

## POST-LUCAS MACROECONOMICS

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The awarding of the 1995 Nobel Prize for Economics to Robert E. Lucas is in recognition of the important contribution this outstanding professor from the University of Chicago has made to various aspects of economic theory. This includes, most notably, his contributions to the analysis of business cycles and economic growth.

In these pages Francisco Rosende describes what he regards as Professor Lucas' main contributions to the development of macroeconomics. These, he argues, go beyond specific hypotheses explaining certain phenomena of interest: indeed, Lucas' work has had a special influence on the methodological focus with which theories of aggregate behavior in economies are constructed, analyzed and evaluated. The author argues that, in view of this special and significant academic contribution, many economists have recognized Robert E. Lucas as the leader of a revolution in the study of macroeconomics, known as the "Expectations Revolution".

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It is hard to find economists this century whose influence on the predominant thinking has been as significant as that of Robert E. Lucas since the end of the 1970s. It does not seem far-fetched to argue that, along with Keynes and Friedman, Lucas has been the economist of greatest influence on the development of macroeconomic theory since the Great Depression of the 1930s. In particular, his research has had a tremendous influence on the thinking and research program in two areas of macroeconomics: namely, the theory of cycles and the theory of growth.

2. For many economists Lucas' contribution basically relates to the introduction of the concept of rational expectations in business cycle analysis. Indeed, it is undeniable that the rigorous treatment of expectations contained in articles like "Expectations and the Neutrality of Money"<sup>1</sup> and "Some International Evidence on the Output-Inflation Trade-Off"<sup>2</sup>, to mention two of his classic papers, brings a greater degree of formalization to arguments that had been presented previously, such as the natural rate of unemployment hypothesis<sup>3</sup>, or the classical theory of the business cycle.

However, Lucas' contribution to macroeconomics has a broader significance than that relating to his treatment of expectations. He has proposed a program of research for studying the aggregate behavior of economies which is different from the approach popularized as the neo-Keynesian synthesis, and associated with the IS-LM model, which has dominated since the mid-1970s.

According to the view Lucas expounds in his "Methods and Problems in Business Cycle Theory",<sup>4</sup> true progress in economic theory is related to a capacity to formalize a given set of hypotheses by means of an abstract

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<sup>1</sup> R.E.Lucas, "Expectations and the Neutrality of Money", *Journal of Economic Theory*, 4, (April 1972).

<sup>2</sup> R.E.Lucas, "Some International Evidence on Output-Inflation Trade-Offs", *American Economic Review* (June 1973).

<sup>3</sup> According to this hypothesis, the monetary authority might achieve increases in output and employment in the short run through more expansionary aggregate demand management; however, the effects would be dissipated as the greater demand pressure leads to an increase in inflation and public expectations with regard to this variable. The hypothesis was originally put forward in M. Friedman, "The Role of Monetary Policy", *American Economic Review* (March 1968) and E. S. Phelps, "Money Wage Dynamics and labor Market Equilibrium" *Journal of Political Economy*, 76, (August 1968).

<sup>4</sup> R.E.Lucas, "Methods and Problems in Business Cycle Theory", *Journal of Money Credit and Banking*, (November 1980) part Is.

construction which we call a model. More specifically, a theory is not a set of arguments concerning a given problem, but a certain number of instructions for building a model aimed at replicating certain aspects of the true behavior of the economy. From this point of view, for Lucas the “revolutionary” nature of Keynes’ *General Theory*<sup>5</sup> is not so much related to the arguments to be found there, as with the fact that at the same time as this book appeared, developments occurred which made it possible to express Keynes’ macroeconomics approach with a greater degree of formality, and also made it possible to evaluate it empirically. In particular, Lucas refers to the fact that in this book Keynes abandons the period of the cycle as a framework for his analysis and reformulates macroeconomic discussion as a problem of determining output levels, using national accounting identities for this purpose. This approach, which is essentially static and disconnected from the methodological procedures used in relative price theory, made it possible to synthesize the macroeconomics debate in a simple way through the IS-LM model developed by Hicks (1937)<sup>6</sup>. In addition to this, progress made in the field of econometrics made it possible to empirically estimate the behavioral functions implicit in the model, and even simulate the effect of economic policy changes on a given set of macroeconomic aggregates by making use of such models.

