

On the modernity of Walras. (*)

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Abstract :

The first part of this text, entitled “Between the Capitol Hill and the Tarpeian Rock ? ” proposes a discussion of the contemporary status of the intellectual schemes inherited from the development of the walrasian program. The second part argues that part of the questions raised by Walras, f.e those concerning the mechanics of price adjustments, have not yet received satisfactory answers. It then argued that a post-walrasian program, with a strong focus on the explanation of market expectations, is on the agenda. .

(*) See last page

1-Preliminaries

For many theorists of my generation, Walras is a natural grand-father. In my case, four reasons come to my mind, going from the most obvious and general to the less obvious and more specific.

- First, Walras is the main ancestor, the founding father of modern general equilibrium theory, which has been a central piece of the post-war theoretical research. The Walras model has been transfigured into the Arrow-Debreu model. Through this sophisticated rewriting and re-assessment, Walras' views and intuitions on the mechanics of a decentralized system of markets have been made more precise, more rigorous and on the whole confirmed (I'll come back on that). But the work has also stressed the general power of the argument, well beyond the specific territories investigated by Walras. The extension to infinite horizon economies¹ provides an unavoidable and precious light to any ambitious inter-temporal theory. The extension to uncertainty, a subject of early personal concern², has served as one of the basis of modern finance theory. Also, as again argued later, in the second part of the 20th century, the Walras model has kept or reinforced its central position in the economist's software. The walrasian input to the macroeconomic debate³, after the second world war, reflects such a central position. The so-called neo classical synthesis was mixing, and supposedly somewhat reconciling, Keynesian and Walrasian ideas. So far as I understand, standard trade theory was framed in a "walrasian" setting. And in a sense, the modern program of public economics, with its emphasis on public goods and externalities, may be called neo-walrasian. Even, the general equilibrium models of second best theory, although they do not directly echo the walrasian understanding of

¹ Malinvaud E. (1953) « Capital Accumulation and Efficient Allocation of Ressources », *Econometrica*. 21, p. 233-266.

² Arrow (1953), "Le rôle des valeurs boursières pour la répartition la meilleure des risques", Paris, CNRS p. 41-53, 'English translation, *Review of Economic Studies*, 1964), Radner (1972) "Equilibrium of plans, prices and price expectations", *Econometrica*, 40, p289-203, Guesnerie R and Jaffray J.Y (1974) "Optimality of equilibrium of plans prices and price expectations", in : Allocation under Uncertainty Equilibrium Optimality, J. Drèze ed. with the assistance of F. Delbaen, L. Gevers, R. Guesnerie et D. Sondermann, Mac Millan, p. 71-86, 1974

³ See for example, D. Wade Hands, (2009) « The rise and fall of Walrasian general equilibrium theory : the Keynes effect. », mimeo, or Goulven Rubin, (2005) "Patimkin's interpretation of Keynesian economics : a genetic approach", mimeo

the subject of public action⁴, adopt a walrasian modelling of production, markets and consumers' decisions etc.....

- The second point is closely connected with the first point, and as much obvious. Walras is a most influential precursor of the mathematical modeling of economic situations. With Cournot, Dupuit, and others, he is one of the fathers of what has been sometimes called mathematical economics, (which is now more adequately labeled as formalized economic theory), which the Econometric Society has successfully promoted in the profession. As we know, for the broad majority of theorists but also of economists of my generation, mathematics was a most useful and somewhat compulsory tool for economic analysis.
- The third point may be more controversial. It refers to the scientific aspiration, if you prefer the search of objectivity, that feeds Walras' work. At his time, the liberal "laissez faire" school was dominating the French establishment. The founding father was J.B Say, whose famous sentence "L'offre crée sa propre demande", brilliantly asserts the inherent stability of markets. Walras was rejecting such an axiomatic faith in the market, claiming an a priori agnostic position : "les économistes jusqu'ici ont moins démontré leur laissez-faire laissez passer qu'ils ne l'ont affirmé », Walras (Elements d'Economie Politique Pure, 1952, p. 223) and just after : « (ils l'ont) souvent étendu au-delà de sa portée véritable....". In a sense, the modern general equilibrium effort reflects a related attempt at an objective understanding of the merits of the market, at a time where citizens as well as scholars were summoned to choose between market capitalism and soviet-like central planning. Probably, a number of theorists of my generation felt some appeal for the "a priori" contradictory instincts of Walras, "socialiste et libéral"⁵ and for the need to understand in depth the virtues and shortcomings of the market.
- A fourth reason is more special, and concerns only the subset of so-called theorists who were more directly concerned with policy issues, and a smaller subset includes those, like me, who were influenced by the tradition of "ingénieurs-économistes". For us, pure economics was a necessary detour to the search of solutions in applied economics...Even if Walras may not have had a quiet relationship with, let us say, Dupuit⁶, his distinction of pure economics, applied and social economics responds to the practitioners' needs and feelings.

