

The History of Recent Macroeconomics Through the Lens of the Marshall-Walras Divide

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Abstract

According to Leijonhufvud, the development of economic theory can be compared to a decision tree, the branches of which originate in choices made about basic methodological nodes. My paper is an attempt at putting this insight into practice by reconstructing the recent history of macroeconomics on its basis. To this end, I examine whether the decision-tree framework can explain three crucial turns in the history of the field: (a) the transition from Keynesian to new classical macroeconomics triggered by Lucas; (b) the transition from the Lucas model to Kydland and Prescott's 'real business cycle' modeling strategy; and (c) the transition from RBC modeling to DSGE modeling.

Keywords: Marshall, Walras, Keynes, Lucas, RBC model, New Keynesian model

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INTRODUCTION

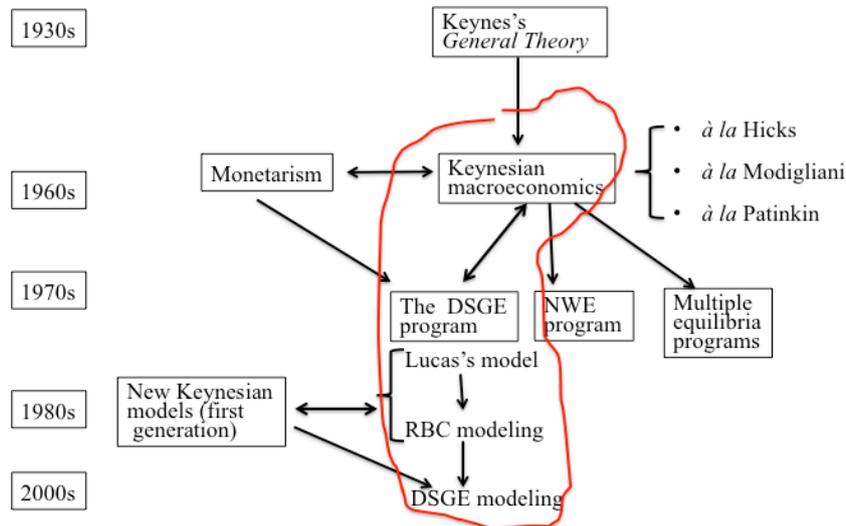
According to Leijonhufvud, the development of economic theory can be compared to a decision tree, the branches of which originate in choices made about basic methodological nodes. These can be compared to the crossroads facing hikers. Taking one fork in a road rather than another makes the journey head in a different direction. The same is true for theoretical bifurcations; choosing one rather than another puts theory on a different track, with possibly far-reaching consequences. To begin with, there are elementary or basic choice nodes to be addressed. Next, once a given branch has grown, choices become more specific as second-, third-level, etc., nodes enter the picture. Even thriving research lines face hurdles, to the effect that changes in bifurcations, the discovery of new nodes, and the abandonment of old ones are usual features in the way theories develop. It may also happen, yet less frequently, that a successful research track at some point lose its momentum: conundrums are brought to light, objections are leveled, and doubts about the validity of the route taken set in. Such an occurrence may result in what Leijonhufvud calls ‘backtracking’ – that is, returning to a previous node and taking a previously neglected bifurcation. Scientific revolutions are occurrences of a full backtracking journey.

Leijonhufvud referred to the decision-tree insight on several occasions but always in general terms (1994, 2006a, 2006b). The purpose of the present paper is to put it to the test by applying it to the history of modern macroeconomics. This would be an audacious aim for a single paper were it not that mine is the offshoot of ten years of research on the history of macroeconomics which led to the publication of a book on the subject, *A History of Macroeconomics from Keynes to Lucas and Beyond* (De Vroey 2016).

In previous works (De Vroey, 2009, 2012), I argued that, though both belong to the neoclassical paradigm, Marshall and Walras opened alternative rather than complementary research lines. In terms of the decision-tree framework, this means that, considering the neoclassical approach as a tree of its own, the Marshallian and the Walrasian approaches have evolved as two distinct branches on this tree (Austrian economics being a third one). This Marshall-Walras divide will act as a benchmark for my inquiry, as I will argue that the transition from Keynesian to Lucasian macroeconomics was to a large extent a backtracking process, drawing macroeconomics away from the Marshallian branch of the tree and pushing it towards the Walrasian one. As for more modern developments – DSGE modeling – I shall argue that it is apposite to replace the facile, usual appellation “new neoclassical synthesis” with that of a “Marshall-Walras synthesis.”

Figure 1 summarizes the main theoretical turns that have taken place throughout the history of macroeconomics. In the present paper, I will limit myself to a subset: the turn from Keynesian to new classical macroeconomics *à la* Lucas, from Lucas to RBC modeling, and from RBC to DSGE modeling.¹

Figure 1. The main episodes in the history of macroeconomics²



In the first section of the paper, I wonder what makes macroeconomics special with respect to the other fields of economics – a question that to the reader’s possible surprise bears on my query in this paper. In section two, I explain the commonalities and differences between Marshall and Walras. In the last three sections of the paper, I study the above mentioned episodes through the lens of the Marshall-Walras divide.

WHAT IS SPECIAL ABOUT MACROECONOMICS?

Macroeconomics is general equilibrium analysis for the simple reason that its object of study is the workings of an entire economy. Unfortunately, semantics is troublesome. Most of the time, general equilibrium analysis is associated with neo-Walrasian theory, which is branded as belonging to microeconomics. Moreover, people automatically associate general equilibrium theory with Walras, as if there existed just a single way of engaging in general equilibrium analysis. This is wrong. For example, Sraffian theory is definitely a general equilibrium field according to the above definition, yet it has little in common with Walrasian theory, save its mathematical nature. More related to the topic of this paper, it may be argued

¹ The DSGE label can be used either to designate the entire research program initiated by Lucas, or only its third phase. To avoid this ambiguity, I refer to the DSGE *program* when having in mind the entire research program and to the DSGE *model* to designate its third stage.

² Arrows indicate a relation of continuity; double-headed arrows, a relation of opposition. NWE stands for ‘non-Walrasian equilibrium.’ Examples of multiple equilibria programs are sunspot models and Diamond’s search externality models (Diamond 1982).

that Marshallian general equilibrium modeling is an alternative to Walrasian general equilibrium modeling.

While macroeconomics must be put under the ‘general equilibrium’ label, it nonetheless significantly differs from Walrasian general equilibrium. Three differences must be mentioned. The first is that Walrasian theory concerns itself with a complex model economy, the components of which are defined in a detailed way. By contrast, macroeconomics usually deals with simplified models.

A second difference is that macroeconomics is geared towards getting at policy conclusions. Such conclusions necessarily support a particular ideological vision, either that of absolute economic liberalism, according to which government interventions in the economy do more harm than good, or that of mitigated economic liberalism, wherein it is assumed that government interventions may result in welfare improvements. Keynes is the emblematic herald of the latter, Friedman of the former. Thus, ideology is present in macroeconomics to a greater extent than in other fields. By contrast, Walrasian economists hardly claim that their models have precise policy conclusions as their outlet.