In an interview published in “Conversations with Economists” by Arjo Klammer, Lucas expresses the view that Keynes’ *General Theory* was an imprecise and unrigorous book, from which one could cite numerous examples providing evidence of the absence of a solid analytic framework, and which eventually could be used to defend different points of view.<sup>7</sup> However, in the interpretation of Keynesian Theory that emerges from setting it in an aggregate supply and demand framework, it takes on a more precise form,<sup>8</sup> which can be differentiated from the classical theory, and therefore submitted to empirical evaluation.

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<sup>5</sup> J.M. Keynes, *The General Theory of Employment, Interest and Money* (Macmillan, London, 1936).

<sup>6</sup> J.R. Hicks, “Mr. Keynes and the Classics”, *Econometrica*, Vol. V, N°2 (April, 1937); reproduced in J. R. Hicks, *Critical Essays in Monetary Theory* (Oxford University Press, 1967).

<sup>7</sup> Arjo Klammer, *Conversation with Economists* (Rowman & Allanheld Publishers), pp. 50 and 51.

<sup>8</sup> In the interview mentioned, Lucas tends to coincide with the position put forward by Leijonhufvud, in the sense that the interpretation of Keynesian theory, since the popularization of the IS-LM framework, is not necessarily consistent with points of view expressed by Keynes himself in the *General Theory*. In this regard, see A. Leijonhufvud, *On Keynesian Economics and the Economics of Keynes* (New York, Oxford University Press, 1968).

Following this line of argument, for Lucas the “revolutionary” nature of the developments which began to occur from the 1970s onwards, inspired by his own work as well as that of Sargent and Barro, among others, is probably the way in which these focused on building models to explain the economy’s aggregate behavior. In particular, this research program aims to integrate aggregate economic analysis with the basic principles on which microeconomic theory is constructed, and the first papers in this line of investigation were directed towards building a conceptual bridge between traditional microeconomic analysis and the theory of business cycles. The conceptual roots of these studies are to be found in earlier papers by Hicks (1939),<sup>9</sup> Hayek (1933)<sup>10</sup>, and Irving Fisher (1926).<sup>11</sup> However these required a greater degree of formalization to make genuine progress.

In “classical theory”, the integration of what today is known as macroeconomics —the theory of fluctuations in economic activity— and the theory of value or relative prices, is achieved by explicitly introducing the assumption of incomplete information within the analysis of general equilibrium. In a parallel way, quantitative theory is used to explain the long-term path of the price level. According to this approach, the concept of equilibrium, like that of the long run, is related to a coincidence between the actual and expected values of the variables which, according to the model, determine resource allocation.

Hicks (1939), for example, argues that the state of “equilibrium” in the process of inter-temporal resource allocation is related to a coincidence between the actual and expected levels of the variables driving resource allocation, whereas in Hayek (1933, 1933b)<sup>12</sup> fluctuations in economic activity are explained in terms of movements in the quantity of money and credit in the economy. The possible appearance of real effects resulting from changes in monetary policy, according to this theory, would depend on the expectations held by the public about the course of aggregate

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<sup>9</sup> J.R. Hicks, *Value and Capital: An Inquiry into Some Fundamental Principles of Economic Theory* (Oxford University Press).

<sup>10</sup> F.A. von Hayek, *Monetary Theory and the Trade Cycle* (London: Jonathan Cape, 1933).

<sup>11</sup> I. Fisher, “A Statistical Relation Between Unemployment and Price Changes”, reprinted in *Journal of Political Economy* (March 1973).