Returning to my own research production, a large part, and it is true particularly of the initial part, has certainly a walrasian flavor. At this stage, let me mention, besides one piece

⁴ See Béraud A. (2010) "Walras et l'économie publique", mimeo

⁵ The assertion is debatable and raises the semantic questions of what is the right definition of the two words, questions that go much beyond this text and ...my competence.

⁶ See Etner F. (2010), «Walras versus Dupuit» mimeo

already quoted, (footnote 3), an early theoretical work attempting to extend the walrasian argument to contexts of increasing returns⁷. Later, although the models under consideration depart along some dimensions from the walrasian prototype, my research in the field of second best⁸ has the walrasian background explained above. And, as I will explain later, besides these examples of direct inspiration, my views of the relevant intellectual questions and of the adequate methods of inquiry may also reflect the same influence.

After these introductory remarks, it make sense to face the question of evaluating more in depth what may be called the modernity of Walras. How relevant are the methods, the message and the intellectual positioning of Léon Walras for the coming generations ?

In a sense, the recent history suggests that Walras, initially a somewhat obscure and isolated scholar of the end of the nineteenth century, has obtained full recognition, much beyond most all his contemporary rivals. The recent history of economic analysis may be read as a victory: Walras has received the honors of Capitol Hill. But, as one knows, the Capitol Hill is close to the Tarpeian Rock, and some have indeed argued that the metaphor makes sense in the present case.

Indeed, I will assess the modernity of the present avatars of Walras research programs, (between the Capitol Hill and the Tarpeian Rock ?- next section) before suggesting that new and more distant avatars may still have to come and to be welcomed.

2- Between the Capitol Hill and the Tarpeian Rock ?

This Section has two sub-sections. The first one concerns the comments that the modern results on the aggregation of demand have triggered. The second one concerns the present state of research in the Arrow-Debreu-Walras tradition.

2-A The Debreu-Mantel-Sonnenschein result and the Walras program.

The deepened understanding of the Walras model triggered by modern general theory has raised questions on the limits of Walras' own understanding of his theoretical world. The Debreu-Mantel-Sonnenschein theorem (from now DMS theorem) is an archetypical example that has been used to challenge not only Walras' intuitions and understanding, but also indirectly the relevance of his work. Clearly, Walras was aware of the complexities of a general equilibrium world (*Eléments d'Economie Politique Pure*, Section 2). He was, much ahead of his time, aware of the possibilities of multiplicity of equilibrium (see previous

⁷ Guesnerie R. (1975) "Pareto optimality in non convex economies", *Econometrica*, 43, 1, p. 1-29, 1975, does not however plead for average cost pricing ! .

⁸ As partly reported in Guesnerie R. (1995) "A Pure Theory of Commodity Taxation", *Cambridge University Press*, 315 pages.

reference, 7ème Leçon), although he seemed to believe, a little bit quickly, that reasonable assumptions were likely to kill multiplicity. He was clearly not aware, and I would say nobody was aware of that before the seventies, that in an abstract exchange economy, with more agents than goods, any aggregate excess demand function, (being continuous and meeting Walras' law) could obtain. However, concluding that the result kills the Walrasian program and dismisses its basic intuition is plainly wrong. And, in fact, its careful examination would rather lead to argue in the opposite direction.

