Collaboration in innovation ecosystems—the influence of system bottlenecks on firms’ collaboration strategies in the solar PV industry

The literature on innovation ecosystems suggests that the success of individual innovations increasingly depends on the success of other innovations residing in a focal firm’s external environment. In particular, external actors deliver upstream components and downstream complements that together with a focal firm’s product deliver a coherent solution to the customer. The interdependencies between firms in innovation ecosystems can result in the emergence of system bottlenecks—components of the ecosystem that constrain growth because of poor quality, high cost, short supply, or other limiting factors. Bottlenecks are critical to the functioning of innovation ecosystems because they limit firms’ ability to create and capture value.

How do firms navigate such bottlenecks? One possible strategy is to collaborate with firms that reside in those parts of the ecosystem where the bottlenecks occur to jointly mitigate, work around, or resolve the bottleneck. While it is a core proposition of the literature that innovation ecosystems thrive based on collaborative strategies, surprisingly little theory and evidence regarding such collaborations exists. We address this gap by studying how system bottlenecks influence a focal firm’s collaboration strategy with different parts of its innovation ecosystem. We argue that as bottlenecks in the components or complements of the ecosystem intensify, focal firms adapt their collaboration strategy by pursuing more collaborations with component providers and complementors, respectively.

We test our hypotheses in the global crystalline silicon solar photovoltaic (c-Si PV) industry. Toward this end, we develop a novel operationalization of system bottlenecks in terms of the evolution of the cost shares of the different elements of a c-Si PV system. The regression results suggest that component bottlenecks significantly drive a focal firm’s collaborations in the components part of the ecosystem, while complement bottlenecks significantly influence collaborations in the complementary location of the ecosystem. We detect substantial differences in the antecedents of components versus complements collaborations, which substantiates our framework that differentiates collaborations based on the interdependency structure of the innovation ecosystem. We also show that the more firms are active in parallel ecosystems, the more they collaborate with partners that possess resources that are fungible across ecosystems. Finally, preliminary results suggest that while bottlenecks drive collaborations, this effect weakens as the ecosystem evolves from a nascent to a more mature state, suggesting that the ecosystem shifts from joint value creation to value capture. Together, these results offer novel insights into collaboration strategy in innovation ecosystems.

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