<sup>12</sup> F.A.von Hayek, “Price expectations, Monetary Disturbances and Malinvestments”, reprinted in English (originally it was published in German), in his *Profits, Interest and Investment* (London: George Routledge and Sons Ltd., 1939).

demand and its actual behavior. Business cycle theory in Hayek and Haberler,<sup>13</sup> for example, refers, as a source of the business cycle, to incorrect estimates by the public concerning the behavior of the rate of interest.

The “classical theory” research program for studying the aggregate behavior of the economy involved numerous issues which currently form part of what is known as neoclassical theory: in particular, the influence of estimation errors by the public regarding fluctuations in activity and employment.<sup>14</sup> However, the development of this line of research was restricted by the lack of progress in its capacity to formalize and estimate. In particular, the rigorous treatment of expectations behavior emerged as a significant obstacle to progress in this line of work.

3. The use of the “rational expectations hypothesis”, originally put forward with little impact by Muth in 1961<sup>15</sup>, had a significant impact on the aggregate-supply approach and the theory of the business cycle. Thus in “Some International Evidence...”, Lucas develops a model where the appearance of unexpected changes in aggregate demand gives rise to changes in the level of real variables, such as the level of output or its rate of growth. However, as people are rational by nature, they can be expected to learn from their mistakes and, therefore, would not systematically make wrong projections. So, any policy aiming to achieve a higher level of output—or lower unemployment—through expansionary monetary management, would end up expressing itself in higher inflation, without the desired effects being achieved on the real sector. According to this approach, the most efficient policy from the monetary management standpoint is the application of a constant growth rule, of the “k percent” type proposed by Friedman.<sup>16</sup> The impact of these studies gave rise to an intensive research program aimed at formalizing the influence of expectations within the cyclical behavior of economies. Later studies by Sargent and

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<sup>13</sup> G. Haberler, *Prosperity and Depression* (Geneva: League of Nations, 1936).

<sup>14</sup> A comparative analysis of the theory of the business cycle developed by Hayek and modern treatments of the issue are to be found in K. Jurgensen and F. Rosende, “Hayek y el ciclo económico: una revisión a la luz de la macroeconomía moderna”, *Working Paper* N°154, Institute of Economics, Catholic University of Chile, March 1993.

<sup>15</sup> J. Muth, “Rational Expectations and the Theory of Price Movements”, *Econometrica*, Vol. 29, N° 6 (1961).

<sup>16</sup> M. Friedman, “The Role of Monetary Policy”, *American Economic Review* (June 1968).

Wallace (1975)<sup>17</sup> and Barro (1976),<sup>18</sup> in which the assumption of rational expectations is used,<sup>19</sup> postulated that monetary policy would not have systematic effects on real equilibria, thereby reviving the classic proposition of the long-run “neutrality of money”. According to this, the equilibrium level of variables such as output, the real interest rate and employment, will depend on the real conditions determining the relative scarcity of goods and productive factors, without nominal variables having a lasting influence on them. As was mentioned above, the concept of the long run in this theory relates to the equilibrium of expectations, so that if  $X$  is the variable to be estimated, the equation  $E[X(t) | I(t-1)] = X(t)$ ,<sup>20</sup> is satisfied, unlike the case of traditional microeconomics where the concept of the long run is linked to the degree of mobility among factors of production.

In later papers, Lucas has posited the rational expectations hypothesis as a condition for consistency in macroeconomic models. Thus, in his “Models of Business Cycles”,<sup>21</sup> Lucas argues: “The term ‘rational expectations’, as used by Muth, refers to an axiom of consistency in economic models, so that its precise meaning can only be established in the context of a given model. I believe that this is the reason why attempts to define the concept of rational expectations in the absence of a model, turn out to be empty (People act in the most efficient way given the information set available to them), or else unintelligible (People are aware of the structure of the world they live in)”.<sup>22</sup> This approach means that agents’ optimizing behavior will be expressed in optimal strategies, once the environment in which they have to unfold, i.e. the basic rules of the game, has been defined. Thus, rationality in the case of a university student wishing to maximize his or her marks in a given course will be reflected in a specific work program that will depend on the demands of the course, and its expected degree of

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<sup>17</sup> T.J.Sargent and N.Wallace, “Rational Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule”, *Journal of Political Economy*, Vol. 83, Nº 2 (1975).