- The theorem is an intriguing and unexpectedly strong confirmation of Walras' intuition on the difference of nature between general and partial equilibrium. How can we find a better refutation of the Marshallian views of the world? General equilibrium is indeed very different from partial equilibrium; even more different, let us concede, than what Walras thought.
- Critics of the Walras model, and of so-called neo-classical economics, used to suggest an opposition between the poverty of the theory and the richness and complexity of phenomena in the real world. The DMS result illustrates that the model may generate interactions so sophisticated that no one would have been able to imagine them. It produces extraordinarily intriguing worlds from simple premises.
- The result also demonstrates, if needed, that our mind, without the support of mathematics, cannot master complex interactions. The discovery of the complexity of interactions in exchange economies cannot obtain from qualitative thinking. Walras here again was right.

Naturally, the defence I have just produced takes the attack too seriously. The result is certainly striking but has just been overdone: it does not imply, for example, that in a production economy, (the ones in which we live) with some given level of technological knowledge, (the present one for example), any excess demand function can be generated through an appropriate choice of preferences⁹. Still, it stresses the role of the specific quantitative data for predicting economic situations and for comparative statics analysis. To know whether aggregate excess demand in our economy inherits or not of some given qualitative property is an empirical question¹⁰. In Walras' terms, I guess, this would reinforce the role and extend the autonomy of applied economics as compared to pure economics.

Indeed, one conclusion I personally draw from the DMS theorem is that the Walrasian research program ought to have been extended to include "theories of intermediate generality". A demand theory of "intermediate generality" faces the problem of aggregation

⁹ See "Ekeland I, Guesnerie R, Jerison M » (2003) « La fonction d'excès de demande des facteurs dans une économie avec technologie donnée », mimeo, uncirculated notes.

¹⁰ This is one rationale for the work of Hildenbrand W (1994) "Market demand", Princeton University Press.

of demand and points out conditions that can be empirically tested. This is the task undertaken by Hildenbrand and some others¹¹, whose neat results have not been given the attention they deserve. Theories of intermediate generality would take a detailed view of the production sector, as proposed in Ekeland-Guesnerie¹², with the aim of enriching both the understanding of the Sraffaian tradition and of the standard trade theory à la Heckscher-Ohlin. Theories of intermediate generality also mean theories that would adopt a viewpoint intermediate between the fully general viewpoint of the inter-temporal Arrow-Debreu-Malinvand model, and, to go to the other extreme, the one good setting of many growth or Real Business Cycle (from now RBC) models. The objective there would be, an example among others, to appraise better some of the relative prices movements that go with growth, or to understand better the mechanics of Dynamic General Stochastic Equilibrium, (DGSE) models and to put in a better perspective the thousands of computer-generated simulations that they trigger.

2-B The present state of the Arrow-Debreu-Walras program.

A more substantial argument is that general equilibrium in the Arrow-Debreu tradition looks now as a sleeping field. After analyzing at a level of maximal generality the interactions within an idealized competitive world, it was tempting to incorporate complications into the abstract setting, in order to take into account let us say oligopolistic competition, incomplete markets...The introduction of oligopolistic competition has not proved very convincing. And a general theory of incomplete markets which looked the next territory to explore has proved illusory, which is not surprising, given the broad variety of causes for incompleteness¹³. Indeed, generality for the sake of generality is not useful, what is useful, as Hadamard put it, is “généraliser pour mieux comprendre”. In other words, generalization aims primarily at checking the robustness of insights obtained in a particular context, which will lead to understand them more in depth, and only secondarily at obtaining new insights. The questions of how far oligopolistic competition brings us from pure competition is important, but our understanding relies partly on potentially general remarks or tools¹⁴, but often on special views, the incorporation of which in a general setting is either somewhat uninformative or premature. As I argued better, a “walrasian” intermediate theory would be of greater relevance.

¹¹ See previous footnote

¹² Ekeland I and R. Guesnerie (2008), “The geometry of production and factor price equalisation”, forthcoming *Journal of Mathematical Economics*, 2010

¹³ See Guesnerie R (199) “The Arrow-Debreu paradigm faced with modern theories of contracting” in “Contract economics” Nobel symposium, L. Werin, H. Wijkander eds, p. 12-41.

¹⁴ As two illustrations of the assertion, see Guesnerie R and O. Hart (1985) "Welfare losses due to imperfect competition: Asymptotic results for Cournot Nash equilibria with and without free Entry". *International Economic Review*, 26, 3, p. 525-545, 1985 and Dierker E, Guesnerie R and Neufeind W (1985) "General equilibrium when some firms follow special pricing rules", *Econometrica*, 53, 6, p. 1369-1393. 1985.

