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Comment on the paper by Groβler

van Daalen, Els

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DISCUSSANT'S COMMENTS

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On the meaning and operationalization of antifragility: Comment on the paper by Großler

Els van Daalen

Faculty of Technology, Policy and Management, Delft University of Technology, Delft, The Netherlands

Correspondence
Els van Daalen, Faculty of Technology, Policy and Management, Delft University of Technology, Delft, The Netherlands.
Email: c.vandaalen@tudelft.nl

1 | INTRODUCTION

In his paper on antifragility in supply chains, Größler (2020) explains the concept of *antifragility*, provides a managerial *operationalisation* of antifragility and investigates the *implications* of antifragility in a supply chain setting by applying it to a system dynamics model of a four-tier supply chain. In these Comments, I take a look at each of these three aspects, i.e., the definition of antifragility, the way in which it has been put into operation, and the implications of the current research, and add some thoughts and questions that came to mind when reading the paper.

2 | ANTIFRAGILITY

Antifragility "refers to systems which gain from volatility and disorder and show an improvement in performance when subjected to large and seemingly implausible changes in parameters" (Größler, 2020). In these general terms, antifragility looks like a relevant and desirable system characteristic. However, the meaning of improved system performance is not as straightforward as it would seem. As the author already states in the discussion of the simulation results, in managerial settings, there are usually multiple outcomes of interest, multiple objectives which are often conflicting: improved performance may not be unambiguous. I would add that the meaning of system performance is even more difficult for dynamic systems, as the performance is usually not about the end state values but about the behaviour over time. For example, which is better: smaller oscillations in 'quality' and lower average 'quality', or larger oscillations in 'quality' and higher average 'quality'? In addition, in managerial settings, different actors may have varying perspectives on the relative importance of the multiple (often conflicting) objectives. Hence, conclusions about antifragility of a system are not absolute. Depending on a specific definition of performance, different conclusions about antifragility can be drawn.

3 | OPERATIONALIZATION

The general meaning of the word operationalize is "to put into operation", and a "system being in operation" means that the "system is being used" (collinsdictionary.com). In the social sciences operationalization refers to "a process of strictly defining measurable factors representing those concepts in the real world" (research.library.gse.edu/surveydesign). The latter meaning in terms of measurable factors is discussed above. Operationalization in the paper by Größler is effected by adding an experience curve structure to the model in which changes in demand lead to lower unit costs. The system with the added structure is called an antifragile supply line. With respect to this added structure, I would like to raise a practical question and a more philosophical question.

The practical question concerns real world examples from a supply chain setting where changes in demand lead to lower unit costs. The author indicates that the intention is "not to causally model how learning and improvement leads to antifragility but rather to explore potential consequences, once we assume antifragility to work like an experience curve effect" (Größler, 2020). I have some

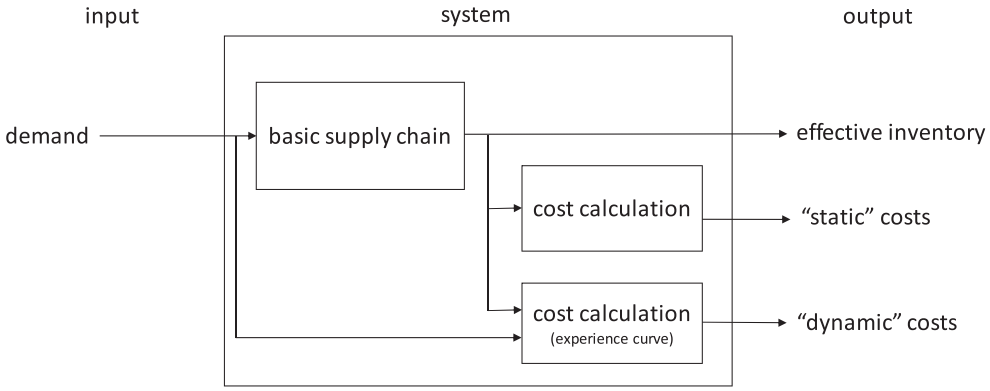

FIGURE 1 Two structures for supply chain costs

difficulties with this assumption and am not completely convinced that demand changes can drive learning or process improvements that allow the organization to proceed with lower costs. I could also hypothesize that in order to deal with demand changes a process improvement is made that makes production more flexible and which could have higher instead of lower costs. Größler indicates that "antifragility is not a consequential reaction coming from change but a potential that needs to be reaped". To take forward that idea, it would be useful to unearth examples of situations where this has been the case in practice.

The changed structured also prompts the question: When can we speak of a different *system* (or different supply line)? To explain the issue, Figure 1 shows two structures for determining costs. One in which unit costs do not depend on changes in demand, and one in which the unit costs are lower for larger changes in demand. These are the two situations that are described in 'experiment 1', where the author compares the robust and the antifragile system simulation.

Größler does indicate that there is no difference in the behaviour of the effective inventory between the robust and antifragile system simulation, that antifragility only influences costs, and that they serve as validation runs only. However, I wonder if we can say that an antifragile *system* is being simulated. An alternative view might be that the same system is simulated when looking at effective inventory as a system output, namely, the basic supply chain system, and for effective inventory it cannot be said that there are two different systems. When is something a different system? I would say that only in the situation where costs are fed back into the basic supply chain (Experiments 2 and 3) will the supply chain system with effective inventory as an output be a different system. A related question is: Can we call a system an antifragile system or a robust system, or would it be more productive to only talk about a system that shows antifragile behaviour or robust behaviour (assuming that an overall measure of performance can be defined)? It may even be useful to not define it as a property of a system but rather of a variable, in that a variable could show antifragility.

4 | IMPLICATIONS

The consequences of adding a specific structure have been tested in a specific supply chain setting in a number of experiments. The author suggests that further research should address assumptions related to, e.g., the structure of the supply chain, ordering policies, development of demand. I agree that there are many interesting questions remaining even within a supply chain setting. It would also be interesting to see if there are other 'operationalisations' of antifragility possible in this supply chain. In addition, large changes in demand have been tested, but perhaps not seemingly implausible changes. It would be interesting if the supply chain model could undergo some more testing in this respect. Looking at less complex systems and perhaps addressing (possibly analytically), some of the questions from a systems and control theory perspective might also yield further insight.

Reading this paper that explores the concept of antifragility in supply chains prompts one's own thoughts about the meaning of antifragility and how this can be investigated. The author ends the paper with a call for further scrutinization of antifragility as a desired system characteristic once higher levels of complexity and dynamics are assumed. In my opinion it is indeed an interesting topic that warrants further investigation and discussion.

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