

#26 Topic: Using structural diversity to measure the complexity of technologies

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Abstract:

The paper introduces structural diversity as a new approach to quantify the complexity of technologies. By modeling technologies as combinatorial networks, a measure of technological complexity is derived that represents the diversity of (sub-)network topologies in these networks. It is further argued that this measure can be empirically approximated with the Network Diversity Score (NDS). The paper also presents an application of this approach to European patent data from 1980 to 2015. On this basis, the measure of structural diversity is shown to replicate a number of stylized facts commonly associated with technological complexity: Complexity increases over time and younger technologies are more complex than older technologies. Complex technologies are also associated to larger R&D efforts and require more collaborative R&D activities. Lastly, when controlling for technologies' size, technologies scoring high on structural diversity are also shown to concentrate in space.