The third difference is that, in the 1960s, macroeconomics evolved into an applied discipline, a move that started with the Klein-Goldberger econometric model. Over the years, this empirical research line developed tremendously. The result is that most macroeconomists, Keynesians included, adhere to the positivist methodological creed spelled out by Friedman in his famous “Methodology of Positive Economics” 1953 article, stating that the validity of theoretical propositions ought to be assessed through empirical verification. The contrary is true for Walrasian theory. In R. Weintraub’s words, “Empirical work, ideas of fact and falsifications, played no role at all in Walrasian theory” (Weintraub 1983: 37).

THE MARSHALL-WALRAS RELATION: COMMONALITIES AND DIFFERENCES

This paper is based on the presumption that ideal types such as ‘the Economics of Marshall’ and ‘the Economics of Walras’ – to use Leijonhufvud (1968) terminology – make sense. There is no unanimity on this view. Some like to debunk it, by claiming for example that there are as many Marshalls and Walrases as there are commentators. The opposite view is that past theorists are so coherent that interpretative disagreements about their work bear on minor points. This may be the case for some works – say Debreu’s *Theory of Value* – but certainly not for those of pioneering neoclassical economists, such as Marshall and Walras. However, there are not many alternative ‘Marshall’ or ‘Walras’ ideal types. In both cases, the same simple pattern of a split between two different theoretical identities can be found. Hence, a similar split among their commentators about their preferred Marshall or Walras. As far as Marshall is concerned, the split is between ‘Marshall the evolutionist economist’ and ‘Marshall the value theorist.’ As for Walras, the split follows from his change of mind about disequilibrium trading over the successive editions of his *Elements of Pure Economics*. To some commentators (Walker 1996), the third edition is the epitome of Walras’s theory; to

others, it is the fourth one. The first interpretation makes Walras adhere to Smith's gravitational view of equilibrium; the second makes him a harbinger of the intertemporal equilibrium concept. If this is accepted, the Economics of Marshall and of Walras can still be regarded as ideal types, the content of which can more or less safely be established. Commentators simply need to state clearly which of the two Marshalls and the two Walrases they have decided to discuss. For my part, I have opted for Marshall the value theorist and the Walras of the fourth edition.

When looking at the literature, Marshall's and Walras's works are usually regarded as complementary. My contention is that, in spite of basic commonalities – their belonging to neoclassical economics – they inaugurated two alternative ways of implementing its program. Let me begin by highlighting their commonalities.

- 1) Marshall and Walras shared the same two aims, making economics 'scientific' and substantiating the claim that the market economy is efficient. They were both defenders of *laissez-faire*.
- 2) They took for granted that market economies are stable, thereby starting their analyses with the study of a perfectly functioning market or economy – that is, in equilibrium.
- 3) They adhered to the subjective theory of value.
- 4) Time organization. They assumed that exchanges take place within the bounds of a well-defined period of exchange.³
- 5) Trade organization. The term 'trade technology,' coined by Clower (Clower [1975] 1984: 194), refers to the *modus operandi* of the market or the economy. In this respect, Marshall and Walras shared several common traits. (a) They assumed that traders are gathered in the same venue or, at least, are part of a common communication network. (b) They assumed that the attainment of end-of-market-period outcomes arises through an interaction between market supply and demand. (c) They made specific assumptions ensuring the achievement of market clearing (a matching of market supply and demand) at the end of the market period. (d) They assumed price flexibility. Rationing (i.e. non-market clearing) could occur only in case of a price ceiling or floor. (e) They adhered to the so-called 'law of indifference' (at the end of the market period, a single price prevails). (f) Their reasoning amounts to assuming that the attainment of market equilibrium is instantaneous.
- 6) Labor market. They assumed that its functioning is similar to that of other markets.
- 7) In congruency with their adherence to *laissez-faire*, the notion of economic policy was alien to Marshall and Walras.

The above traits are the commonalities between the Economics of Marshall and the Economics of Walras. They refer to what may be called the generic content of neoclassical economics – the methodological choices about which all its founders agreed and which

³ Hicks's Week device is an apt way of capturing this conceit of time. It depicts the economy or the market under study as a succession of weeks, with trade occurring only on Mondays during well-defined time slots.

shaped its identity. I now turn to their differences. They can be gathered under two headings: (a) vision of economics and (b) basic methodological nodes.

1. Two specific visions of economics

When considering how economists view their field, two distinct positions stand out: a pragmatic vision and a principled one. The first wants economics to address concrete issues. Marshall adhered to it as exemplified by the first sentence in his *Principles*: “Political Economy or Economics is the study of mankind in the ordinary business of life” (1920: 1). For his part, Walras held the principled vision. His aim was to study the equilibrium of a competitive economy and to demonstrate its efficiency — “I submit that economics will not attain the status of a science until economists are compelled to demonstrate that which they have hitherto been content, in the main, merely to assert” (Walras 1954: 427). Such a study, he believed, was to be led at a high level of abstraction.⁴ These two visions can be compared along different dimensions.

1.1 *Reasoning style: mathematical versus non-mathematical.* Walras was of the view that the mathematical language is compelling. This followed directly from his vision of economics. Marshall’s standpoint was ambiguous. Though he found mathematics useful for testing the consistency of economic reasoning, he believed that it was better to confine it to the appendices of theoretical works.

1.2 *Theory/model relations.* Marshall regarded a theory and a model as two separate entities. Theoretical propositions are deemed to pertain to the real world and to explain real-world events, ideally in a causal way. Models are subservient to theory, serving the purpose of checking the logical validity of theoretical propositions. One pre-condition for their usefulness is that, though false by definition, they capture some essential trait of their object of analysis. The matter is different when it comes to Walras. To him, a theory and a model were one and the same thing, necessarily a mathematical model. In this view, theoretical propositions pertain to the fictitious model economies created by economists rather than to the real world.

1.3 *Eclecticism or monism:* Pragmatic economists like Marshall find it apposite to use different models according to the issues they are addressing, even if these models turn out to be loosely connected. Not so for Walras. *The Elements* was composed of nested models. Its first model studies a two-good exchange economy with agents on each side of the market exclusively endowed with one of them. In modern parlance, it would be called his baseline model. Its purpose is to elicit the decision rule that agents must adopt in order to behave in an optimizing way (the equality of the marginal rates of substitution ratio with their relative price

⁴ The following passage from Marshall’s *Principles* illustrates his opinion about Walras’s vision: “The need for such guidance [into the practical conduct of life] was never so urgent as now; a later generation may have more abundant leisure than we for researches that throw light on obscure points of abstract speculation, or in the history of past time but do not afford immediate aim in present difficulties” (1920: 42-3).

ratio). All the subsequent models, each expanding on the previous one, remain anchored in the same decision rule. This is methodological monism.

1.4 *The overarching methodological imperative.* The choice here is between external consistency (or realism) and internal (or logical) consistency.⁵ The former was clearly Marshall's overarching priority, but his pragmatism was such that he never experienced the need to choose between realism and logical consistency. For his part, Walras experienced a dilemma and opted for sacrificing external to internal consistency. In the first edition of *The Elements*, he wanted to remain close to Adam Smith's explanation of the competitive process. To this end, he assumed that the equilibrium of the economy resulted from a trial and error process, exchanges taking places as disequilibrium prices yet moving gradually to their equilibrium values. Unfortunately for him, Bertrand and Edgeworth set their sight on his analysis and found it wanting, claiming that the existence of out-of-equilibrium trading generates a path-dependency problem. As a result, even if the adjustment process were to converge towards equilibrium, the attained equilibrium would be different from that obtained without 'false trading.' Walras's initial reaction to this critique was one of denial, but he progressively came to realize that they were right. After much hesitation a long agonizing, in the fourth edition of the *Elements* (more than twenty years after its first edition), he resigned himself to excluding the disturbing assumption. In Bridel's words, "caught again between theoretical rigor and greater realism, Walras gave up without hesitation the latter for the sake of the former" (1997: 34).

