## An integrated study of cyber insurance and cyber security

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## Abstract

Cyber risk is a top business concern nowadays and has been attracting an increasing attention during the coronavirus pandemic and the Ukraine crisis. Companies can purchase cyber security plans to reduce its likelihood of being compromised by cyber attacks, and insurance policies to transfer cyber losses to insurers. We perform an integrated study where there is an insurer who sells a cyber insurance policy and a company who can purchase the insurance policy and a certain cyber security plan. In doing so, we model the company's IT structure by a network and assume that the insurer has the pricing power. This way the insurer can internalize the contagion risk within the company into the insurance premium. The company makes its purchase decisions of the insurance policy and the cyber security plan, and then the insurer will adjust the premium to optimize its profitability. We characterize this Stackelberg equilibrium between the two parties, and study the effect of the network's structure on the company's purchase decision and the insurer's profitability.

Keywords: cyber risk; network analysis; contagion; Stackelberg equilibrium

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