However, the just sketched discussion does not give full justice to the starting remark, i.e the present disaffection of let us say the Arrow-Debreu-Walras program. Although the disaffection for the field may have been increased by inappropriate research choices, (as I have argued above when stressing the need for theories of intermediate generality), it goes without saying that it is, also and mainly, the consequences of the field's own achievements. The clarification of the central questions that were behind the model, has led to an explosion of research in many directions. After the highly demanding and somewhat arid period of general equilibrium modeling came the time of "one hundred flowers"¹⁵.

These new research directions taken have led to the re-assessment of some of the crude assumptions that are behind the Walras construct. I have in mind here, for example everything that comes under the heading of "behavioural economics", which questions the basic rationality assumption of the walrasian model. Also, the understanding of the production of knowledge, which is at the heart of the "new economy", brings us rather far away from the walrasian paradigm of exogenously given technological possibilities, associated with a priori fixed production sets. Also, the emphasis of formalized economic theory has switched away from general equilibrium. The theory of asymmetric information is an example among others: some of the early contributors had a strong general equilibrium culture¹⁶, although most of the questions which the new developments served to illuminate are partial equilibrium¹⁷. Finally, the fact that the economy was apparently moving along quieter paths, (although temporarily as we have seen) has put further away systemic questions (and the Walras model is about systemic questions, it goes without saying and I come back on that)

There is no doubt that these new tracks of research have led us to a better understanding of many issues. For example our understanding of the working of many specific markets have improved : labor markets involve complex processes of search and matching, the mechanics of insurance markets, or loan markets, with adverse selection leaves us far away from the

¹⁵ Boyer R. (1991), in " Le mouvement social"

¹⁶ See for example my co-author, J.J Laffont, and let me illustrate the argument by quoting Guesnerie R.-Laffont J.J "Advantageous reallocation of initial endowments", *Econometrica*, 1984, ...together with Guesnerie R and Laffont J.Y (1984) "A complete solution to a class of principal agent problems with an application to the control of a self-managed firm". *Journal of Public Economics*, 25, 3, p. 329-369.

¹⁷ Although this is not always the case : the taxation principle, (Hammond P. (1979) "Straightforward Incentive Compatibility in large economies" *Review of Economic Studies*, 46,p. 263-282, Guesnerie R. "On taxation and incentives, further remarks on the limits to redistribution" (1981) Bonn discussion paper 89, Chapter 1 of "A Contribution to the Pure Theory of Taxation"), which reflects the consideration of incentive compatibility constraints in the theory of redistribution, has a general equilibrium flavour. But it justifies a second best theory, which, although it has walrasian features, cannot be labeled walrasian. See Guesnerie R. (1995) "The genealogy of modern theoretical public economics: from first best to second best", *European Economic Review*, 39, p. 353-381. 1995.

Marshallian, but also Walrasian, stylized market, etc... So, many elementary bricks of the standard model are being challenged, and more seriously than does the pseudo challenge of the DMS theorem.

At this stage, the conclusion seems clear. Walras will remain one of the major figures in the history of economic thought. The prominent position that he was given by Schumpeter was, at the time where the “history of economic analysis” was written, still controversial. The development of modern general equilibrium has made it more evident. Walras’s ideas have been influential in almost all fields of economic analysis, including macroeconomics. His views of the mechanics of the interaction between markets has become an unavoidable reference, either to be transposed, or to be amended or to be refuted. But, we are aware now that, for example, that real markets do not closely resemble the stylized elementary market à la Walras or à la Marshall : the walrasian elementary brick is too simplistic. Hence, the provisional conclusion is that for exploring further the territories of pure economics, the modern Walrasian theory, as renewed from its Arrow-Debreu avatar, will remain a kind of “base camp”¹⁸, from which the ongoing exploration is developing towards higher parts of the mountain. Walras victories during the 20th century are not victories à la Pyrrhus, but only victories, point. The destiny of victories is to be written in history books. In other words the Walras research program has been incredibly successful but is exhausted¹⁹.

In the next section, I try to challenge this apparently reasonable “constat” and show that the walrasian program is in a sense unfinished. It has not provided good answers to some of the good questions it was raising. This is the case, for example, of all what concerns the global adjustments of prices towards equilibrium. A revised approach to these good questions may lead to revival of the program.

