

# ***Regulation and Infrastructure Investment: The Case of Broadband***

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# *Overview*



- **Introduction: Broadband and Regulation**
- **Infrastructure Investment and Competition**
- **Regulation and Infrastructure Investments**
- **Evaluation and Conclusions**

# ***Importance of broadband for the economy***

- **Direct effects:**
  - **Growth effect through increased broadband penetration revives telecom sector**
  - **Increase in broadband access, packet switching, backbone usage**
  - **Reduction of narrowband**
- **Indirect effects could dwarf direct effects in the long run:**
  - **Increase in contents programming and development of new applications**
  - **Vehicle for convergence:**
    - **Platform competition**
    - **New competition through triple play and VoIP**

# ***Broadband and infrastructure investments***

- **Focus on access network (and packet switching?) rather than backbone network and contents**
  - Penetration
  - Upgrading (triple play)
  - Collocation
- **Investment is not an end in itself but a means to an end: better and more affordable services.**
- **Broadband investment and broadband penetration: Investment push or demand pull? [If we build it will they come?].**
- **No reasons for government investments or subsidies**

# ***Potential reasons for regulation of broadband***

- **Market power/economies of scale/sunk costs → Asymmetric regulation (costs and incentive distortions)**
  - **Competition policy preferred**
    - **Vertical integration/separation: vertical economies (of scope) vs. restriction of rivals**
  - **Bottleneck (access) regulation**
  - **End-user regulation**
- **Network externalities (bandwagon effects)/democratic participation → Symmetric regulation**
  - **Interconnection (any-to-any)/open access**
  - **Standardization (proprietary, non-proprietary)**
  - **Universal service regulation (extended to broadband?)**

# ***Competition preferable to regulation***

- **End-user regulation reduces competition: Substitute for competition**
- **Access regulation (bottleneck regulation): Motor for competition**
- **Conditions for access regulation**
  - **No competition in wholesale and downstream retail markets**
  - **Call termination has no downstream retail market under calling-party-pays principle**

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# ***Infrastructure competition vs. service competition***

- **Advantages of infrastructure competition:**
  - Innovative services
  - New technologies
  - Product differentiation
  - Enduring competition
  - Obsolescence of regulation
- **Drawbacks of infrastructure competition:**
  - Risks
  - Excess capacity (Telecom meltdown, fiber optics)
  - Bankruptcies
  - Sub-optimal scale (wasteful duplication)
- **→ Service competition necessary for and complementary to infrastructure competition**
- **Path dependence: Past duplications are sunk**

# ***Infrastructure competition vs. service competition***

- **Virtuous cycle: Competition → investment → higher penetration (or new application) → more competition**
  - VoIP as killer application in the literary sense of the word?
- **Vicious cycle: Competition → investment → excess capacity → more competition**
  - The vision and building of the “information superhighway” of the 1990s ended in the telecom meltdown

# ***Inter-modal vs. intra-modal competition***

- **Fundamental tradeoff:**
  - **Presence of inter-modal competition substitutes for intra-modal competition.**
  - **Absence of inter-modal competition requires facilities-based intra-modal competition or regulation of service competition.**
- **Broadband inter-modal: DSL, Cable modem, satellite, 3G, powerline**
- **Path dependence: US vs. Germany**
- **Broadband intra-modal: 3G carriers; line sharing, bitstream, resale of access service**

# *Inter-modal vs. intra-modal competition*

- **Inter-modal competition:**
  - Always facilities based
  - Innovation and sequential monopolies: Access holidays ( $\approx$  patents)
  - The most efficient technology should win
- **Intra-modal competition**
  - Facilities based or service based
  - Facilities based: 2G and 3G
  - Service based: Last mile problem
  - The most efficient firm(s) should win

# ***Intra-modal competition: Bottleneck access***

- **Vertical economies**
  - **Between network levels**
  - **Between network and retail**
  - **Between network, retail and contents**
- **Access regulation vs. competition for the bottleneck: short-term vs. long-term**
  - **Can essential facilities be circumvented**
    - **by competitors?**
    - **by consumers? (inter-modal competition)**
  - **Are new technologies in sight for replacing essential facility?**
  - **In absence of regulation, does bottleneck access develop by itself?**

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# ***How can regulation promote competition and efficient investment?***

- **Regulatory governance and regulatory incentives (pricing)**
- **Regulatory governance**
  - **Unified regulation across networks (convergence)**
    - **Consistency: Similar objectives and yardsticks**
    - **Competitively and technologically neutral**
  - **Predictable and constrained**
    - **Safeguards against arbitrary changes**
      - **Due process**
      - **Contents**
    - **Predictable criteria for deregulation**
    - **Independence (credibility)**
    - **Private ownership of incumbent**

