Comptes rendus de lecture

Vincent Martinet, *Economic Theory and Sustainable Development—What Can We Preserve for Future Generations?*

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Théorie économique et développement durable – Que peut-on préserver pour les générations futures ?

The recent book by Vincent Martinet is a very welcome addition to the literature on sustainability. As the book title clearly indicates, the author's objective is to analyze how methods in economic theory (and in particular growth theory) approach sustainable development and to explore alternative methods, mainly through the use of two mathematical methods: invariance and viability theory. The author wishes to rephrase the theoretical debate to focus on operational criteria for sustainable development paths. The incorporation of sustainable development in environmental policy has to some extent been bogged down in the debate between proponents of strong sustainability versus proponents of weak sustainability, and the conditions on substitutability implied under each approach. It is very encouraging to see someone trained in the economic approach of weak sustainability theory go to such efforts to understand and reconcile the different criteria proposed in the sustainability literature with the concerns of proponents of the strong sustainability criterion.

The book is composed of two parts, with two clear objectives. In the first part of the book, the author reviews how economic growth theory approaches natural resource management and sustainability and he also analyzes some different criteria for defining sustainability. This part constitutes a much useful addition to the literature since it includes criteria developed after the appearance of Geoffrey Heal's book *Valuing the Future: Economic Theory and Sustainability* from 1998. Since other texts have explained and analyzed in detail the separation between the strong and weak sustainability concepts (in particular the book *Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms* by Eric Neumayer), Martinet's book instead focuses on an analytical description of the different criteria in two canonical models: the cake-eating economy and the Dasgupta-Heal-Solow production-consumption model. This approach is a very useful pedagogical tool since it clarifies each sustainability criterion and allows for a clear discussion of their implications. The first two chapters introduce the reader to the canonical models and to the

distinction (that is judged rather sterile by Vincent Martinet) between strong and weak sustainability criteria. The third chapter gives a basic exposition of intertemporal decision theory and optimal growth theory, whereas the real "meat" in the first part (at least for readers with economic education) is found in Chapter 4 that contains a clear and useful overview of different sustainability criteria and their implications in the two basic models. For each of the two basic pedagogical models, Martinet analyzes the implications of discounted expected utility, the undiscounted utilitarian criterion, the maximin criterion, the green golden rule, the Chichilnisky criterion and the mixed Bentham-Rawls criterion. Chapter 5 then focuses on the interpretation of two commonly used criteria for operationalizing sustainability in policy: the Hartwick rule and genuine savings. Vincent Martinet ranges himself among the researchers claiming that the use of discounted utility under the constraint of non decreasing utility implies already defining implicitly the sustainability criterion and thus makes a value judgement on what sustainability implies *a priori*. The idea is not new, but it is nicely presented and very convincingly argued here. Since each sustainability criterion entails different conclusions on what can be preserved for future generations, in Chapter 6, the author next introduces the discussion of what *can* be preserved *a posteriori* for future generations under each criterion, the analysis of which is developed further in the second part of the book.

The second part of the book then introduces the author's and his colleagues' preferred approach to working on sustainability and resource management: invariance theory and viability theory (also called weak invariance theory). As the book title indicates, Vincent Martinet concludes the first part of his book by the question: if sustainable development is all about preserving something for future generations, we need to find better analytical methods to define this "something" that is to be preserved. The author argues convincingly that invariance theory could be applied to explore what is to be preserved. Invariance theory has indeed been used in economic growth theory by some pioneering authors. Unfortunately, Martinet has to conclude that the application of this theory to the problem of sustainable development only yields rather pessimistic conclusions in the sense that it does not bring us further than some of the usual sustainability criteria. If "something" is invariant along the optimal trajectory it is constant with respect to time or changes in technical constraints. Whereas sustainability should imply preserving "something" for future generations, it is not obvious that this "something" should be a constant *quantity*. As Martinet shows in Chapter 7 in the book, however, the outcome of applying invariance theory to the sustainability problem unsurprisingly leads to the same outcome as the maximin criterion in the cake-eating model: no depletion of the resource at all should be tolerated for sustainability. In the production-consumption model, only very restrictive conditions on the form of technical progress and the discount factor result in a conservation law. Hence, the author turns instead (in Chapter 8), to what is called weak invariance theory or viability