<sup>18</sup> R.J.Barro, “Rational Expectations and the Role of Monetary Policy”, *Journal of Monetary Economics*, Vol. 2 (1976).

<sup>19</sup> So that useful lessons for future projections could be derived from past errors. In mathematical terms this meant that the projection error for period “t” is orthogonal with the information matrix for period “t-1”.

<sup>20</sup> The variable  $I(t-1)$  represents the information matrix held by the representative individual, containing the actual behavior of variables relevant to the projection up to the period (t-1).

<sup>21</sup> Robert E. Lucas, *Models of Business Cycles* (Basil Blackwell, 1987).

<sup>22</sup> *Ibid*, p.13.

difficulty,<sup>23</sup> as well as the nature of the teacher, the system of evaluation, classmates' level of preparation, etc. Consequently, in courses with different evaluation rules, the optimal strategy will also be different. So, the processing of past information regarding the teacher's characteristics and the demands of the course will be assessed in the light of the rules of the game in force during the semester in question.

Similarly, the optimal strategy for maximizing inter-temporal consumption emerges once the basic macroeconomic conditions have been defined; in other words, the game in which the representative agent is involved (e.g. an open or closed economy, the exchange rate regime, the authorities' period of office, etc.). In this regard, it is important to mention the developments made by Kydland and Prescott (1977)<sup>24</sup> and Barro and Gordon (1983),<sup>25</sup> which, using the concept of rational expectations and the treatment of aggregate supply developed by Lucas, define a "game" aimed at explaining how, even in the presence of rational expectations, it is possible for governments to continue to try to exploit a "Philips Curve". In this game, on the one hand the authorities have the incentive to invest in their reputation and achieve macroeconomic equilibrium with low rates of inflation; yet once they have acquired a reputation for responsibility in the fight against inflation, they have incentives to expand aggregate demand and try to achieve a higher level of output and employment. This is because the gaining of a good reputation leads to the inflationary impact of this type of policy taking time to appear. The public, for their part, know that the political authorities usually have a high discount rate, which leads them to prefer better economic conditions in the present. So, they suspect that the situation might tempt central bankers to break away from tight aggregate demand management in order to achieve given short-term targets. The game thus produces a continuous interaction between the Central Bank and the public, where the temptation for the former "to inflate" the economy depends critically on the confidence perceived by the community regarding its anti-inflationary commitment. On the other hand, the public knows that temptations grow in certain periods (for example in pre-election periods), so it is advisable to be specially alert. In this

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<sup>23</sup> Which will lead to a continuous reassessment of the work plan as new information is obtained.

<sup>24</sup> F.Kydland and E. Prescott, "Rules Rather than Discretion: The Inconsistency of Optimal Plans", *Journal of Political Economy*, Vol. 85 N° 3 (1977).

<sup>25</sup> R.J.Barro and R.J.Gordon, "A Positive Theory of Monetary Policy in a Natural Rate Model", *Journal of Political Economy* (August 1983).

framework, the public's rationality is reflected in correctly identifying the objective function and constraints facing the authorities. This problem, known in the literature as "temporal inconsistency", has made it possible rigorously to explain unstable inflation behavior in numerous economies, as well as the existence of political cycles, and hence draw conclusions regarding the advisability of certain institutional frameworks —Central Bank autonomy, for example— to solve these problems.

4. Of the models of business cycles initiated by Lucas' paper and the later extensions, including the model of temporal inconsistency, it can be deduced that the period in which a monetary "surprise", affects the equilibrium of the real sector depends on how accustomed the economy in question is to such surprises. Thus, whereas in an economy with a long inflationary history the verification of an increase in sectoral demand will be seen essentially as an indicator of future inflation on the part of producers, in economies accustomed to price stability the same phenomenon will be seen as sign of better sectoral conditions, and will lead producers to raise the level of output and employment. In both economies, the stable one and the inflationary one, the final effect of expansionary monetary management is a proportional increase in level of prices; however, in the inflationary economy this will be manifested more quickly, whereas in relatively more stable economies, an increase in aggregate demand will generate an increase in the level of activity and employment for a time. This expansion in the real sector occurs because agents temporarily confuse a generalized increase in demand with a change in sectoral conditions.

