

Assessing Corporate Control Resilience: A Digital Twin Framework for Complex Ownership Networks

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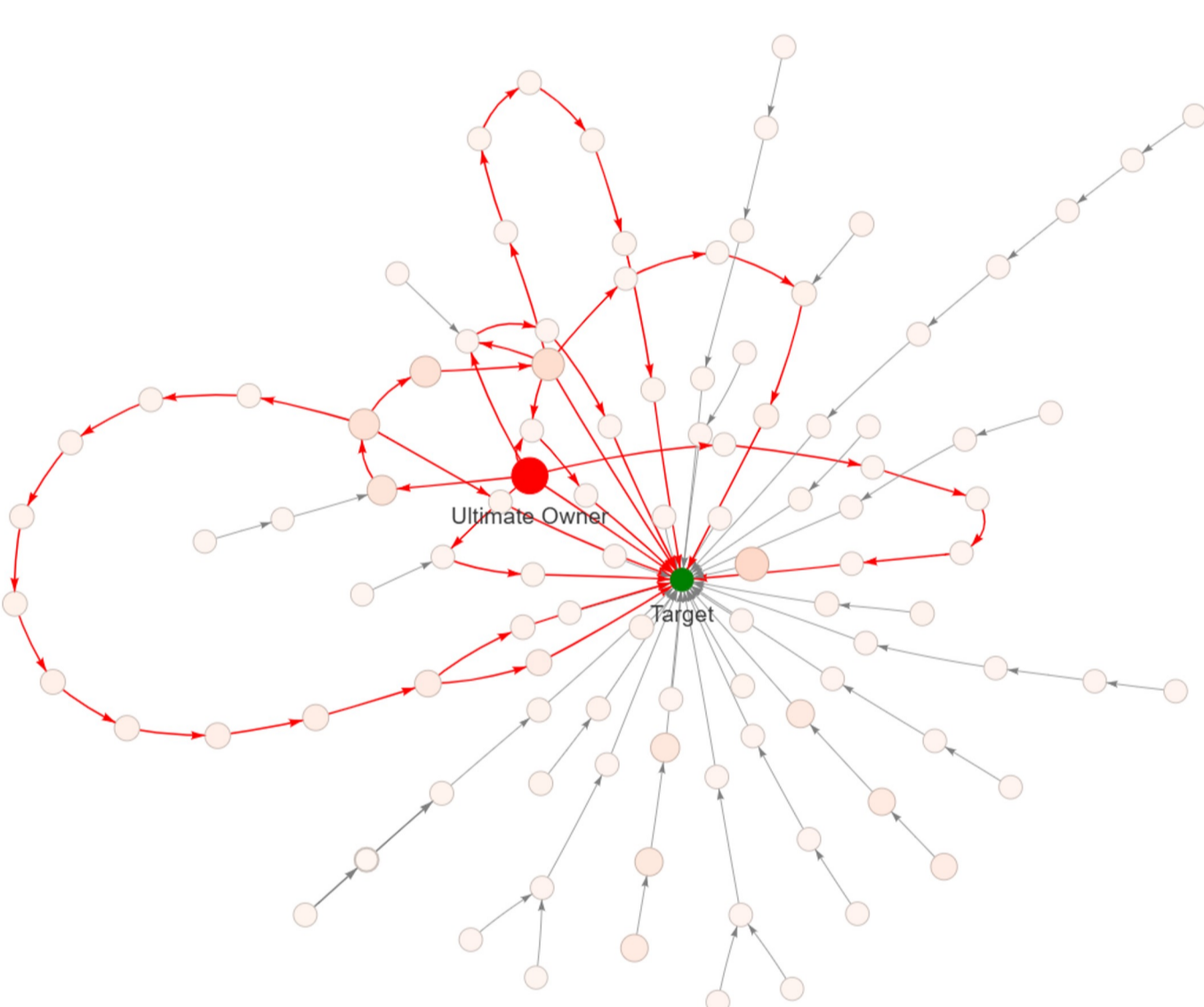
Background

Corporate ownership in modern financial markets forms complex, multi-layered networks where control propagates through institutional investors, index funds, and cross-border shareholding chains. Understanding the resilience of these structures is crucial for corporate governance, regulatory oversight, and market stability, yet traditional ownership metrics often fail to capture indirect or coordinated influence.