1.5 *Theory/measurement.* By measurement, I mean engaging in original empirical measurement work, which is more than merely collecting data. In principle, two forks of the road presented themselves to early neoclassical economists: engaging either in purely theoretical contributions or in contributions mixing theory and measurement. Both Marshall's *Principles* and Walras's *Elements* are pure theory works. However, Marshall was inclined to engage in the search of empirical evidence. Walras, for his part, was of the opposite opinion, holding the view that pure theory requires no confirmation from reality.

Table 1 summarizes this.

Table 1. The contrast between Marshall's and Walras's visions of economics⁶

		Marshall	Walras
General characterization:	pragmatic vision	✓	
	principled vision		✓
Dimensions: 1.1 Reasoning style:	mainly in prose	✓	
	mathematical		✓
1.2 Theory/model relation:	theory ≠ model	✓	
	theory = model		✓
1.3 Eclecticism/monism:	eclecticism	✓	
	monism		✓

⁵ See Wren-Lewis (2011).

⁶ Here as well as in the subsequent tables, slots in grey indicate that alternative bifurcations have been taken.

1.4 Overarching methodological imperative:	external consistency	✓	
	internal consistency		✓
1.5 Theory/measurement:	in favor	✓	
	opposed		✓

2. Basic methodological nodes

My aim here is to identify the basic methodological nodes which Marshall and Walras faced in their theoretical endeavor. My list of such nodes comprises seven items.

2.1 *Equilibrium concept*. Two bifurcations are possible. The first is adopting the state of rest concept, which has a common-sense ring. In this understanding, equilibrium has the status of a center of gravity. It has a twofold meaning: it can refer to the center of gravity allocation – this is the fundamental meaning – or to any allocation arising at the closure of the market period – the subordinate meaning. This state of rest is not supposed to be always (or even ever) realized. What matters is that disequilibrium states trigger a re-equilibration process. “The ordinary economic situation is one of disequilibrium moving in the direction of equilibrium rather than of realized equilibrium” (Viner 1953: 206). Two other features must be mentioned. First, it is assumed that no irreversible change in the basic data of the market or of the economy occurs over the period studied. Shocks may occur but their effects are temporary. At the end of this period, the market, or economy, is assumed to return to the equilibrium allocation that prevailed at its beginning. Second, only intra-periods of exchanges are assumed to take place. The alternative bifurcation consists in adopting the intertemporal equilibrium concept. Here, time is cast as a succession of dated points of exchanges. Irreversible changes are possible. Moreover, equilibrium is no longer a two-tier construct – hence, it has a non-equivocal meaning, that is generalized optimizing behavior. Since in this bifurcation inter-market period substitution is deemed possible in addition to intra-market period substitution, optimizing behavior means choosing an optimizing intertemporal *path*. Finally, the existence of equilibrium is postulated.⁷ As a result, the disequilibrium notion can be dispensed with.

Treading classical political economists’ footsteps, Marshall adopted the state of rest concept, calling the subsidiary concept ‘temporary equilibrium’ or ‘market equilibrium’ and the fundamental one, ‘normal equilibrium.’⁸ As for the intertemporal equilibrium concept, it has its roots in Walras’s *Elements*. In the first edition, Walras still adhered to the state of rest view of equilibrium. Yet, as seen above, over its subsequent editions, he decided to exclude ‘out of equilibrium’ outcomes from his theoretical construct. Likewise, when coming to grips with the market for equipment goods in his capital formation and credit model, he started to think

⁷ Whenever equilibrium is regarded as a characteristic of reality, this standpoint looks unacceptable. Yet it makes sense when, in accordance with Node 1.2, theoretical propositions are meant to refer to fictitious model economies rather than to real-world ones. “Cleared markets is simply a principle, not verifiable by direct observation, which may or may not be useful in constructing successful hypotheses about the behavior of these series” (Lucas and Sargent 1979: 64).

⁸ In the present day, economists talk rather about ‘short-run’ and ‘long-run’ equilibrium, in my eyes, an unfortunate terminology. Hence, I will stick to Marshall’s terminology.

in intertemporal terms by bringing expectations into the picture. Therefore, I regard him as a forbear of Hicks, and later Arrow and Debreu, and still later DSGE macroeconomists with whom the intertemporal equilibrium concept is associated.⁹

2.2 Object of analysis. This bifurcation separates the study of isolated markets and that of the economy as a whole. The first deals with trading experiments confined to a single market or to the relationship between a few markets, the goods of which are either substitutes or complements – that is, partial equilibrium analysis. The second deals with the workings of an entire economy, that is general equilibrium analysis. With a few exceptions, Marshall opted for the first. Walras stuck to the second. The ‘economy’ notion requires additional comments. A standard definition of it is provided by Arrow and Debreu. They define an economy as an array of heterogeneous agents, displaying endowments and preferences, and of production technologies. I would like to complement this definition with the consideration of trade technology aspects. When this is done, it may be that economies which are identical according to the Arrow-Debreu definition differ with respect to trade technology. This leads me to introduce a sub-node differentiating the ‘Walrasian economy’ and the ‘Marshallian economy’ bifurcations.

2.2.a. A Walrasian economy. A Walrasian economy is a grand single market encompassing all agents and all goods and services and wherein, at each period of trading, all exchanges occur in a single stroke. Agents are price takers, hence the need for a third-party character, the auctioneer. She is the driving force allowing the realization of equilibrium. Her role is to announce prices and change them until a price vector making all agents’ optimizing plans compatible is obtained. Until this result is obtained, agents do not interact; they are merely in a binary relationship with the auctioneer. Worth noticing is the ambivalent character of the Walrasian economy. On the one hand, it is a private economy; on the other hand, it is a planning economy. In such an economy, nothing happens before equilibrium is attained. In other words, trade occurs before production. It is then small wonder that the disequilibrium notion is unnecessary to explain the workings of this economy.

2.2.b A Marshallian economy. Turning to the Marshallian economy, it is an entity composed of separate markets. In each of them, a particular good or service is exchanged against money. They function separately, yet a mechanism making the market outcomes compatible is supposedly present (more on this presently). Marshall himself did not bother to come to grips with the study of such an economy. Keynes did so, but in a narrative way. The IS-LM model can be regarded as the first attempt at formalizing the workings of a Marshallian economy. Later in the paper, I shall argue that DSGE modeling has a Marshallian economy for object of study. The specific trade technology traits of this economy can be reconstructed by extrapolating from what is known about the functioning of Marshallian markets. Marshall assumed that agents are nominal price/quantity makers. They go on the market and announce

⁹ For a more in-depth study of Walras’s view of equilibrium, see Donzelli (2007) and Jaffé ([1981] 1983).

price and quantity mixes forming their demand or supply function. It is supposed that individual supply and demand functions can be aggregated into market supply and demand functions. Market equilibrium exists when suppliers and demanders agree on a single price/quantity mix. Moreover, in a Marshallian economy, the price-formation process is more complicated than in the Walrasian economy because two equilibration processes must be considered. As far as market-period equilibration is concerned, the mechanism ensuring its attainment is the assumption that agents have the correct model of the workings of markets at their command, and have enough information to foresee the market equilibrium allocation.¹⁰ In such a case, neither a supplier nor a demander will ever find an agent from the opposite side of the market willing to trade at a price either higher or lower than the equilibrium price. The second type of adjustment process is the attainment of normal equilibrium which arises whenever market clearing and disequilibrium coexist. In Marshall's reasoning, this all hinges on what is going on in producers' minds. Incentives are the equilibrating mechanism. Once producers are aware that the discrepancy between market-period and normal conditions is lasting, it is in their interest to change the quantity produced until normal equilibrium is returned to. As for the order in which trade and production take place, Marshall's pragmatism led him to assume that production takes place in advance of exchange – after all, this is what usually happens in reality. This translates into having input and intermediary markets operate before final goods markets.