5. As a result of the theoretical developments which have arisen from the pioneering work of Lucas, mentioned above, a strong identification has been engendered between the methodological postulates underlying those papers and the specific aggregate supply hypotheses which result from such models, as described in equation (1):

$$(1) y(t) = y_n + bf [M(t) - E[M(t) | I(t-1)]] + hy(t-1) + e(t)$$

In equation (1)<sup>26</sup> which is expressed in logarithms, the level of aggregate output  $y(t)$ , for period  $t$ , is a function of: the "natural" level of output ( $y_n$ ), resulting from equilibrium in the real sector of the economy, and monetary surprises, whose influences on the economy depend on a

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<sup>26</sup> This is derived formally in Lucas (1973), "Some International Evidence...", *op. cit.*



technological parameter  $\beta$ , and the parameter  $\phi$ <sup>27</sup> which indicates the economy's relative degree of stability. Thus, the greater the macroeconomic instability, the closer to zero will be the parameter  $\phi$ , which means that in the face of increases in the demand for the goods and services they supply, economic agents will tend to see an increase in sectoral prices as a reflection of an increase in inflation, rather than an improvement in the relative conditions of their sector. In this case, the capacity of the Central Bank to affect equilibrium in the real sector tends to disappear; however, the same tends to happen to the resource-allocating role of the price system. Finally, there is a lagged output variable, indicating the existence of technological adjustment costs, and a variable representing random shocks to aggregate supply ( $\epsilon$ ), with a mean of zero.

Despite the big impact the treatment of aggregate supply developed by Lucas and synthesized in (1) had on the profession, the empirical evidence was not favorable.<sup>28</sup> So, while some economists argued that as monetary statistics are known with a high degree of frequency and timeliness,<sup>29</sup> it is difficult to explain activity cycles based on unexpected changes in monetary management, others have questioned the assumption of price and wage flexibility included in Lucas model.<sup>30</sup> Thus, for example, Taylor (1979)<sup>31</sup> postulates the existence of high costs in rewriting wage contracts, which in a context where firms set the price of the final good by adding a margin, or mark-up over labor costs, would lead even to anticipated changes in monetary policy having some sort of effect on the real sector. Other recent theories have postulated the existence of price adjustment

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<sup>27</sup> More rigorously, this parameter is equal to the quotient between the variances of sectoral demand faced by the representative firm and the variance of total demand, incorporating the influence of sectoral movements mentioned above, and the variability of aggregate demand. In general, this parameter can be interpreted as the quotient between the variance of real conditions in the economy and the sum of the variances of real conditions and the variance of money supply.

<sup>28</sup> A critical assessment of these hypotheses is to be found in Frederic S. Mishkin, *A Rational Expectations Approach to Microeconomics: Testing Policy Ineffectiveness and Efficient-Market Models*, NBER, The University of Chicago Press, 1983.

<sup>29</sup> For example, see G.Haberler, "Critical Notes on Rational Expectations", *Journal of Money Credit and Banking* (November 1980,) Part 2.

<sup>30</sup> For example see J. Tobin, *Asset Accumulation and Economic Activity: Reflections on Contemporary Macroeconomic Theory* (University of Chicago Press, 1980).

<sup>31</sup> J. B. Taylor, "Staggered Wage Setting in a Macro Model", *American Economic Review*, 69 (1979b).

costs —the cost of rewriting the menu in restaurants, for example—, for which certain changes in aggregate demand would produce real effects.<sup>32</sup>

Beyond the specific assessment of the different aspects of these theories, they do not provide support for the predominant 1960s viewpoint developed under the umbrella of the neo-Keynesian synthesis, according to which governments face a dilemma between achieving low inflation or a low employment rate. In fact, both Taylor's contracts model and the menu-costs approach use the assumption of rational expectations, according to which the active use of aggregate demand policies will finally lead to their effects only being reflected in inflation, without positive real effects being achieved. In Taylor's model, this would occur through a shortening of the period for wage-setting<sup>33</sup>, and even through a possible use of indexation rules.