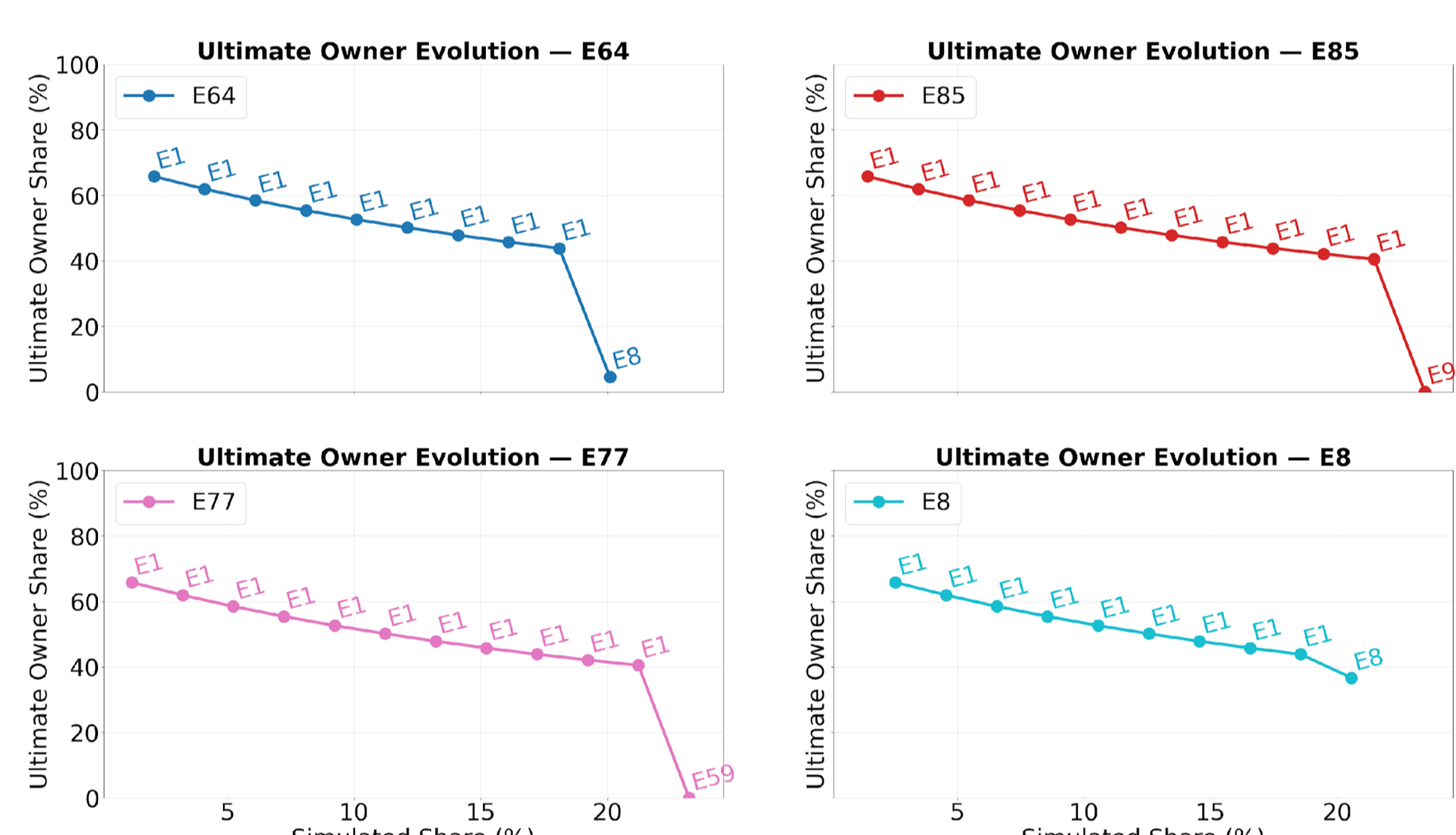
This work introduces a data-driven, interactive digital twin of ownership networks that enables systematic stress testing of control using the Mizuno Network Power Index (NPI), allowing researchers and policymakers to explore how control is distributed and evolves within interconnected ownership structures.

