

Referee report: “A Note on Aoki-Yoshikawa Model”

The paper formally expands a particular model by M. Aoki and H. Yoshikawa (henceforth AY), authors of the book “Reconstructing Macroeconomics” that inspired this special issue with the same title in *E-conomics*. It is a sound and technically important extension of the original model, and is therefore perfectly suited for publication in this special issue.

The original model of AY concerns the statistical equilibrium allocation of labor across economic sectors that are characterized by differences in productivity. Utilizing the principle of maximum multiplicity of sectoral labor assignments subject to constraints on aggregate demand and the economy-wide endowment of labor, AY show that the combinatorially most likely distribution, or *maximum entropy distribution*, of labor shares across different productivity sectors will be a so-called Boltzmann-Gibbs distribution, essentially a discrete version of the exponential distribution.

Formally, the maximum entropy formalism implies that all labor assignments across sectors are *a priori* equiprobable. The central point of this note is to show that one can relax the assumption of equiprobable configurations, which will lead to more general stationary distributions, including as a special case the exponential in AY’s original model. Moreover, the authors of the present paper also propose a binary Markov chain model to describe the migration of labor among sectors, thereby adding a dynamical aspect that is by construction absent (or better: “hidden”) in the maximum entropy formalism. From an economic perspective, an interesting feature of the Markov chain model concerns the transition rates describing labor migration, because the authors introduce a crucial parameter that (a) allows to tune the choice of new sectors by migrating workers, making them either prefer to migrate to more populated or to less populated sectors, or recovering the original model when labor is indifferent to the choice of a new sector; and (b) the parameter decides upon the stationary distribution. This would be useful if one observed an empirical distribution of sectoral labor shares with a particular functional form, and wanted to know which transition rates would provide a ‘micro-foundation’ that is consistent with the observed distribution.

Although the paper is generally well-written, I have two minor issues that I would like to see addressed in a (basically effortless) revision. First, since the book of AY contains a plethora of models, the title is at best unfortunate (and, also, reference should be made to the appropriate chapter in the book, I believe Chap. 3). How about “A Note on the AY Sectoral Productivity Model” or something to that effect? Second, I am generally wary of allegories like “...demand has the meaning of energy” (p. 3 after Eq. (9)) since they often miss crucial differences between physics and economics. The passage should be rephrased to make clear that this is merely a formal analogy to a well-understood problem in physics, without any economic content or implications. The concept of energy is the prime example for such a conundrum, since in economics most relevant quantities are rarely ‘conserved.’ Hence subsequent passages that emphasize the conservation of demand are most unfortunate from this perspective.

Finally, and somewhat unfairly, I cannot resist but to point out that neither AY nor the authors of this note subject the model to empirical scrutiny. After all, the supposed migration of workers between sectors in situations of exogenously given aggregate demand will help us very little in understanding how effective demand is shaped over time, or why and how productivity differences across sectors arise in the first place.