D I S S E R T A T I O N P R O P O S A L

Yue (Sarah) Wu

“Essays in Sustainable Finance”

Tuesday, December 10, 2024
2:30pm
Tepper 5219

Chapter 1: Innovation Spillover in Production Network (joint with Lars-Alexander Kuehn and Liyan Shi)
This paper explores the spillover effects of firm innovation within the production network. Unlike prior research focusing on knowledge networks, we investigate how R&D activities between upstream and downstream firms influence profitability and innovation incentives. Empirical findings show that upstream firms' R&D efforts have a greater positive effect on downstream firms' revenue and innovation outcomes than the reverse, especially when customers have greater bargaining power. These results are supported by a calibrated equilibrium model capturing these interactions through rent-splitting and bargaining power mechanisms. The study aims to quantify the return on R&D investment within production networks, and to distinguish the effects of green versus brown innovations across upstream and downstream firms.

Chapter 2: Tax-Equity Financing of U.S. Renewable Electricity Generation (joint with Chris Telmer)
Renewable energy has experienced significant growth in the U.S., accounting for 21.4% of total energy generated in 2023 — more than twice its 2010 share. Much of this expansion has been propelled by federal subsidies, primarily through non-refundable tax credits and accelerated depreciation. To fully leverage these tax credits, renewable energy developers often partner with tax-equity investors, who provide upfront capital in exchange for all tax credits and a portion of revenues until a specified internal rate of return (IRR) is achieved. Despite appearing low-risk due to guaranteed returns, tax equity investments carry a reported risk premium of 4.5%. Using data from 122 Texas wind plants, we find that the discrepancy between the tax-equity investor’s cost-of-capital and expected return results in 25% of federal tax credit subsidies are captured by tax-equity investors, diverting benefits away from renewable energy developers.

Chapter 3: The Impact of AI Technology on Firms' Environmental Sustainability
AI optimization and predictive accuracy can reduce production emissions, but AI training and inference are energy-intensive, with cloud computing firms reporting soaring emissions linked to AI usage. This study explores corporate incentives to balance these opposing environmental impacts and quantifies the externalities associated with AI usage. Using data from U.S. public firms, I find that within firms, environmental sustainability is negatively related to AI intensity, while a reverse pattern emerges cross-sectionally, where firms with higher AI intensity tend to have better sustainability outcomes. This relationship is more pronounced for S&P 500 firms, likely due to greater public scrutiny. I aim to further analyze the impact of AI intensity on environmental outcomes, considering factors such as regional policy exposure and shareholder pressure.

Proposed Committee
Lars-Alexander Kuehn (Co-Chair), Liyan Shi (Co-Chair), Chris Telmer, Chester Spatt, and Nick Muller (External Reader)

Proposal Documents
https://cmu.box.com/s/esah2ondg43qw5du9g1cjk9rs44t034y