

Innovation in 5G Technology: Leadership, Competition and Policy Issues

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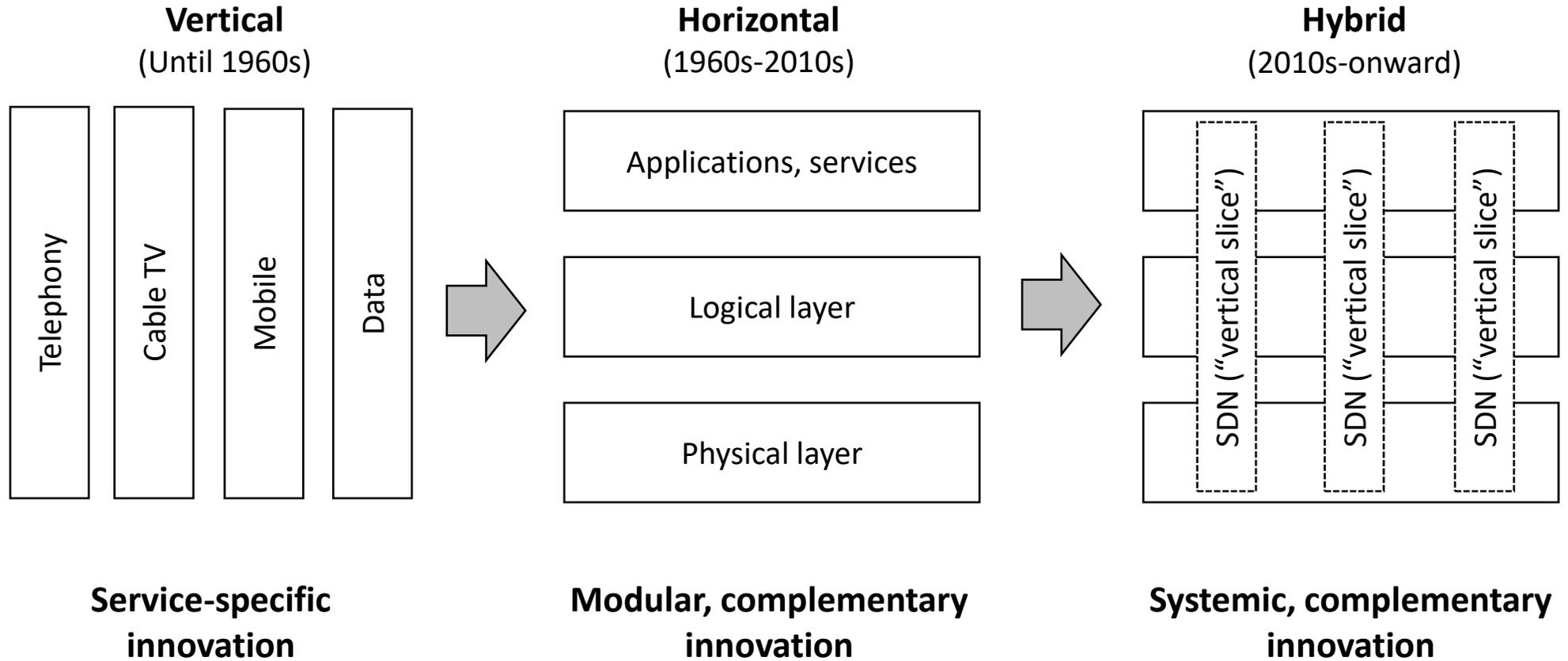
“Any theory that purports to explain novelty, whether it deals with invention, innovation, or the emergence of new species of biota, is intrinsically difficult and paradoxical. How can you have a theory of the unexpected?”

Kenneth R. Arrow (2012, p. 43)

Outline

- Evolution of the ICT innovation system
- Innovation and its drivers
- Phases and complexity of 5G innovation
- Player positioning in the 5G innovation system
- Complementary, interdependent innovation
- Direct, indirect, and systemic effects of regulation
- Policy guardrails for the innovation system
- Getting 5G market design right