Results

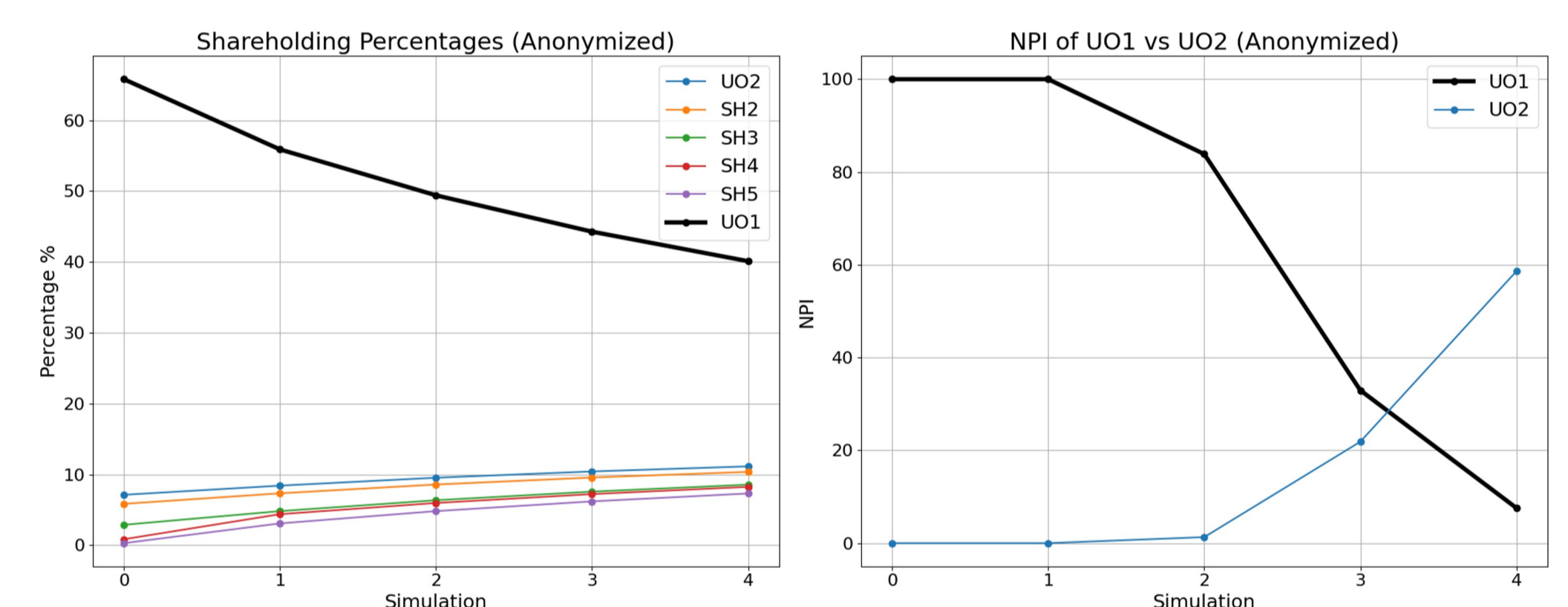
Result 1: The NPI enables the identification of the ultimate owner by capturing both direct and indirect control within the ownership network.



Result 2: Simulations of concentrated ownership changes show that the control structure is relatively resilient: individual non-state shareholders must substantially increase their direct stakes before a shift in the ultimate owner occurs.