2.3 Real or monetary analysis? An apt description of this node is to be found in J. Schumpeter's *History of Economic Analysis* book:

Real analysis proceeds from the principle that all the essential phenomena of economic life are capable of being described in terms of goods and services, of decisions about them, and of relations between them. ... Monetary analysis introduces the element of money on the very ground floor of our analytical structure and abandons the idea that all essential features of economic life are represented by a barter-economy model (Schumpeter 1954 277-8).

Marshall took the monetary analysis bifurcation, Walras the real analysis one.

2.4 Implicit versus explicit microfoundations. Microfoundations refers to the methodological standard stating that aggregates are grounded in individual agents' optimizing decision-making – a principle on which all neoclassical economists agree. However, Marshall and Walras implemented it differently. While Marshall was keen to derive firms' input demand functions and output supply functions from maximizing behavior, he did not bother to do so for households. As far as they are concerned, he found it acceptable to skip the formal derivation of their market demand and supply functions from their individual decisional process. This I is the 'implicit microfoundations' bifurcation. For his part, Walras strongly believed that all aggregate functions needed to be explicitly microfounded.

¹⁰ "Though everyone acts for himself, his knowledge of what others are doing is supposed to be generally sufficient to prevent him from taking a lower or paying a higher price than others are doing. This is assumed provisionally to be true both of finished goods and of their factors of production, of the hire of labor and of the borrowing of capital. ... I assume that there is only one price in the market at one and the same time" (Marshall 1920: 341; my emphasis).

2.5 Competition. In the Walrasian approach, perfect competition and the price-taking assumption are one and the same, this selfsameness resulting from the adoption of the auctioneer trade technology. Whenever Walrasian models depart from the Walrasian baseline model – for example through the introduction of multiple equilibria, public goods, externalities, increasing returns or incomplete markets – the price-taking assumption remains at work. No departure from perfect competition occurs. Here also, Marshall takes a totally different standpoint. In the introduction to his *Principles*, he discusses competition in a discursive way, without referring to the perfectness of competition and the conditions thereof. For a more precise characterization of what perfect competition *à la* Marshall means, we have to turn to the next generation of Marshallian economists. For example, Frank Knight mentioned no less than nine requirements for perfect competition, among which perfect mobility, perfect communication between individuals, and the exclusion of all forms of collusion (Knight 1921: 76 seq.). What is interesting for my purpose in Knight's view is that competition becomes a matter of degree. In other words, the Marshallian approach, unlike the Walrasian one, is congenial to departures from perfect competition.¹¹

2.6 Information. Quite understandably, the founders of the neoclassical approach did not delve into information problems. Their viewpoint was deterministic. Both Marshall and Walras implicitly assumed that agents hold perfect information. Yet perfect information *à la* Marshall is different from perfect information *à la* Walras. As made clear in his corn model, Marshall assumed that agents were able to conjecture the market-day equilibrium price. This implies that agents know the supply and demand functions. In Walras's theory, agents' information domain is narrower than in Marshall's. Because of the presence of the auctioneer, agents do not need to be knowledgeable about market excess demand functions

2.7 Flexibility, rigidity, and sluggishness. These notions are abundantly used in economic writings, especially in macroeconomics, but they are scarcely defined precisely. My way of filling this lacuna is as follows. Look first at what happens on a given market period in both the Marshallian and the Walrasian approaches. I define a flexible price as a price – instantaneously attained as explained earlier – whose formation encounters no exogenous impediment. Market clearing thus ensues. Symmetrically, prices are rigid whenever such an impediment exists. In elementary neoclassical economics, there is only one cause for rigidity, an exogenous price ceiling or floor. A rationing outcome or lack of market clearing result ensues. Turning to sluggishness, the first thing to say is that it cannot arise as a market-period occurrence either in the Marshallian or in the Walrasian approach because market-period equilibrium occurs instantaneously. However, it makes sense in the Marshallian approach when it comes to returning to normal equilibrium after a disequilibrium has arisen, an inter-market period phenomenon. As soon as this process is time-taking, as Marshall liked to assume, sluggishness enters the picture. In other words, sluggishness and correction of

¹¹ Whenever imperfect competition prevails, one side of the market unilaterally sets the price/quantity mix.

disequilibria go hand in hand in the Marshallian approach. If these definitions are accepted, rigidity cannot be regarded as an extreme case of sluggishness as they relate to distinct adjustment processes.

Table 2 summarizes.

Table 2. The Marshall/Walras divide. *Implementation bifurcations*

		Marshall	Walras
Basic methodological nodes	state of rest equilibrium	✓	
	intertemporal equilibrium		✓
2.1 Equilibrium:	isolated markets	✓	
	an entire economy (a Walrasian economy)		✓
2.2 Object of analysis:	monetary	✓	
	real		✓
2.3 Real or monetary analysis:	implicit	✓	
	explicit		✓
2.4 Microfoundations:	perfect competition <i>à la</i> Marshall	✓	
	perfect competition <i>à la</i> Walras		✓
2.5 Competition:	perfect information <i>à la</i> Marshall	✓	
	perfect information <i>à la</i> Walras		✓
2.6 Information	market-period flexibility with inter-period sluggishness	✓	
	market-period flexibility		✓

It must be noticed that the two approaches testify to a specific internal consistency. Let me give just one example. Adopting the Marshallian trade technology, wherein production precedes exchange, implies the possibility of disequilibrium states in which firms have an incentive to change their behavior. The contrary is true when adopting the Walrasian trade technology because in the latter the formation of equilibrium precedes production. The Austrian approach, not studied here, is another consistent gathering of bifurcations within neoclassical economics. However, while there are alternative ways in which neoclassical economics can be developed, they are limited in number.

The scene is now set for addressing the heart of the paper, making sense of the history of macroeconomics using the decision-tree framework. As illustrated in Figure 1, this history can be regarded as a succession of transformations, most of them generating controversies. In this paper, I limit myself to studying the more recent turns, from Keynesian macroeconomics to new classical or Lucasian macroeconomics (I will use both appellations), from the Lucas model to RBC modeling, and from RBC modeling to DSGE modeling. For each of them, I will proceed in two steps.¹² In the first, I consider general nodes related to their visions of macroeconomics. In the second, I focus on changes in more specific nodes involving the implementation of the general visions.

¹² In an earlier section I discussed the vision of economics of Marshall and Walras. Here my concern is narrower as it pertains to the vision held about macroeconomics.

