FLEXIBILITY FOR A RESILIENT SYSTEM

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ABSTRACT

In this study the authors wish to introduce a new concept into the field of sustainability science and the study of resilience. This study looks to answer two questions: why is flexibility needed and what flexibility actually is.

Researchers from different fields have contended that flexible systems should have an inherent capacity to absorb shocks and perturbations so that a given system is able to maintain its essential functions. In this paper, the authors introduce the concept of flexibility as a measure of resilience. Flexibility as a concept has been used in the field of economics, engineering and biological systems. The authors reviewed literature from these fields before demarcating the characteristics of a flexible system that can be implemented in sustainability science.

The authors then go on to propose a conceptual framework incorporating flexibility as a characteristic while designing complex systems. Robustness and innovation are both identified as being important for a system. While robustness is important in the context of the present, innovation becomes important in the context of future. However in the event of an unknown externality, the authors contend that the flexibility of a system is crucial in maintaining its robustness. Also, that same flexibility is crucial in realizing innovation within that system. To sum up, flexibility as a characteristic leads to both innovation and robustness.

To illustrate the concepts described earlier the authors studied whether an economic system that has a higher contribution of the knowledge intensive service sector to the economy is positively related to economic complexity in that country.

It is widely accepted by scholars working in the field of innovation that technological knowledge creation is evolutionary in nature. It has been proposed that the combination of existing knowledge plays an important role in the creation of new knowledge. This concept can be similarly expanded to ideas, where the generation of ideas is possible by combining existing knowledge. Thus, the combination of existing technological knowledge and organizational knowledge creates novelties and leads to innovation. Numerous examples in the field of biology prove the presence of combination, which results in novelties. In this thesis the author contends that the service sector facilitates this process of combination of knowledge, which results in diverse economic activities.

This interplay is similarly seen in the service sector, which allows the mixing of knowledge from diverse fields, as for example consultancy firms typically employ individuals with different skills sets. This is mainly due to higher chances of diverse ideas combining giving rise to novel ideas and suggestions. The author would like to highlight the flexible role played by the knowledge intensive services. Knowledge intensive service sectors like management consultancy, professional services and technical services allows peer to peer movement of knowledge, allowing for a horizontal flow of information. This is in contrast to the vertical integration of knowledge flow, and can thus facilitate a faster adaption of ideas.

The methodology employed by the authors map the countries' contribution of the knowledge intensive service sector per GDP with the economic complexity of each country. The data for the GDP contribution of knowledge intensive service sector is sourced from OECD and EU database. The Economic Complexity Index (ECI) reflects the diversity and ubiquity of exports

of a country, as ECI is based on trade data. A higher ECI reflects higher diversity and less ubiquity of products exported, which is highly desirable. The data for ECI is sourced from Complexity Atlas, where the data is calculated using UNCTAD data.

Results suggest that there is relationship between knowledge intensive services and economic complexity. The knowledge intensive service sector plays an important role in creating avenues for combination of knowledge, which leads to the creation of new knowledge. A correlation analysis showed that technical services played a higher role than the research and development sector in creating economic complexity. The role of imitation is an important contributor in knowledge diffusion vis-a-vis innovation. The role of management consultancy and professional services played an important role in contribution to economic complexity in bigger economies like Germany or the United Kingdom.

It is very important to understand the role played by the service sector in creation of a flexible economy in future. The authors argue that a system with a strong knowledge intensive service sector is crucial for an innovative and robust economy, as they are sites of knowledge combination. This understanding is crucial to design systems in transition. Given the dynamic nature of flexibility, identifying the characteristics system, which leads to flexibility, will add a new dimension to the study of sustainability transitions and help create smoother transitions.

Keywords: Flexibility, Resilience, Business Services, Sustainability, Flexible Systems