3- Arguing for a post-Walrasian program.

Starting from a quick critical reminder of the concern of Walras for the mechanics of the equilibrium adjustment, and of his introduction of the tâtonnement, this section proposes to redefine the reflection and to sketch the lines of a possible welcome avatar of Walras’ initial research program.

3-A Walras and the mechanics of the price system.

One of the most remarkable aspects of Walras’ intellectual adventure is his attention to the process leading to equilibrium: he fully understands that economic theory has not only to single out a plausible outcome of economic interactions, (for him the general equilibrium

¹⁸ The metaphor is developed in Arrow-Hahn (1971) “General competitive analysis”, Holden Day.

¹⁹ At least in its pure theory, positive dimension. The applied economics dimension as well as the associated normative issue would deserve separate discussion..

outcome, solution of a system which has as many equations as unknowns), but also to demonstrate convincingly that the market forces do generate such an outcome. Existence is a void requirement, absent of a convincing story telling why prevailing price adjustments on all the different markets generate equilibrium in the global interacting system. Walras's concern for this problem is certainly one of the most spectacular sign of his intellectual superiority on most of his rivals, as well as a reflection of his scientific concern opposed to the ideological faith in the magic of the invisible hand.

A remark is in order: the RBC school has been viewed promoting a change of paradigm in macroeconomics : keynesian macroeconomics was replaced by walrasian macroeconomics. In any case, the emphasis on the change of paradigm, in the sense of Kuhn, is excessive: the RBC program, and it is true also for its new-Keynesian successor, reflect as much a switch in the objective of the research program: it is associated with some kind of let us say of VAR-like redefinition and normalization of the empirical facts to be explained. But to refer to the paradigm as walrasian is, in a deep sense, wrong. In such a one-good, rational expectations, world, the basic modelling option makes irrelevant one of the major concern of Walras, the connection between the market by market price adjustments and the emergence of the equilibrium. The new-keynesian avatars of RBC are, in a sense, as I will argue later, more faithful to Walras' spirit.

How to describe Walras concern leading to the study of tâtonnement: computation of equilibrium ? implementation ? or something else. In a sense, the tâtonnement is a computation algorithm : there are, from the mathematical viewpoint, much better algorithms, like the Scarf algorithm, but it is an algorithm. The fact that the markets interactions act, at least to some extent and with non well understood limitations, as the elementary pieces of a super-computer used to fascinate a great mathematician as S. Smale²⁰. The fact that it does not fascinate a number of economists, for which the power of the invisible hand requires no explanation, shows that ideology makes you blind. "Implementation" of equilibrium is another possible terminology, that puts emphasis on the transmission of information conveyed by the tâtonnement, which is another side of the picture²¹ "Equilibration", the French neologism proposed by François Perroux is probably a better word, although its connotation may leave in the shadow the algorithmic (and the super-computer) dimensions of the problem.

²⁰ Whose interest for general equilibrium may be illustrated by Smale S : (1981) "Global Analysis and Economics", in K.Arrow and M. Intriligator, Handbook in Mathematical Economics, 1, Amsterdam, North Holland, Chap. 8

²¹ See de Vroey (2003) "Perfect information à la Walras versus perfect information à la Marshall », Journal of Economic Methodology, 10-4, 465-492, for an emphasis on this dimension.

3-B A modern re-assessment of Walras questions on “equilibration”²².

Whatever the name we put on the problem, it attracted a lot of attention from Walras. However his attempt to describe the price mechanism as a tâtonnement has produced an unconvincing story. The story is unconvincing for several reasons. First, even if you accept it, the process, at least in the way it has been formalized in the literature starting from Samuelson, is likely to converge only under somewhat special circumstances: uniqueness is neither necessary nor sufficient, and again because of the DMS theorem, almost nothing can be ruled out on the basis of the general theory in an exchange economy. Again, as argued above, this does not make the theory irrelevant. On the contrary, the fact that the tâtonnement process in particular, or any price adjustment in general, does not converge in some specific setting is a fact of great interest. Indeed, Keynes opposition to wage deflation in a depression reflects an opinion on the desirable sense of price adjustment that echoes (in a related but different ? setting) the possible failure of the walrasian tâtonnement process²³. In the absence of a theory of intermediate generality, this dimension of the problem has been obliterated, and it is probably unfortunate...The second reason for doubting the walrasian story is that real price adjustments are almost always of non-tâtonnement type. This is true but does not invalidate entirely the attention to tâtonnement, in particular because convergence or divergence of different types of processes are likely to be somewhat related.