Evolution of the ICT innovation system



Innovation and its drivers

- Innovation is an evolutionary process of combination and recombination of knowledge, to explore an “adjacent possible”
- Factors influencing the rate and direction of innovation
 - Entrepreneurial risk-taking (especially during early phases of discovery) (↑)
 - Innovation opportunities (technological, market, regulatory) (↑)
 - Appropriability of innovation rents (↑)
 - Contestability of a market (↑ / ↓)
- Additional innovation drivers in 5G/6G ecosystems
 - Strength of complementarities between players (↑)
 - Coordination costs between players (↓)

Phases and complexity of 5G innovation

Revolutionary services (5G, 6G)

Services requiring high reliability, low latency, and high data rates for heterogeneous devices across uplink and downlink (Saad et al. 2019)

Evolutionary services (5G)

Ultra-reliable low latency communications (URLLC)

Basic Internet in Everything (IoE)

Enhanced mobile broadband (eMBB)



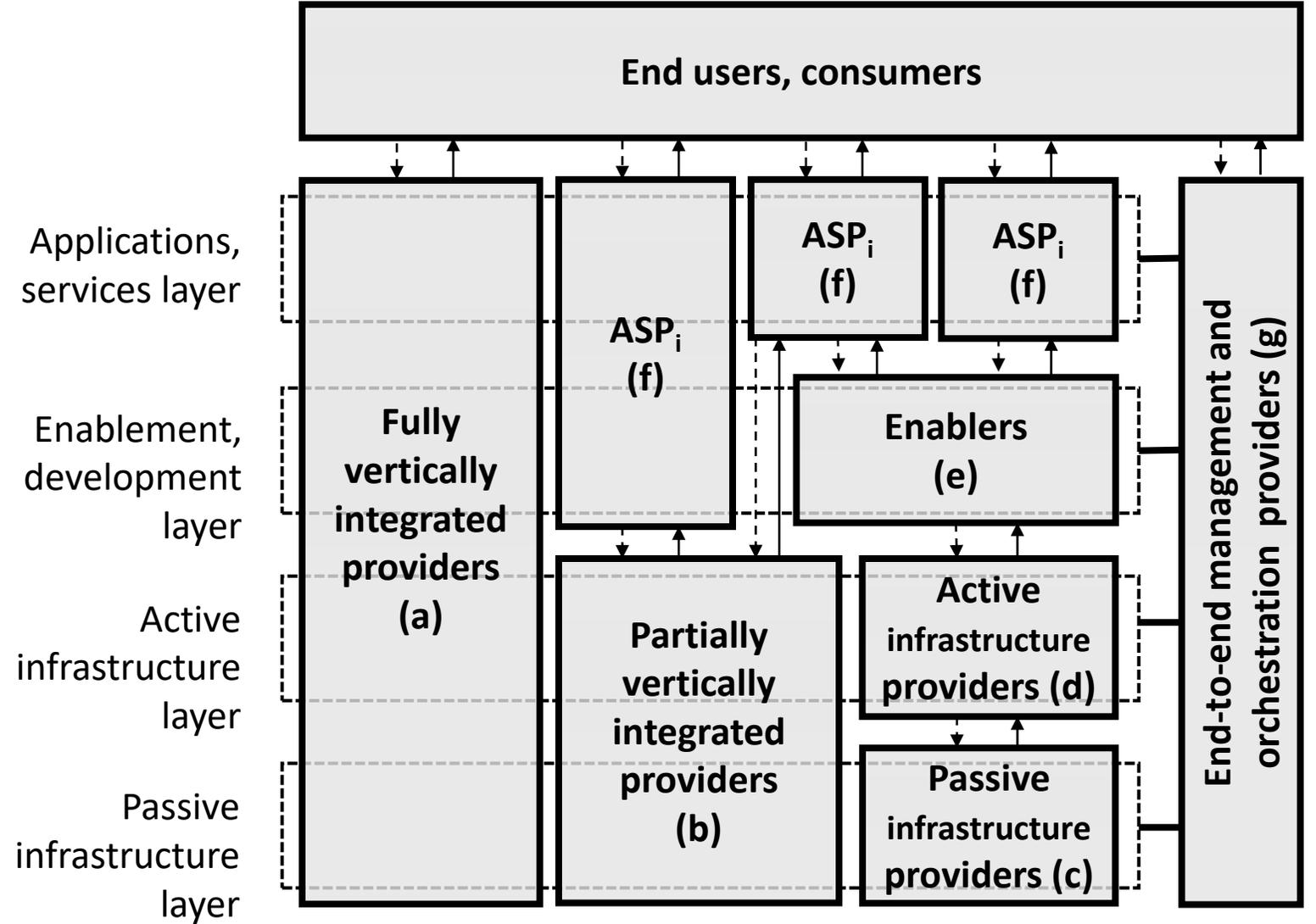
Entrepreneurship; risk taking; tinkering, trial and error; angel and venture funding; initial coordination of systems under conditions of deep uncertainty

