the twin advantages of which were its parsimony and the purposes which it can serve.

New developments resulted from attempts to reply to the early criticisms, which pointed out insufficiencies and inconsistencies. New stylised facts were integrated into its successors. This led to a growth in the type of shocks considered. For example, in order to improve upon the anomalous correlation between productivity and hours worked, Christiano and Eichenbaum (1992) introduced a shock related to government consumption expenditures, which had a negative wealth effects on households. Another striking defect of the early real business cycle models was their lack of consideration of money. Kydland and Prescott had argued that monetary shocks played only a minor role in explaining business fluctuations. Accepting this conclusion was one thing, but the nagging stylized fact of the inverse evolution of the interest rate, on the one hand, and of inflation and output, on the other was another. Monetary policy had thus to re-enter the picture. Woodford's (2003) book, *Interest and Prices*, blazed the trail.

DSGE modelling

The mid-nineties saw a decline in real business cycle modelling and the concomitant emergence of a new type of models, dynamic-stochastic general equilibrium (DSGE) models. This move should be seen as an endogenous change rather than a revolution. Ending their methodological fight, new Keynesians and real business-cycle theorists came to agree upon adopting a workhorse model that both considered apposite — hence the ‘new neoclassical synthesis’ label (Goodfriend and King 1997). Keynesians’ contribution to the wedding was imperfect competition and sluggishness, as well as a focus on the role of the central bank. In exchange they accepted the basic components of real business cycle modelling (i.e., exogenous shocks, the dynamic stochastic perspective, the equilibrium discipline, intertemporal substitution and rational expectations).

Monopolistic competition was integrated into DSGE modelling by borrowing the Dixit-Stiglitz aggregator from Dixit and Stiglitz's (1977) model of product differentiation. In the canonical version of this model, the economy comprises four types of goods: labour, a final all-purpose good, a continuum of intermediary goods, and money. The final good is a homogenous good produced using the intermediary goods. It is exchanged competitively. Intermediary goods are each produced by a monopolistic firm using Leontief technology based only on labour. These monopolistic firms are price-makers applying a mark-up on their marginal costs. If, for any reason, they are willing but unable to change their prices, it is in their interest to increase the quantity sold, until demand is fully satisfied.

As to sluggishness, this is a notion that had had applicant status in the lexicon of authorised theoretical concepts for a long time, and which had in the past recurrently been denied such access. Now, at last, a satisfactory theoretical translation (i.e. menu costs and staggering contracts) of its fact-of-life evidence seemed to have been found. It eventually became fixed in Calvo's (1983) price formation theory, a formulation close to the staggered contracts insight. It is assumed that at each period of exchange, firms are authorised to change their prices as soon as they receive a signal, occurring with a given probability. If for instance this probability is $1/3$, then on the average firms will reset their prices every 3 periods. While this price formation assumption can be criticised for being *ad hoc*, it has been more widely used than the earlier versions of sluggishness, as a result of its tractability.

Another development that emerged in the last decade of the twentieth century concerned monetary policy, in particular the rules that central banks should follow. Here a radical shift away from Friedman's vision has taken place: the rate of interest (not of the quantity of money) is now the control variable. Two economists, Taylor and Woodford played a prominent role in this development. Taylor devised a rule that became popular enough to be named the 'Taylor rule'. It originated in an article (Taylor 1993), which tried to provide an empirical assessment of the FED's policy. The rule consists of fixing the rate of interest taking into account three objectives: (a) price stability, measured by the difference between the observed and the targeted rate of inflation; (b) the output gap, the deviation of effective from potential output (i.e. the output level that would have occurred had the economy been competitive) and (c) an economic policy shock, a purely residual shock uncorrelated with either inflation or output. Woodford pursued the same idea in several contributions, ranging from a 1977 article (Rotemberg and Woodford 1999) to his 2003 book, *Interest and Prices: Foundations of a Theory of Monetary Policy*. This book quickly became a standard reference in the monetary policy literature. Woodford's approach was to address the problem at the level of principles by attempting to make a full link between macroeconomic stabilisation and economic welfare. Taking the stabilisation of inflation as the prominent aim of monetary policy, he nonetheless found ways to couple it with the Keynesian objective of a stabilisation of the output gap. He also paid considerable attention to the credibility dimension:

When choosing a policy to best serve the goal of stabilization, it is crucial to take account of the effects of the policy's systematic component on people's expectations of future policy. For this reason, my work has focused largely on the study of policy *rules*: this forces one to think about the systematic patterns that one can expect to be anticipated by sufficiently sophisticated market participants" (Woodford 2006, p. 2).

This perspective, Woodford further argues, has some counter-intuitive implications. For example, it makes policy inertia desirable or, in other words, purely forward-looking policy is seen to be harmful.

The end result of all these developments is that we now find economists holding opposite policy views agreeing about the conceptual apparatus upon which to base their theoretical conversation. This state of affairs seems to be agreeable to both camps. Macroeconomists from the real business cycle tradition are happy because new Keynesians have yielded by adopting their language and toolbox. New Keynesians are content because they have been able to bring to the merger the concepts they were insisting upon in their more static days. Moreover, the admission that monetary policy can have real effects marks a reversal of the Friedman-Lucas view that had previously held the high ground. In other words, when it comes to policy, new Keynesians seem to be the winners.