There are two more serious objections to the Walras' approach to the problem. First, prices are often quoted, not by the auctioneer but by actors. Second, and this reason is clearly linked to the first one, decisions, and this is true for responses to the price changes, or decisions of price changes, are determined by expectations on what will happen. These two aspects of the problem are not captured in Walras's modeling. The absence of concern for expectations reflects a bias of all the 19th century theories, may be because they often appeal implicitly to a steady state. However a price adjustment theory which does not put attention at expectations, has a dubious plausibility, even in the steady state of a Real Business Cycle model²⁴. In a sense, the best way up to now, to take into account Walras' concerns, is to have prices quoted by firms, which possibly have some market power. This is the solution adopted in the new-keynesian models, which add to a RBC-like model the two evoked dimensions of pricing. Although the solution is somewhat artificial (prices are quoted at exogenously given times, although possibly random) it proposes a solution of price determination which improves upon previous ones. The Achille's heel of the story is however that expectations play a crucial role in the process but are taken to be “rational”: hence people quote prices to-day, which is fine,

²² The following ideas also echo Guesnerie R (2005) « Notes sur la concrétisation de l'équilibre économique » in Histoire des représentations du marché par Guy Bensimon, Michel Houdiard, p.49-63.

²³ Notes on this question appear in Guesnerie R, Jerison M (2003) « Notes sur un tâtonnement sur le prix des facteurs dans une économie de production », mimeo, uncirculated notes..

²⁴ As a parenthesis, Evans-Guesnerie-Mc Gough (2010) "Eductive stability in RBC models" argue that the steady state of such a model is inherently expectationally unstable

but on the basis of unbiased forecasts of future prices: on the one hand the invisible hand is subject to scrutiny, on the other hand, some of its magic is kept! People's minds become the substitutes of the missing computer! Naturally, "equilibration" is a key dimension of the debate on the extent of relevance of the Walrasian logic in macroeconomics. Keynes, moving away from Marshall, turned out to stress general equilibrium issues, without becoming a Walras' disciple. Some of his followers made an attempt to reconcile, or at least to connect, (this is one way to see the neo-classical synthesis as argued above) the competing insights²⁵. The remaining mysteries are clearly mysteries of "equilibration". Let me sketch a research program that would be a kind of 21th century avatar of the "equilibration" part of the initial Walras program.

Let me suggest, with the liberty and naivety allowed by the present exercise, to organize the program around three pillars.

- First, as is the case in new Keynesian models, prices for goods sold on the markets, are quoted by producing firms on the basis of present and expected costs and demand.
- Goods are distinguished from factors, and a special emphasis is put on the labor market. Here price moves reflect some non-tâtonnement process, for example in line with the logic of labor matching. This distinction between factor markets and goods markets is indeed in Walras²⁶, although the relative timing of adjustment on the different set of markets is here not apparently made fully clear.
- Expectations are not axiomatically taken as rational, but the plausibility of the Rational Expectations Hypothesis is assessed, for example along the lines of the "eductive learning" logic developed in Guesnerie²⁷, or the "evolutive learning logic of Evans-Honkappohja²⁸

From this brief outline (*), I am not expecting to convince a large crowd to immediately join the program, but I want only to suggest that Walras' soul is marching on!

(*) This text mainly consists of extracts of a previous paper with the same title Guesnerie ()

²⁵ Cf the references of footnote 4.

²⁶ See Reyberol A. (1999) "La pensée économique de Walras, Dunod, Paris.

²⁷ Guesnerie R. "Assessing Rational expectations », Volume 1, 2, MIT Press, 2001-2005. The second volume is centered on the "eductive" viewpoint, the first one focuses on a related question, the multiplicity of sunspot type, on that, see also Guesnerie R and Woodford M. (1992) "Endogenous fluctuations", (avec M. Woodford) in *Advances in Economic Theory, Econometric Society Monograph, Cambridge University Press*, 289-412., 1992

²⁸ Evans-Honkappohja (2005) "Learning and expectations in macroeconomics », Princeton University Press

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