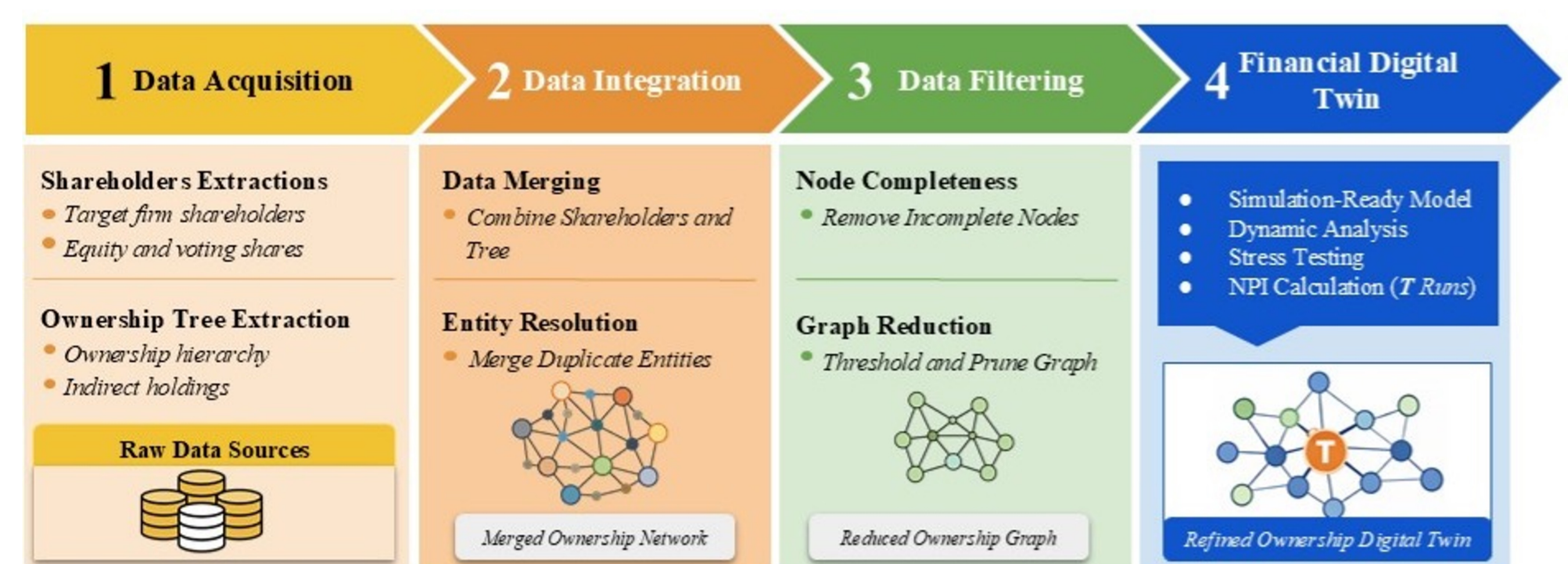


Result 3: In a dispersed scenario, coordinated incremental acquisitions by multiple entities within the same corporate group enable a transfer of control with relatively small cumulative stakes, revealing the amplifying role of indirect ownership pathways.



Methodology

- **Digital Twin Construction:** A data-anchored digital twin of the ownership network was developed by integrating shareholder data, resolving entities, and filtering the graph to retain economically relevant control pathways, producing a simulation-ready representation of corporate control.
- **NPI-Based Analysis:** Control distribution and the identification of the ultimate owner were evaluated using the Mizuno Network Power Index (NPI) [1,2], enabling a network-based assessment beyond direct ownership metrics.
- **Stress-Test Simulations:** Two scenarios were implemented—a concentrated increase by major non-state shareholders and dispersed, coordinated increments within a corporate group—to examine how incremental ownership changes affect control dynamics.



Summary/ Highlights

State control is resilient under concentrated ownership but dispersed or coordinated shareholding strategies can shift ultimate control, revealing vulnerabilities invisible to static, direct-ownership analyses.

References

- Abeltino A., Bacaloni T., Bernardini A., Giancaterini F., and Pannone A. (2026). Power and Control in Complex Networks: A Taxonomy and Critical Review. <https://arxiv.org/abs/2601.10218>
 Mizuno, T., Doi, S., & Kurizaki, S. (2020). The power of corporate control in the global ownership network. PLoS One, 15(8), e0237862