KEYNESIAN VERSUS NEW CLASSICAL MACROECONOMICS

The expression ‘scientific revolution’ has often been overused, but if there is one episode in the history of macroeconomics deserving to be called thusly, it is the replacement of Keynesian macroeconomics with new classical macroeconomics, the first stage in the DSGE program.¹³ This appears clearly when contrasting the visions of macroeconomics held respectively by Keynesian and new classical macroeconomics, personified under Lucas’s name, as done in Table 3.

Table 3. Contrasting the Keynesian and the Lucasian general visions of macroeconomics¹⁴

		Keynesian vision	Lucasian vision
1.1 Aim:	explaining involuntary unemployment or underemployment	✓	
	constructing a theory of the business cycle		✓
1.2 Stability:	existence of market failures	✓	
	the market economy is stable (M&W)		✓
1.3 Theory/model relation:	theory ≠ model (M)	✓	
	theory = model (W)		✓
1.4 Theory/measurement:	theory + measurement	✓	✓
1.5 Eclecticism/monism:	as many models as needed (M)	✓	✓
	single baseline model (W)		✓
1.6 Overarching methodological imperative:	external consistency (M)	✓	✓
	internal consistency (W)		✓
1.7 Strict standards for ‘good’ scientific practice:	Absent	✓	
	Present		✓

Node 1.1 *Aim*. Keynes’s purpose when writing his *Treatise on Money* (1930) was to construct a theory of business cycles. With the book barely finished, Keynes admitted that it was hardly a success – according to Lucas, because Keynes lacked the proper apparatus to implement his project. Then came the Great Depression. Its onset

... did nothing to improve Keynes’s equipment for understanding the business cycle, viewed as a recurrent sequence of booms and depressions. Instead, it permitted him to reformulate the problem itself as one of accounting for the level of output and employment at a point in time, as opposed to one of accounting for a particular pattern repeated in the time series. This simpler problem was one on which progress could be made at the Marshallian level of analysis on which Keynes was a master (Lucas 1980: 700).

What was impossible in Keynes’s age, Lucas claimed, ceased to be so in the 1970s thanks to the existence of dynamic programming, of the Arrow-Debreu conceptual toolbox, and of the intertemporal equilibrium concept. Thus, the time had come to return to Keynes’s initial project.

Node 1.2 *Stability*. This node points to a difference in premise between the generic neoclassical and Keynesian visions of macroeconomics. The former takes for granted that the market economy is stable – that is, market forces are effective in bringing market economies

¹³ On this, see Wren-Lewis (2016).

¹⁴ Slots colored in grey indicate opposite standpoints. **M** means Marshall, **W** Walras. These signs indicate the methodological belonging of the bifurcations considered. The bifurcation taken in node 1.6 is colored blue in order to indicate that Lucas straddles two bifurcations which up to now were surmised to be incompatible.

to a single optimal equilibrium allocation. Two implications follow. The first concerns the theory-building strategy: the analysis must start with the study of the equilibrium outcome. The study of imperfections, frictions, and complicating factors is postponed to a further stage of the theoretical construction. The second implication concerns policy: if markets are stable, no major reason exists for governmental intervention in the economy. The Keynesian vision of macroeconomics, common to Keynes himself and to the first generation of Keynesian economists, is based on the opposite premise. Their basic intuition is that real-world market economies experience market failures – especially aggregate demand deficiencies – which market forces are unable to remedy. Again, two implications follow. The first concerns theory construction: from the onset, the flaw must be present in the theoretical discourse. The first generation of IS-LM models did this.¹⁵ They comprised two variants, the classical and the Keynesian ones. In the former, nominal wages are assumedly flexible, in the latter, rigid. Keynesians considered the Keynesian variant as the right depiction of reality and the classical model as a mere foil. The second implication is that governments must engage in demand activation in order to fix the problem.

Node 1.3 *Theory/model relation*. Here, there is nothing to be added to the above discussion.

Node 1.4 *Theory/measurement*. The move toward measurement started within Keynesian macroeconomics with the rise of structural modeling which was spurred by L. Klein. It amounted to making Keynesian macroeconomists adhere to Friedman's positivist creed, according to which models are validated through empirical resting. While Lucas was highly critical of Keynesian macroeconomics, he nonetheless hailed it for having taken the econometric turn. In his words:

One exhibits understanding of business cycles by constructing a *model* in the most literal sense: a fully articulated artificial economy which behaves through time so as to imitate closely the times series behavior of actual economies. 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 be viewed as 'theories' at all (Lucas [1977] 1981a: 219).

The Keynesian and the Lucasian standpoints thus are close as far as the basic theory/measurement node is concerned. As will be seen in Table 4, this ceases to be true when sub-nodes are introduced.

Node 1.5 *Eclecticism/monism*. Keynesian macroeconomics was eclectic. Explicit microfoundations were present at times (in sectorial studies), but not always (the IS-LM model). Some models were partial equilibrium, others not. Rational expectations were deemed useful for some markets, adaptive expectations for other ones. Econometric models took on a life of their own, drifting away from theory. Lucas wanted this eclecticism to cease. Methodological monism was to be the rule.

Node 1.6 *Overarching methodological imperative*. In Table 1, I associated the 'external consistency' bifurcation with Marshall and the 'logical consistency' bifurcation with Walras.

¹⁵ See for example Allen (1967, Chapter 7).

After the rise of econometric modeling, emphasis on real-world relevance led econometric models to be more data- than theory-driven. ‘Big is good’ was the motto.¹⁶ Keynesian macroeconomists must be classified as Marshallian on this node. Lucas’s standpoint was more complex. I regard him as having walked a tight rope. In Lucas ([1980] 1981), he made it clear that the type of transformation of macroeconomics that he wanted to implement amounted to moving it from the Marshallian to the Walrasian approach, hence the ‘priority to logical consistency’ bifurcation. However, he did not want to forego the applied character of macroeconomics and its positivist attitude – a standpoint that is hardly congruent with the Walrasian approach. Walrasian economists regard general equilibrium theory as an abstract construction, the strength of which lies in its ability to posit issues in a rigorous way. As far as explaining reality is concerned, they consider that the best it can do is provide a negative benchmark. Nor do they think that their theory should be assessed on the grounds of its ability to withstand falsification. The same holds for policymaking. Claiming that the Walrasian model can be useful for policy is a long shot. In short, Lucas wanted to reconcile Walras’s principled attitude and Friedman’s positivism. Hence my double check mark in node 1.6. Some may regard this standpoint as wanting to have one’s cake and eating it too. Others may hail it as an audacious breakthrough.

Node 1.7 *Strict standards*. This new node points to Lucas’s most lasting impact, namely having set up “particular sets of rules and techniques to model aggregative economic observations” (Manuelli and Sargent 1988: 523). Translating this remark into the vocabulary used in this paper, Lucas’s contention was that the time had come to make several bifurcations compulsory:

- the general equilibrium analysis bifurcation
- the intertemporal equilibrium concept bifurcation
- the explicit microfoundations bifurcation
- the rational expectation bifurcation
- the stochastic shock bifurcation
- the deeply structural model bifurcation.

No such standards were present in Keynesian macroeconomics. Lucas (and Sargent) succeeded in convincing the profession that they were the *sine qua non* for ‘good’ scientific practice, thereby also acting as admissibility criteria for publication in top journals.