In the menu-costs model, demand pressures will lead to a gradual increase in inflation and, therefore, a more frequent revision of the price list, whereby the possibility of achieving increases in output and employment as a consequence of systematic increases in aggregate demand would be dissipated<sup>34</sup>.

6. Aside from the debate set off by business cycle models which were developed on the basis of the formal incorporation of the rational expectations hypothesis, there seems to be a significant amount of agreement among economists regarding the impact of those papers on the research methodology to be pursued. This means that the study of the economy's aggregate behavior should be based on models with microeconomic foundations, with defined assumptions regarding the stochastic structure of the economy and its influence on the process of expectations formation.

As was mentioned above, in recent macroeconomic models it is common to find a rational expectations assumption being used, as well as some attempt to provide microeconomic foundations for this<sup>35</sup>.

Econometric testing of the business cycle theory developed by Lucas, synthesized in equation (1), has led to the development of new

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<sup>32</sup> A synthesis of the neo-Keynesian approach is to be found in D. Romer "The New Keynesian Synthesis", *Journal of Economic Perspectives*, Vol. 7 (Winter 1993). Also see L. Ball, D. Romer and N.G. Mankiw, "The New Keynesian Economics and the Output-Inflation Trade-Off", *Brookings Papers on Economic Activity* Vol. 1 (1988).

<sup>33</sup> This argument is not formally incorporated in Taylor's model; however, it is a logical result of a model in which the existence of rational agents is assumed.

<sup>34</sup> In this respect, see L. Ball, D. Romer and N.G. Mankiw (1988), *op. cit.*

<sup>35</sup> A defense of this line of work is found in N.G. Mankiw, "A Quick Refresher Course in Macroeconomics", *Journal of Economic Literature* (December 1990), despite the fact that Mankiw has been identified with the "neo-Keynesian" current.

theoretical insights. From these, a recognition of the importance of incorporating the credibility of political announcements has emerged as a pre-requisite for achieving better explanatory power for monetary theories of the business cycle. Thus, Lucas (1994)<sup>36</sup> postulates that significant fluctuations in activity are accompanied by similar oscillations in the money supply, without alternative theories having achieved a moderately satisfactory explanation of strong activity cycles. However, in this paper Lucas acknowledges that existing knowledge within the profession, relating to the characteristics of aggregate supply, remains limited, so it is hard to sustain a recommendation for monetary policies of an anti-cyclical type. Furthermore, this strengthens the hypothesis initially proposed by Friedman and reiterated by Lucas in his studies of the business cycle, in that the optimal monetary policy is one involving stable rules.

On the other hand, Sargent (1986)<sup>37</sup> examines stabilization experiences, and this has led to an emphasis on the importance of commitments assumed by the authorities aimed at guaranteeing a path for money supply consistent with stabilization plan targets. According to the evidence examined by Sargent, an expected contraction in the rate of growth of money supply, even though the public are aware of it, may not lead to significant changes in conduct if the contraction is not seen as part of a change in the strategy of monetary policy. This approach, in which credibility has a leading role, makes it possible to recover the conceptual validity of developments that have occurred in monetary theory since the 1970s, although it raises significant challenges at the empirical level, for adequately quantifying the role of credibility in the authority's actions and announcements.

7. An alternative interpretation of the origin of fluctuations in economic activity is the "real theory of economic fluctuations", which achieved popularity following the publication of an important paper by Kydland and Prescott (1982).<sup>38</sup> According to this approach, economic fluctuations arise from individuals' optimal responses to successive shocks to aggregate supply or demand, resulting from technological changes and alterations to the environment in which individuals take decisions. Although this line of work does not attach much importance to the influence of

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<sup>36</sup> R. E. Lucas, "Review of Milton Friedman and Anna J. Schwartz's 'A Monetary History of the United States, 1867-1960'", *Journal of Monetary Economics*, 34 (1994) [published in Spanish in this edition of *Estudios Públicos*].