theory, developed in particular by Jean-Pierre Aubin. Vincent Martinet and his colleagues have shown in several articles (cited in the book) that viability theory offers an interesting and practical approach (despite its high level of complexity) to analyze resource management problems and sustainable development more generally in that it enables multi-criteria objectives. As argued in the first part of the book, the problem with commonly used rules such as the Hartwick rule for environmental policy is that it is not forward-looking and hence cannot guarantee that a consumption path is sustainable in the future. Instead of having to calculate what should be the optimal shadow values, the viability approach instead defines the set of all states and decisions that enable the constraints on the sustainability thresholds to be satisfied at all times. It is thus a practical exercise answering exactly the question of the book: given the initial state and the dynamics, what exactly (if anything) can be preserved for future generations? One of the most interesting results of Chapter 8 is the strong link between viability theory and the well-known maximin criterion. Nevertheless, for an economist the question remains of how to choose between the possibly multiple viable paths that may be identified using this approach. The very real problem of choosing the indicators and the levels of the sustainability thresholds is the topic of the book's final chapter. By defining the inverse viability problem, one can search for the sustainability indicators and thresholds that are possible to satisfy over time, given the current state.

Are there any suggestions to be made for future editions of the book? Well, this is the hard part for a reviewer, in particular one who has appreciated reading the book. As noticed rather soon by anyone who picks up the book, the two parts are not on the same technical level. On the one hand, understanding invariance theory requires knowledge of group theory, and in particular, Lie group theory, which is not (yet!) a common prerequisite for economists, one of the likely reader group targets for the book. On the other hand, much of the material in the first chapters of the book is likely to be well known to graduate students in economics, another target of the book. For readers who come from other backgrounds and have the necessary technical knowledge to apply viability theory, the book will lack the detailed proofs of many of the propositions and statements that are presented (for which the author refers the reader both to articles as well as to the book *Sustainable Management of Natural Resources: Mathematical Models and Methods* by Michel De Lara and Luc Doyen). But the main objective of Vincent Martinet's book is indeed to introduce viability theory to the mainstream toolbox for sustainability problems, and in this, he succeeds well. As always in textbooks, certain issues have to be left out, not least because of space. So what, if anything, is left out from the discussion? For applications on viability theory under uncertainty and stochasticity, the reader is referred to the works of Martinet, Doyen and De Lara. While this is understandable because of space constraints, it is a pity since the manner in which viability theory can address risk seems to be the most interesting aspect in its application to sustainability problems. A reader is also left with some questions for useful discussion: The viability approach is maybe a rather

difficult criterion to embrace for some proponents of sustainability in that it seems to take the initial state as a given and define all viable trajectories (if they exist) from this given state. Does this method allow for restoration actions? While the related concept of *minimum time to crisis* is briefly outlined in Chapter 8, the role of the initial state is left out of the discussion in the current book. Another issue is the temporal trade-off imposed by sustainability indicators and thresholds. Vincent Martinet exposes both a positive and a normative approach for defining these crucial thresholds. While the positive analysis is very appealing in that it clearly defines both the maximal levels of sustainability thresholds that can be maintained in the future, given the initial states, as well as the trade-offs between different feasible sustainability thresholds, the normative analysis may seem less convincing to some. Indeed, the normative choice among indicators based on a preference ordering among them necessitates some common *numéraire* of the various thresholds, and still implies a dynamic trade-off as in the utilitarian approach[1]. The direct appeal of viability theory applied to sustainable development seems to reside in its positive analysis, rather, which then clarifies the normative choice that society has to make through political or social processes based on a much better informed decision support through the use of viability theory. It is therefore unfortunate that only a few pages are devoted to applications of the viability approach on actual examples of sustainability issues. More practical examples of applying the approach may help convince more readers of the usefulness of the approach in allowing for dynamic trade-offs. To conclude, though, Vincent Martinet's book is a clear and consistent exposition of viability theory applied to sustainable development and its relation to the sustainability criteria that are commonly used in economics. One of the most useful features of the book is the author's serious attempt to reconcile sustainability objectives implemented through prices or quantities. In this sense, the book goes beyond the current textbooks and will reveal itself as most useful to students, researchers or anyone who wishes to think seriously about what sustainability actually implies and how it can be translated practically into environmental policy.