The conclusion to be drawn from Table 3 is that indeed Keynesian and new classical macroeconomics (that is, the DSGE program) are based on radically different visions of the field’s research strategy.

¹⁶ In Klein’s words: “In contrast with the parsimonious view of natural simplicity, I believe that economic life is enormously complicated and that the successful model will try to build in as much of the complicated interrelationships as possible. That is why I want to work with large econometric models and a great deal of computer power. Instead of the rule of parsimony, I prefer the following rule: the largest possible system that can be managed and that can explain the main economic magnitudes as well as the parsimonious system is the better system to develop and use” (Klein 1992: 184).

In Table 4, I show how these changes in vision came to be translated into specific bifurcations. The shaded bifurcations are Lucas's standards. As far as the other nodes are concerned, the bifurcations are not compulsory. This is the case for competition, information, types of shocks, flexibility/rigidity, and trade technology. The shaded check marks indicate that the Keynesian and the new classical movements took different bifurcations. For all of them, except node 2.3, the Keynes/Lucas and the Marshall/Walras divide coincide. Some departures are more important than others, and the most important ones coincide with Lucas's standards. Within these, rational expectations are often regarded as the game changer. For my part, I find the shift from the state of the rest to the intertemporal equilibrium concept as important.¹⁷ As far as measurement is concerned, the Lucas critique and the ensuing injunction for deeply structural models was also a turning point.

Table 4. The contrast between Keynesian and new classical macroeconomics. *Implementation bifurcations*

		Keynesian macro	Lucasian macro	
Basic methodological nodes				
2.1 Equilibrium:	state of rest equilibrium	✓		
	intertemporal equilibrium		✓	
2.2 Object of analysis:	isolated markets	✓		
	an entire economy:	Marshallian economy	✓	
		Walrasian economy		✓
2.3 Real or monetary analysis:	monetary	✓	✓	
2.4 Microfoundations:	implicit	✓		
	explicit		✓	
2.5 Competition:	perfect competition <i>à la</i> Marshall	✓		
	perfect competition <i>à la</i> Walras		✓	
2.6 Information:	perfect information <i>à la</i> Marshall	✓		
	signal-extracting problem		✓	
2.7 Flexibility, sluggishness, rigidity:	market-period rigidity	✓		
	market-period flexibility		✓	
Additional nodes				
2.8 Labor market :	present (with unemployment or underemployment)	✓		
	absent		✓	
2.9 Expectations:	if any, adaptive expectations	✓		
	rational expectations		✓	
2.10 Shocks:	type	demand shocks	✓	
		combination of real and monetary shocks		✓
	nature:	deterministic	✓	
		stochastic		✓
2.11 Money neutrality:	non-neutrality:	serving the Keynesian cause	✓	
		serving the monetarist cause		✓
2.12 Measurement:	estimation: econometrics	✓	✓	

¹⁷ It allowed the introduction of a richer dynamics concept in replacement of the dynamics concept at work in state of rest equilibrium. In Lucas's words: "Dynamic theory — I mean theory in the sense of models that one can write down and *do* something with, not in the sense of 'opinion' or 'belief' — has simply be reinvented in the last 40 years. ... While Keynes and the other founders of what we now call macroeconomics were obliged to rely on Marshallian ingenuity to tease some useful dynamics out of purely static theory, the modern theorist is much better equipped to state exactly the problem he wants to study and then to study it" (Lucas 1987: 2).

	overarching constraint :	data availability	✓	
		theory		✓
	admissible models:	structural models	✓	
		deeply structural models		✓
	achievement:	replication	✓	✓
forecasting		✓		

Lastly, comparing Tables 3 and 4 sheds light on the relationship between Keynes (and Keynesian macroeconomics), on the one hand, and the neoclassical approach, on the other. Keynes can be regarded as an anti-neoclassical economist because he wanted to overthrow the basic premise of the *generic* neoclassical approach, according to which the market system is stable to the effect that government must take a hands-off attitude toward policy. Yet his way of implementing this project consisted in adopting and expanding the *Marshallian* set of methodological choices, which makes his work neoclassical in another sense. In sum, he wanted to use the language of Marshall, a neoclassical economist, to move away from the neoclassical vision of economics – definitely a paradoxical project. Keynesian macroeconomists followed suit.

THE TURN FROM NEW CLASSICAL TO RBC MACROECONOMICS

Though clever and original, Lucas’s model was short lived. Few economists were convinced by its central idea that changes in the money supply raised a serious signal-extracting problem. Moreover, even economists who were impressed by it did not know how to pursue the line it opened. What saved the DSGE program was the rise of RBC macroeconomics, which originated in Kydland and Prescott’s “Time to build and aggregate fluctuations” paper (1982).

Kydland and Prescott’s contribution was both theoretical and applied. They constructed a model determining the optimal consumption/leisure equilibrium path of an economy inhabited by identical, infinitely-lived agents, and subjected to stochastic TFP shocks. They used it to replicate a few selected second moments of US time series over the 1950-75 period.¹⁸ Their 1982 model had four special features. First, it aimed at explaining business fluctuations as resulting from technology shocks, leaving aside any money non-neutrality aspect. Second, it studied a competitive economy through the proxy of a planning economy. Third, it led macroeconomics into the age of computers by using numerical approximations. Fourth, it used calibration rather than econometric testing for empirical assessment.

What made their work stunning is that, while resting on just one shock and six parameters, their model had a better fit than other ones which contained dozens of equations

¹⁸ “To answer this question [of how volatile the US postwar economy would have been if technology shocks had been the only contributor to business-cycle fluctuations] a model economy with only technology shocks was needed. Using the standard neoclassical production function, standard preferences to describe people’s willingness to substitute intra- and inter-temporally between consumption and leisure, and an estimate of the technology shock variance, we found that the model economy displays business cycle fluctuations 70 percent as large as did the U.S. economy. This number is our answer to the posed question” (Kydland and Prescott 1996: 74).

and many more free parameters. As stated by Plosser, that such a simple model “with no government, no money, no market failures of any kind, rational expectations, no adjustment costs and identical agents could replicate actual experiences this well is most surprising” (Plosser 1989: 65).

The initial reception of Kydland and Prescott’s article was lukewarm. Yet, gradually, what had just been a tiny new offshoot on the still tiny new DSGE sub-branch of macroeconomics became sturdier.¹⁹

Table 5 compares the vision of macroeconomics underpinning Lucasian and RBC modeling.

Table 5. Comparing the Lucasian and the RBC general visions of macroeconomics

		Lucas	RBC
1.1 Aim:	constructing a theory of the business cycle	✓	✓
1.2 Stability:	the market economy is stable (M&W)	✓	✓
1.3 Theory/model relation:	theory = model (W)	✓	✓
1.4 Eclecticism/monism:	monism (a single baseline model) (W)	✓	✓
1.5 Overarching methodological imperative:	external consistency (M)	✓	✓
	internal consistency (W)	✓	✓
1.6 Strict standards for ‘good’ scientific practice:	Present	✓	✓

Table 3 indicated that there was a gulf between Keynesian and Lucasian macroeconomics. Table 5 indicates that, as far as their vision of economics is concerned, Lucas and Kydland and Prescott see eye to eye. However, beyond this commonality, significant departures are also present. They are identified in Table 6, which refers to the RBC baseline model (King, Plosser, and Rebelo 1988).