<sup>37</sup> T. Sargent, *Rational Expectations and Inflation* (New York: Harper & Row Publishers, 1986).

<sup>38</sup> F. Kydland and E. Prescott, "Time to Build Aggregate Fluctuations", *Econometrica*, 50 (November 1982).

money as a source of business cycles,<sup>39</sup> the research methodology used is set fully within the methodological proposal initiated by Lucas. That is, the construction of macroeconomic models built on the assumption of optimizing agents who carry out inter-temporal plans, in which they have to efficiently predict the variables they do not control but which do affect the final result of the objective function. The theoretical attractiveness of these models, and their relative empirical success, have led to them to being referred to as the “rational expectations school” in recent macroeconomic debate, in that such models are inserted within the classical approach, where it is postulated that in the absence of interventions by the authority the private sector can achieve an efficient allocation of resources in a decentralized way. Hence, from these models it can be deduced that in market economies it is reasonable and efficient for there to be continuous fluctuations in the pace of growth and activity, which it would be inefficient to stabilize.

8. Over the past ten years, economists have shown great interest in the study of growth theory, after several decades in which discussion in this area had been practically at a standstill. Lucas’ work has had a significant influence on the renewal of interest in studying the determinants of, and the influence of policies on, economic growth.<sup>40</sup> Although his study came after work published by Paul Romer<sup>41</sup>, in my view it is in Lucas’s work that a new approach to growth can clearly be detected. This is because in Romer’s pioneering work the analysis focuses on certain mathematical properties a model needs to fulfil in order to explain evidence for the non-convergence of growth rates. However, it is in Lucas (1988) where a formal model is developed stressing the importance of factors such as the average stock of human capital and the synergy provoked among all workers when this increases.

According to this approach, economic policy could have a big influence on the pace of growth in a economy, in that by removing distortions it becomes possible to make better use of workers’ skills.

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<sup>39</sup> From an empirical point of view, this approach has called into question the validity of the monetary theory of the business cycle, in which the “theory of monetary innovations” developed by Lucas is set, by postulating the existence of anticyclical behavior in prices as a characteristic feature of business cycle. In this regard, see F. Kydland and E. Prescott, “Business Cycle: Real Facts and a Monetary Myth”, *Quarterly Review* (Spring 1990), Federal Reserve Bank of Minneapolis.

<sup>40</sup> R. E. Lucas. “On the Mechanics of Economic Development”, *Journal of Monetary Economics* (1988).

<sup>41</sup> Paul Romer, “Increasing Returns and Long-Run Growth”, *Journal of Political Economy*, 94 (October 1986).

Independently of whether Romer's or Lucas' work is the decisive factor in the resurgence of growth theory, the conceptual contribution made by the Lucas study mentioned above is unquestionable. From this paper comes the recommendation to focus analysis of the effects of alternative economic policies more on growth than on short-term fluctuations. This, by proving that the accumulated effect of a policy affecting an economy's growth rate may be substantial, and therefore also its impact on the welfare level of the representative agent. From this standpoint, discussion relating to whether it is advisable to stabilize the business cycle using policy package "A" or "B", would in Lucas's view, be a relatively insignificant question unless the eventual growth effects of each strategy choice are measured. Within this perspective, discussion on stabilization policies would be relatively insignificant unless there was solid analysis of the growth effects of different policy alternatives.

This proposition is consistent with the idea that the adoption of monetary management of the type proposed by Friedman will lead to fluctuations in activity that essentially reflect changes in the real conditions of the economy, in response to which individuals will seek an optimal insurance scheme. The application of anti-cyclical policies would, therefore, not fit into this framework.