Invention

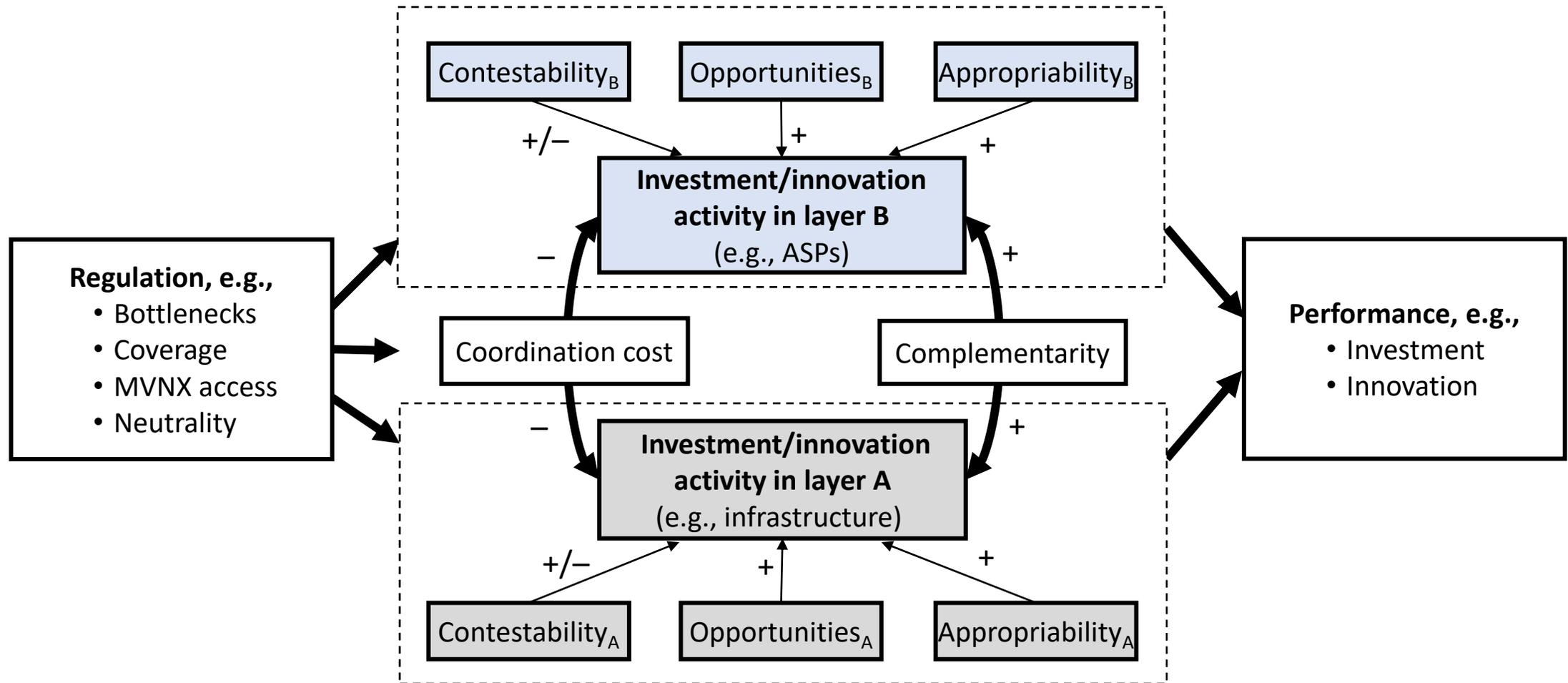
Technological, economic, regulatory innovation opportunities; appropriability conditions; contestability; complementarities; coordination costs; under conditions of uncertainty and risk