Another milestone in the recent evolution of macroeconomics has been Christiano, Eichenbaum and Evans's (2005) article⁵. This enriched the standard DSGE model, based on staggered wage and price contracts, with four additional ingredients: (a) habit formation in preferences for consumers; (b) adjustment costs in investment; (c) variable capital utilisation; and (d) the need for firms to borrow working capital in order to finance their wage bill. The ensuing (complex) model allows the authors to account for the inertia of inflation and persistence in output, two important features supporting the Keynesian standpoint on the real effects of monetary shocks.

The next step occurred when Smets and Wouters (2003) took up Christiano, Eichenbaum and Evans's model and estimated it for the euro zone viewed as a closed economy. Before this, central banks were still using models that, for all their sophistication, remained based on the Kleinian tradition⁶. In contrast, the Smets-Wouters model was microfounded, specifying the preferences of households and the central bank. Smets and Wouters estimated seven variables (GDP, consumption, investment, prices, real wages, employment and the nominal interest rate) under ten structural shocks (including productivity, labour supply, investment preferences, cost-push and monetary policy shocks). Having more shocks certainly gives a better fit. The flip side, however, is that none of them comes out as dominant. The model also embedded friction, which had the effect of slowing down the adjustment to shocks. Smets and Wouters's main contribution is technical, consisting of using Bayesian estimation methods in a DSGE setting for the first time⁷. In a very short time, central banks around the world adopted the Smets-Wouters model for their policy analysis and forecasting, thus replacing 'old' with 'new' Keynesian modelling. However, one aspect of the old way of modelling remains: the distinctive trait of real business cycle models was their attempt to be as simple as

⁵ This article first appeared in 2001 as a Federal Reserve Bank of Cleveland working paper.

⁶ For example, the model used by the European Central Bank, the Area Wide (AWM) model, was still constructed from a neoclassical synthesis perspective. "The model is designed to have a long-run equilibrium consistent with classical economic theory, while its short-run dynamics are demand driven" (Fagan, Henry and Mestre 2001, abstract).

⁷ By supposing a 'prior' probability distribution of its coefficients, Bayesian estimation procedure allows the equations of large-scale linearised models to be estimated simultaneously through the maximum likelihood method, something which is impossible with a traditional estimation model.

possible. In effect, they comprised a limited number of equations. The new models *à la* Smets-Wouters constitute more complex constructions based on more questionable microfoundations.

The impact of the 2008-9 financial crisis on macroeconomic theory

How did macroeconomics stand in the wake of the so-called Great Recession (an analogy with the Great Depression of the 1930s)? These events brought out at least two blind spots in the dynamic stochastic approach to macroeconomics (that is, DSGE modelling in general). The first is the limited attention that had been given to the financial sector in these models, a dramatic blank once the Great Recession broke out in 2008. The second pertains to the limits of what can be done with models premised on the view that, whatever the situation in which economic agents find themselves, they ought to be considered as having achieved their first best optimising plan. In other words, DSGE models exclude in advance the possibility of any pathology in the working of the market system, and certainly of any collapse in the trading system to the extent that we have recently encountered.

This marks a clear analogy with the situation faced by Keynes in the 1930s. Equilibrium models convey a Panglossian view (all is for the best in this best of all possible worlds) of the working of the economy as they rule out the possibility that markets can fail and that agents may find themselves in a state where they are unable to achieve their optimising plan⁸. When the economy is in a state of plain sailing, this neglect is admissible, but it is no longer justifiable when the economy shows signs of collapse. Whatever the virtues of the new-classical real business-cycle methodology, its limits are clear. To ‘old’ Keynesians, this has the sweet smell of revenge. New voices have arisen proclaiming the need to return to Keynes’s *General Theory*. Lord Skidelsky, Keynes’s biographer and the author of *The Return of the Master* (Skidelsky 2009), and Paul Krugman, the 2008 Nobel-prize laureate (see for example Krugman 2010) are two prominent figures in this movement (not to mention Posner’s rediscovery of Keynes’s book (Posner 2009)). In Krugman’s words, “Keynesian economics remains the best framework we have for making sense of recessions and depressions” (2010, p. 8).

We disagree with these economists. We prefer to draw a distinction between two meanings of the Keynesian modifier. The first point to a general vision that can be labelled ‘ideological’ without giving this terms a pejorative meaning and which views the market economy as likely to fall prey to market failures upon which governments are able to remedy. The second

⁸ As Keynes wrote in a famous passage of the *General Theory*, “The celebrated optimism of traditional economic theory, which has led to economists being looked upon as Candides, who, having left this world for the cultivation of their gardens, teach that all is for the best in the best of all possible worlds provided we will let well alone ...” (Keynes 1936, p. 33).

designates the conceptual apparatus proper to the Keynesian tradition in its heydays, i.e. the IS-Lm model. Against the background of this distinction, our view is that the Keynesian vision might well ride high again, but we doubt that any return to the Keynesian conceptual apparatus will occur. Be that as it may, what is certain is that Krugman's and Skidelsky's injunctions were badly received by the profession.

The Great Recession will certainly have an impact on the course of macroeconomics. The clearest sign of this is the widespread admission that the loose integration of finance into macroeconomic models was a serious mistake (Eichenbaum 2010), and the ensuing surge of work aiming to fill this gap. At this juncture, it is, however, still difficult to gauge whether a mere integration of the financial sector within the existing framework will suffice, or whether the Great Recession will trigger a more radical reorientation of macroeconomics.

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