Set in the context of a small and open economy, such as Chile's, the policy proposal that emerges from the theoretical developments discussed above, is to stabilize the growth of money and to allow an institutional framework where the private sector can seek optimal insurance to confront changes in the terms of trade. Thus, for example, a strategy aimed at smoothing out fluctuations in the real exchange rate, through which an appreciable fraction of domestic saving is used to finance an accumulation of international reserves, may be an inefficient policy unless the existence of some type of positive externality associated with stabilizing the conditions of profitability in the tradable sector of the economy can be proved, as well as the incapacity of the private sector to carry out the stabilization task, and assuming the benefits of stabilization are not canceled out by eventual costs in terms of growth.

9. As was mentioned at the outset, the aim of the present paper has been to describe the main repercussions of the theoretical contributions made by Robert E. Lucas to the development of economic theory. Although it is possible that some of Lucas' theoretical arguments need empirical backing before they can be consolidated within the central body of economic theory, it cannot be denied that his methodological proposal has been broadly welcomed throughout the profession, as can be seen by reviewing the

structure and content of most of the macroeconomic texts used in postgraduate economics programs in the main academic centers of the world.

As regards the policy impact of the arguments underlying the theories developed by Lucas, the conclusion, in my opinion, is more ambiguous. Indeed, while in numerous countries a certain consensus has developed regarding the costs of inflation, and this has led to a steady increase in the number of economies which have given autonomy to the central bank in order to avoid the implementation of policies leading to an exploitation of short term cycles, in practice there are still numerous economies which, to a greater or lesser extent, use active policies for managing aggregate demand. According to Lucas' macroeconomic approach, central banks do not have sufficient knowledge to control the final effect of fine-tuning policies, and so it is more appropriate to use rules.

Possibly, the explanation of the "activism" which is seen in the administration of numerous central banks is passing through a more careful analysis of the type of incentives underlying the institutional framework in which central banks operate. This translates into a scenario where the authorities have incentives not to exploit short-term gains originating from business cycles. But at the same time they do have the tools, and possibly the temptation, to play what they may see as a stabilizing role. In other words, even in a framework of central bank autonomy, there could be an appreciable degree of activism<sup>42</sup>, to the extent that central bankers have the tools to affect aggregate demand, and in the face of unforeseen changes in the pace of expansion of aggregate demand, or in inflation, they may be led to try to play stabilization role—which they present to the community as prudential or conservative. This would involve rejecting the option of keeping to a monetary rule and ascribing spending fluctuations to real changes which should be confronted in an optimal way by the private sector. Of course, once an active aggregate demand management policy has been adopted, it is difficult to break away from, as it is likely that the mere existence of lags in the impact of monetary policy will lead to a succession of periods when it is thought necessary to stimulate growth, followed by periods of adjustment where the previous overexpansion gets corrected.<sup>43</sup>

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<sup>42</sup> In this respect, see B. Bernanke and F. Mishkin, "Central Bank Behavior and the Strategy of Monetary Policy: Observations from Six Industrialized Countries", *Working Paper* N° 4082, NBER.

<sup>43</sup> An interesting assessment of the type of optimal contract which should be imposed on central bankers for them to apply optimal policies from the standpoint of the representative agent is to be found in C. E. Walsh, "Optimal Contracts for Central Bankers", *American Economic Review* (March 1995).

As regards growth theory, it is more difficult to foresee a concrete impact for the developments that have occurred in this area over the past ten years. However, it cannot be denied that these have increased the importance of the structural adjustment programs that have been undertaken in numerous economies over recent decades. This can be seen in the way that the elimination of distortions has been shown to be an important requirement for making the best use of knowledge and other productive resources. In this respect, it is important to mention a recent survey undertaken by Easterly,<sup>44</sup> which concludes that it is policy packages, more than their isolated application that are the true source of economic growth.

There is probably not sufficient perspective yet to adequately judge the true extent of Lucas's contributions to the development of economic theory. However, the reaction in academic circles suggests that they should have profound and lasting effects, as few have had in this century.

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<sup>44</sup> W. Easterly, "Los determinantes del crecimiento economico", *Cuadernos de Economía* (August 1992).