Innovation

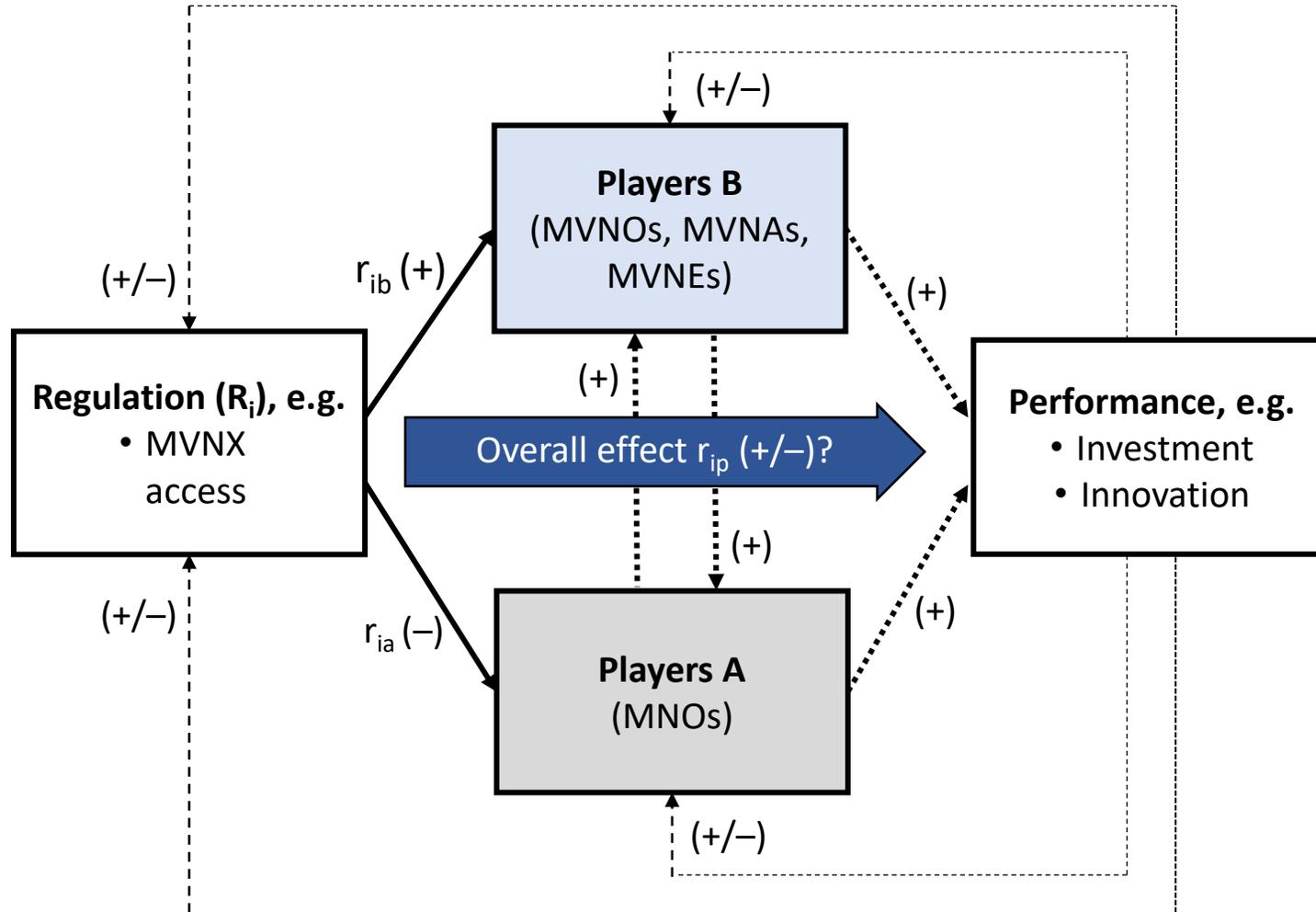
Player positioning in the 5G innovation system