The first departures to be noticed are the abandonment of a monetary perspective (node 2.3), the replacement of monetary shocks by technology shocks (node 2.10), the change in information set-up (node 2.6), and the change in measurement tool from deeply structural modeling to calibration (node 2.12). All these bifurcation changes are indeed significant. Nonetheless, the change that I wish to insist on – because it is never mentioned – relates to node 2.2 (object of analysis) and impinges on several other nodes.

Table 6. The turn from Lucas to RBC modeling. *Implementation bifurcations*

		Lucasian macro	RBC macro
Basic methodological nodes			
2.1 Equilibrium:	intertemporal equilibrium	✓	✓
2.2 Object of analysis:	an entire economy, a Walrasian economy	✓	
	a set of individuals living in autarky		✓
2.3 Real or monetary analysis:	monetary	✓	

¹⁹ In a further stage, growth and business fluctuations happened to become the two sides of the same coin, the Solow model, growth (business fluctuations) being concerned with its deterministic (stochastic) component with the technology shock equated with the Solow residual.

	real		✓
2.4 Microfoundations:	explicit	✓	✓
2.5 Competition:	perfect competition <i>à la</i> Walras	✓	
	irrelevant		✓
2.6 Information:	signal-extracting problem	✓	
	agents are knowledgeable about the states of nature		✓
2.7 Flexibility, sluggishness, rigidity:	market-period flexibility	✓	
	irrelevant		✓
Additional nodes			
2.8 Labor market :	absent	✓	✓
2.9 Expectations:	rational expectations	✓	✓
2.10 Shocks:	type:	combination of real and monetary shocks	✓
		total factor productivity shocks	
	nature: stochastic	✓	✓
2.12 Measurement:	technique:	econometrics	✓
		calibration	
	main achievement: replication	✓	✓

Up to now, I have assumed that node 2.2 comprises only two bifurcations, the study of particular markets or that of an entire economy. At this juncture, a third bifurcation needs to be introduced in which the object of analysis is ‘a set if individuals living in autarky.’ The standard characterization of the baseline RBC model is that it studies a planning economy composed of identical agents. Strictly speaking, this account is false. My dissent is less on the word ‘planning’ than on the word ‘economy.’ As seen in a previous section, an economy can be defined in an Arrow-Debreu way or in a trade technology one. It is the latter that matters here. According to its broadest trade technology definition, an economy is an institutional set-up allowing people to consume goods and services that they have not produced. This definition encompasses both the planning and the market economy, the Marshallian and the Walrasian economies being two variants of the second. Against this definition, the notion of a one-person economy is an oxymoron. Declaring that people barter with themselves amounts to confusing allocation of time and exchange. The object of study of the baseline RBC model – an array of agents living in autarky who consume only what they have produced and produce only what they will consume – is not an economy, be it a Marshallian or a Walrasian one.

Most, if not all, presentations of the baseline model hide this feature. Take the King *et al.* paper. They write: “We consider an economy populated by many identical infinitely-lived individuals with preferences over goods and leisure ...” (1988: 198). It is taken for granted that the notion of an ‘economy’ is apposite, perhaps on the grounds that there are many individuals. Notice that they write ‘goods’ in the plural, which suggests an opportunity to trade. It is true that there are different goods in the economic sense of the word since they are consumed at different points in time. Yet there is just a single physical good which is at the same time a consumer and a capital good. Capital accumulation and resource constraint having been defined, the model “focuses on the optimal *quantities* chosen by a social planner

or representative agent directly operating the technology of the economy” (1988: 200). This statement calls for three remarks. First, the emphasis is mine because I want to underline that prices play no role in this model. The baseline model is solved exclusively in quantity terms. Nothing is said about whether *traded* quantities as opposed to *self-consumed* ones exist, or about how total production is allocated across agents. It is small wonder that this is the case; the agents are self-employed agents (a trait that often remains unmentioned). If so, and if there is a single physical good, no reason for exchange exists. Second, in a planning economy, the planner dictates to the agents in the economy what they must produce and consume, which implies that the planner and the agents are different actors. In the RBC baseline model, the planner and the agent are one and the same person. Third, the reference to the representative agent is odd as well. This notion was introduced by Marshall in order to deal with the fact that firms are different in age from each other. Yet in the RBC baseline model, agents are identical. Hence there is no need for averaging them. The theorist may pick any agent as her object of study, and the result obtained will be valid for the whole set of agents.²⁰

Of course, RBC economists had something different in the back of their minds when devising the RBC modeling strategy. The baseline model serves as a springboard for the study of market economies. The values that are plugged into RBC models for simulations are drawn from real-world time series. Yet this does not warrant describing it as if it were a market economy. And there is no need to invoke the second theorem of welfare.

The above remarks makes the nice replication result of Kydland and Prescott’s model even more striking. Who on earth would have bet a penny on a project pursuing the ambition of mimicking real-world US time series over a quarter of a century on the basis of a Robinson-Crusoe type model? This is Friedman’s ‘as if’ principle, exponentially augmented. Yet Kydland and Prescott won the wager. Still, skeptics would not be convinced and would declare their modeling strategy a hopeless wreck. For those who accept the positivist claim that the validity of a theory hinges on its ability to replicate real-world data – as most macroeconomists do – Kydland and Prescott struck a strong blow.

A further remark is called for. The fact that the turn initiated by Kydland and Prescott was so highly counter-intuitive does not suffice to disqualify it. Ramsey-like models with heterogeneous agents exist. Hence it may be surmised that the choice of taking the ‘autarkical agents’ bifurcation was made for tractability reasons. The RBC enterprise of building an equilibrium model of the business cycle, the argument might run, is sufficiently daunting to temporarily put aside the most essential premise of macroeconomics. In this line of thought, models should not be judged as final products, but rather on whether they lead to being successfully superseded. If this is the case, and if it turns out that in subsequent models a

²⁰ Hence the oft-made criticism that RBC modeling is off the mark because resting on a representative agent is misdirected. Properly stated, it should bear on the absence of trade!

return to studying an ‘economy’ occurs, the autarky episode can be hailed as an acceptable detour.

The conclusion to be drawn from the above remarks is subtle. As far as its object of analysis is concerned, RBC modeling is neither Walrasian nor Marshallian. It is also non-Walrasian on the ground of its adoption of the positivist standpoint. Nonetheless, it is Walrasian in other respects. Returning to Table 5 (vision of macroeconomics), it is generically neoclassical with respect to node 1.2 (stability). It adheres to the Walrasian line on nodes 1.3 (theory/model relation) and 1.4 (eclecticism/monism). As for Table 6, it also takes the Walrasian line on two important markers, nodes 2.1 (equilibrium) and 2.4 (microfoundations). The final word is then that in spite of being non-Walrasian on two scores RBC modeling nonetheless rests a Walrasian methodological principles.

THE TURN FROM RBC TO DSGE MODELING

In the middle of the 1990s, a new turn occurred under the stewardship of economists such as J. Gali, M. Woodford, L. Christiano, M. Eichenbaum and C. Evans, and M. Gertler. It constitutes an offshoot of RBC modeling, a third wave in the development of the DSGE *program*, and abides by the standards defined by Lucas.²¹ While it goes by several names: ‘DSGE’ models, ‘new Keynesian’ models, or ‘new neoclassical synthesis,’ I use the DSGE *modeling* expression.