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References

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De Lara, Michel and Luc Doyen. (2008) *Sustainable Management of Natural Resources: Mathematical Models and Methods*, Berlin, Springer.

[1] As the author emphasizes, the preference ordering is on sustainability thresholds, and not on the utility derived from the actual levels of these thresholds, but nevertheless, this involves a temporal trade-off in utility.

Heal, Geoffrey. (1988) *Valuing the Future: Economic Theory and Sustainability*, New York, Columbia University Press.

Neumayer, Eric. (2010) *Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms*, Cheltenham, Edward Elgar.

Gaël Giraud et Cécile Renouard, *Le facteur 12 : Pourquoi il faut plafonner les revenus*

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L'augmentation des inégalités de revenus et de patrimoine est tous les jours sous les feux de l'actualité : mouvements d'indignés et franchise *Occupy*, rémunérations dans les entreprises à capitaux publics ou bonus dans les banques ayant reçu des garanties de l'État, plaidoyers pour une révolution fiscale ou départs pour la Belgique de patrons ou d'acteurs... Quel sujet économique est plus accrocheur et appropriable que celui-ci, quelle brutalité plus perverse que les comparaisons interpersonnelles auxquelles il invite ?

La lutte contre les inégalités et pour la justice sociale peut revêtir une variété de formes et de couleurs. Dans ce livre, c'est de l'instauration d'un revenu maximal que Gaël Giraud et Cécile Renouard se font les avocats. La thèse qu'ils endossent est marginalement plus subtile, puisqu'il s'agit de plafonner les écarts entre les plus hauts revenus et les plus bas, ces derniers pouvant hypothétiquement être utilisés comme variable d'ajustement.

Il n'est pas paradoxal pour un économiste de penser que c'est en réduisant les revenus les plus élevés que l'on va porter secours aux membres les plus démunis de la société, alors qu'un médecin ne pourrait espérer améliorer la santé des uns en intervenant sur les autres ou qu'un architecte confronté à une pièce trop sombre n'aura rien à gagner à occulter les fenêtres d'une autre pièce recevant beaucoup de lumière. Le premier niveau d'analyse des possibilités de redistribution propre à l'économie est bien sûr celui du transfert pur, en tant que jeu à somme nulle. Si le salaire médian a cessé d'augmenter aux États-Unis depuis la fin des années 1990, ce serait parce que le centile le mieux rémunéré de la population américaine aurait accaparé l'ensemble des fruits de la croissance. Le deuxième niveau d'analyse, plus fin, porte sur les conséquences de la redistribution sur l'efficacité. Je reconnais m'être attendu, à la lecture du titre et du sous-titre de cet ouvrage, à une plongée systématique dans les mécanismes économiques relevant de l'efficacité et sous-tendant un salaire maximal – des analyses de ce type existent pour le salaire minimum, l'instrument symétrique d'encadrement des rémunérations (par exemple dans un rapport du CAE de P. Cahuc, G. Cette & A. Zylberberg). Cet ouvrage n'en prend pas la forme, pas plus que d'une monographie sur les pratiques en matière de rémunération à l'image du travail de T. Piketty sur les très hauts revenus. Il propose plutôt une promenade érudite offrant de multiples points