Complementary, interdependent innovation



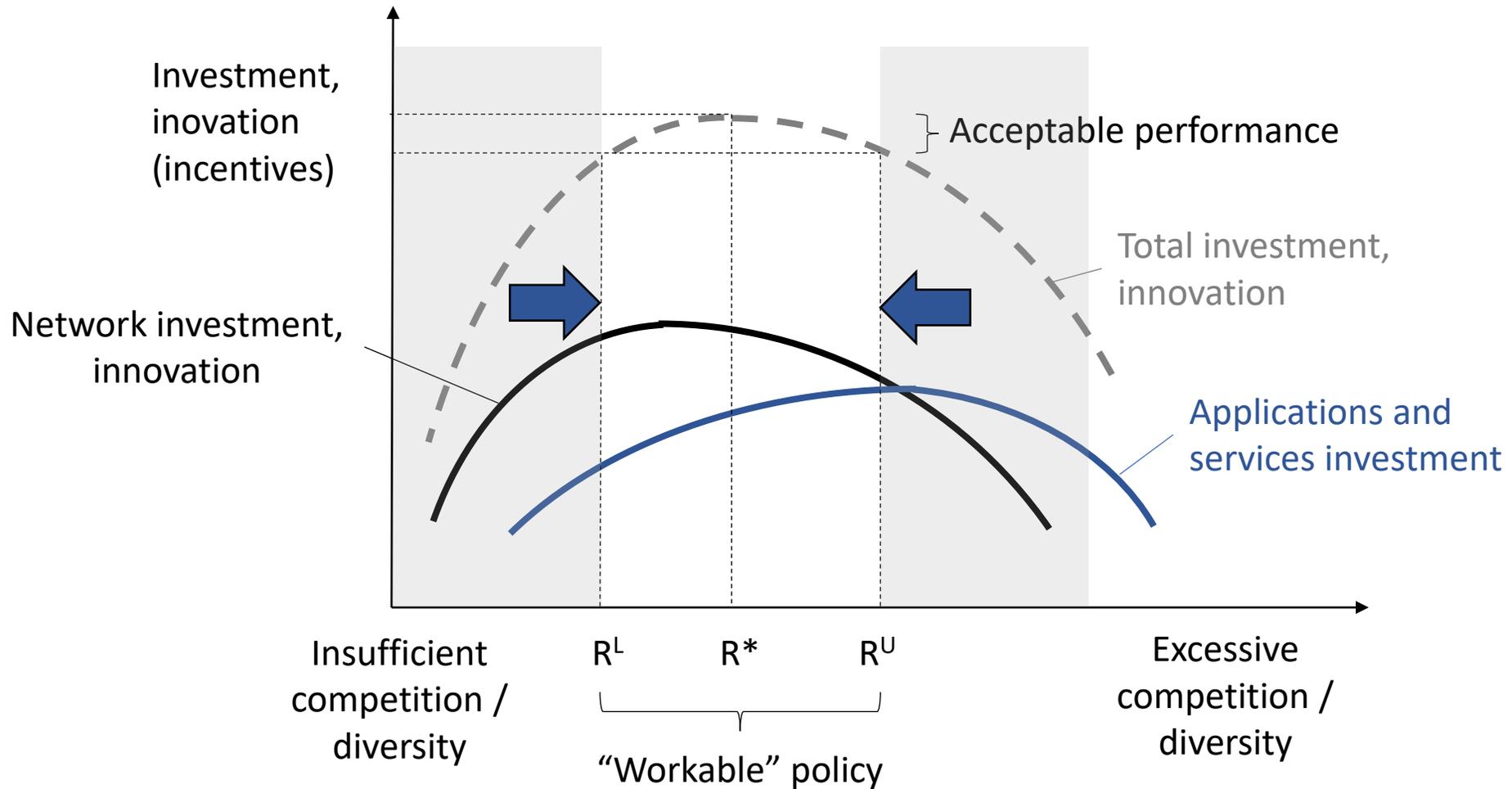
Direct, indirect, and systemic effects



- Localized access to spectrum
- Network neutrality
- Backhaul regulation
- 5G Coverage requirements
- MVNX regulation

- Direct effects
- ⋯ Indirect effects
- - - Systemic effects

Policy guardrails for the innovation system



Getting 5G market design right

- Ecosystem dynamics create strong endogenous forces to align innovation incentives of players over time
- Market design should create conditions that allow entrepreneurial experimentation across phases of innovation
- Policy and regulation should allow differentiation while providing safeguards against discrimination
- Policy can reduce the risk of systemic market failures (e.g., establish non-discrimination safeguards, reduce coordination costs)
- Policy ought to facilitate institutional diversity (e.g., open standards in addition to standard essential patents and proprietary technology)
- Policy needs to create a dynamic learning system to avoid locking the system into a low performance trajectory

Sources

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