Three papers can be regarded as mileposts over the course of its short history. The first one was R. Clarida, Gali and Gertler’s 1999 article, “The Science of Monetary Policy: A New Keynesian Perspective.” One of its appeals is its rephrasing of IS-LM categories into the DSGE language. Their model has three equations, an intertemporal IS equation, an intertemporal Phillips curve equation (with expectations bearing on one period ahead rather than on the current period), and a Taylor-rule-like equation capturing the fixing of the nominal interest rate by the central bank. The second landmark piece was Christiano, Eichenbaum, and Evans’s 2005 (first circulation in 2001) article, “Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy.” Their model comprises financial intermediaries, and monetary and fiscal authorities. Its main emphasis is on monetary policy shocks, but it also introduces multiple distortions, in particular Calvo pricing both in the labor market and the intermediary goods market. The third game-changing paper was F. Smets and R. Wouters’s 2003 article “An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area”.

Table 7. Visions of economics. Comparing Lucas, RBC, and DSGE modeling

		Lucas	RBC	DSGE
1.1 Aim:	constructing a theory of the business cycle	✓	✓	✓
1.2 Stability:	the market economy is stable (M&W)	✓	✓	✓
	optimality: optimal outcome (W)	✓	✓	

²¹ As stated by Gali, it has a “core structure that corresponds to an RBC model on which a number of elements characteristic of Keynesian models are superimposed” (Gali, 2008: 2).

		sub-optimal outcome (M)			✓
1.3 Theory/model relation:	theory = model (W)		✓	✓	✓
1.4 Eclecticism/monism:	monism (a single baseline model) (W)		✓	✓	✓
1.6 Overarching methodological imperative:	positivism (M)		✓	✓	✓
	internal consistency (W)		✓	✓	✓
1.7 Strict standards for 'good' scientific practice:	present		✓	✓	✓

Table 7 displays the continuity between DSGE modeling and the two previous stages of the DSGE program. There is, however, one difference. Although the economy is still regarded as stable, its outcome is no longer optimal because it departs from perfect competition. However, as seen in Table 8, when it comes to more specific bifurcations, important changes take place.

The most conspicuous of the changes amount to four. The first one is the replacement of the initial perfect competition with monopolistic competition (node 2.5). It was motivated by the will to bring the stickiness theme back to the forefront, initially as affecting price formation and, in a further step, as also bearing on wage formation (node 2.7).²² The second change is the return of money to center stage (node 2.11). It came with the interest rate replacing the quantity of money as central banks' policy instrument, exemplified in one form or another by the so-called Taylor rule. An objective function is ascribed to central banks which are now expected to exert an active role in price stabilization. The third change is the introduction of other shocks than TFP shocks, such as monetary policy shocks, shocks in government consumption, Calvo-style price- and wage-formation shocks, habit persistence, or price indexation (node 2.9).²³ Finally, tremendous changes occurred on the measurement front. While calibration was still used (in the context of a huge increase in databases), structural VAR analysis and Bayesian econometrics became front and center.

The above changes are well known. In view of this paper's purpose, I need to address the question of how DSGE modeling fares with respect to the Marshall-Walras divide. For one thing, it moves away from the autarkical framework underpinning the baseline RBC model. A second important novelty is that its object of study is a Marshallian economy (node 2.2). It comprises three markets which are described as functioning separately. In its simplest form, the story begins with households monopolistically selling their labor services to firms producing intermediary goods; once the intermediary goods are produced, they are monopolistically sold to a single firm; the latter assembles them into a single final good which is sold to households. The associated prices are a nominal wage, the prices of the intermediary

²² In De Vroey (2016), I comment that "monopolistic competition represents the most minimal departure from perfect competition possible, while nonetheless giving the impression that it is an important step forward in terms of realism. The reason for its wide acceptance must lie elsewhere, namely in its ingeniousness and tractability" (p. 332).

²³ The introduction of Calvo pricing indicates a hands-off approach with respect to the explicit microfoundations requirement since its justification is indirect. See Wren-Lewis (2016: 31).

goods, and the final price. They are set separately, with sellers being price-quantity makers. Their compatibility springs from the perfect information assumption, all agents knowing the structure of the economy and the value of the parameters relevant for the decisions they need to make. Does this mean that we have come full circle, back to the initial situation in which macroeconomics was an integral part of the Marshallian approach? The answer is ‘no’ because the observation I made about RBC is also valid for DSGE modeling. As Table 7 shows, DSGE models are based on Walrasian methodological principles. The object of analysis is a Marshallian economy, but it is studied in a Walrasian style. Moreover, there is another resemblance with the Walrasian approach, the preponderance given to households in shaping economic outcomes, while in the Marshallian universe the focus is on firms. In DSGE models, households are the ultimate decision-makers as production decisions are driven by their preferences. Firms act as a mere transition mechanism. Indeed, the Euler equations driving the equilibrium outcome of the economy have households as their exclusive support.

Table 8 summarizes the above observations.

Table 8. The turn from RBC to DSGE modeling. *Implementation bifurcations*

		RBC models	DSGE models
Basic methodological nodes			
2.1 Equilibrium:	intertemporal equilibrium	✓	✓
2.2 Object of analysis:	a set of individuals living in autarky	✓	
	a Marshallian economy		✓
2.3 Real or monetary analysis:	real	✓	
	monetary		✓
2.4 Microfoundations:	explicit	✓	✓
2.5 Competition:	irrelevant	✓	
	perfect competition <i>à la</i> Marshall or monopolistic competition according to the market		✓
2.6 Information	agents are knowledgeable about the states of nature	✓	
	perfect information <i>à la</i> Marshall		✓
2.7 Flexibility, etc.:	irrelevant	✓	
	stickiness (Calvo pricing) in the labor and the intermediary goods market		✓
Additional nodes: 2.8			
Expectations:	rational expectations	✓	✓
2.9 Shocks:	type:	TFP shocks	✓
		several shocks of different types	
	nature: stochastic	✓	✓
2.10 Additional markets:	irrelevant	✓	
	labor market and intermediary goods market		✓
2.11 Central bank:	irrelevant	✓	
	present; it aims at stabilizing the price level using a reaction function (Taylor rule)		✓
2.12 Phillips curve	irrelevant	✓	
	forward-looking Phillips curve		✓
2.13 Measurement:	technique:	calibration	✓

		variety of techniques		✓
	main achievement:	replication	✓	
		replication and foresight		✓

CONCLUDING REMARKS

The task I set out for myself in this paper was to examine whether Leijonhufvud's decision-tree framework can shed light on the history of macroeconomics. My conclusion is positive. The turns that took place in the development of macroeconomics can be understood as the result of dissatisfaction with the bifurcations taken earlier and a decision either to try new ones or to abandon prevailing bifurcations and return to old ones. I hope that the reader will also adhere to the view that the Marshall-Walras divide is a useful benchmark for the study of the history of macroeconomics. This being said, the idea of a neat coincidence between the Marshall/Walras and the Keynesian/DSGE macro divides is too good to be true. Keynesian macroeconomics was indeed fully Marshallian, but afterwards the picture became more complex. With Lucas, a shift toward making macroeconomics Walrasian occurred, yet it was not a full embrace. RBC modeling has a baseline model that is neither Marshallian nor Walrasian in trade technology. As for DSGE modeling, it marked a return to the Marshallian trade technology, while still abiding by the Walrasian methodological principles that Lucas imported in macroeconomics.

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