# ***Telecom infrastructure investments***

- **Incumbents vs. entrants or non-replicable vs. replicable investments?**
- **Incumbents:**
  - Last mile bottlenecks
  - Inter-modal competition in access technologies
- **Entrants:**
  - Investments in replicable parts of networks
  - Access-related investments
  - Investments in bottleneck bypass: Tradeoff between unbundling and bypass

# ***Regulatory pricing principles (mostly for bottleneck regulation)***

- **Pricing close to efficient costs**
  - Time-of-use sensitivity, capacity-based pricing
  - Risk adjustments for sunk assets (technical obsolescence, declining input prices, declining demand, increasing replicability): Mark-ups on cost of capital, risk sharing, long-term contracts
  - Efficient costs in shrinking vs. expanding markets
- **Ramsey markups or non-linear pricing to cover common costs**
- **Baumol-Willig rule: Avoid price squeeze**
- **Long-run pricing: Price caps vs. rate-of-return regulation**
- **Increasing replicability: 20-20 hindsight: Heads I win, tails you lose**

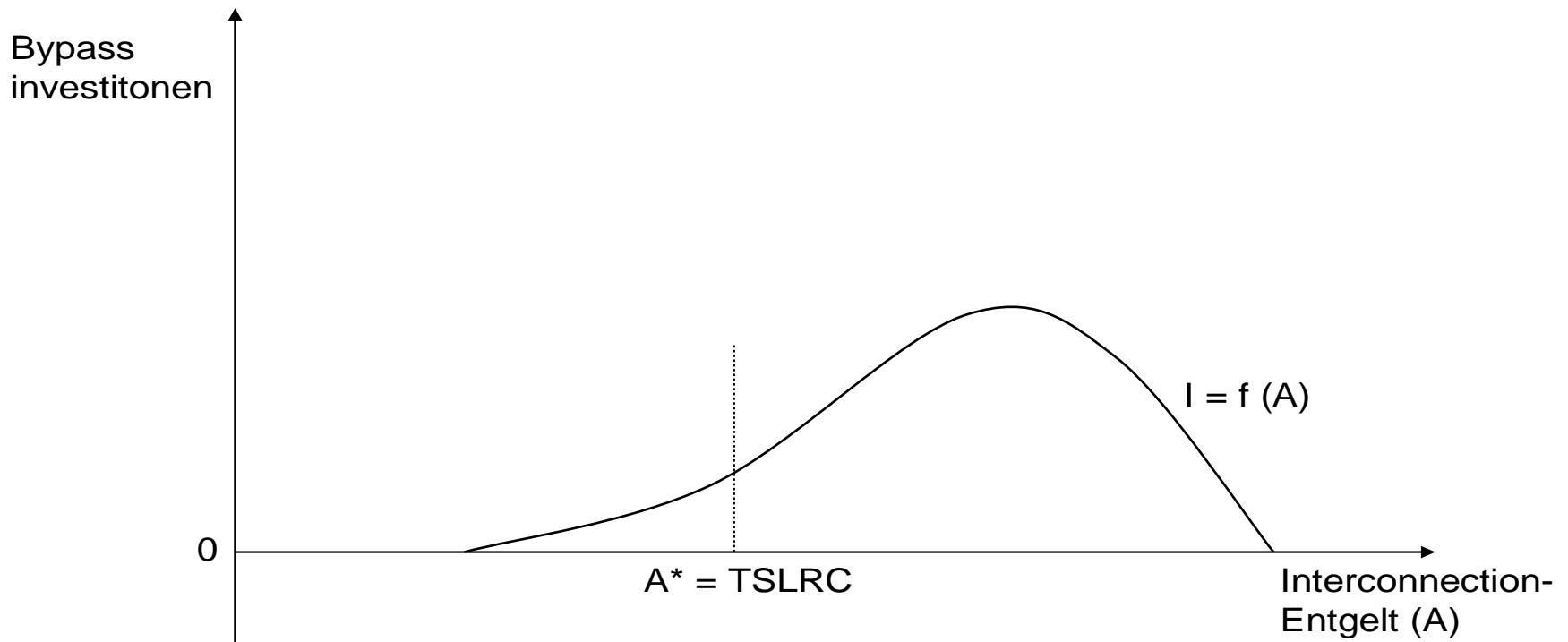
# *End-user regulation and investments*

- **End-user regulation only if access regulation unsuccessful**
- **The stricter end-user regulation of incumbent**
  - the lower quality of service
  - the higher cost of capital
- **Incumbent's output/investment first increases then decreases as end-user regulation becomes stricter (leading to non-price rationing)**
- **Entrants' investments and outputs decrease in stricter end-user regulation of incumbent**

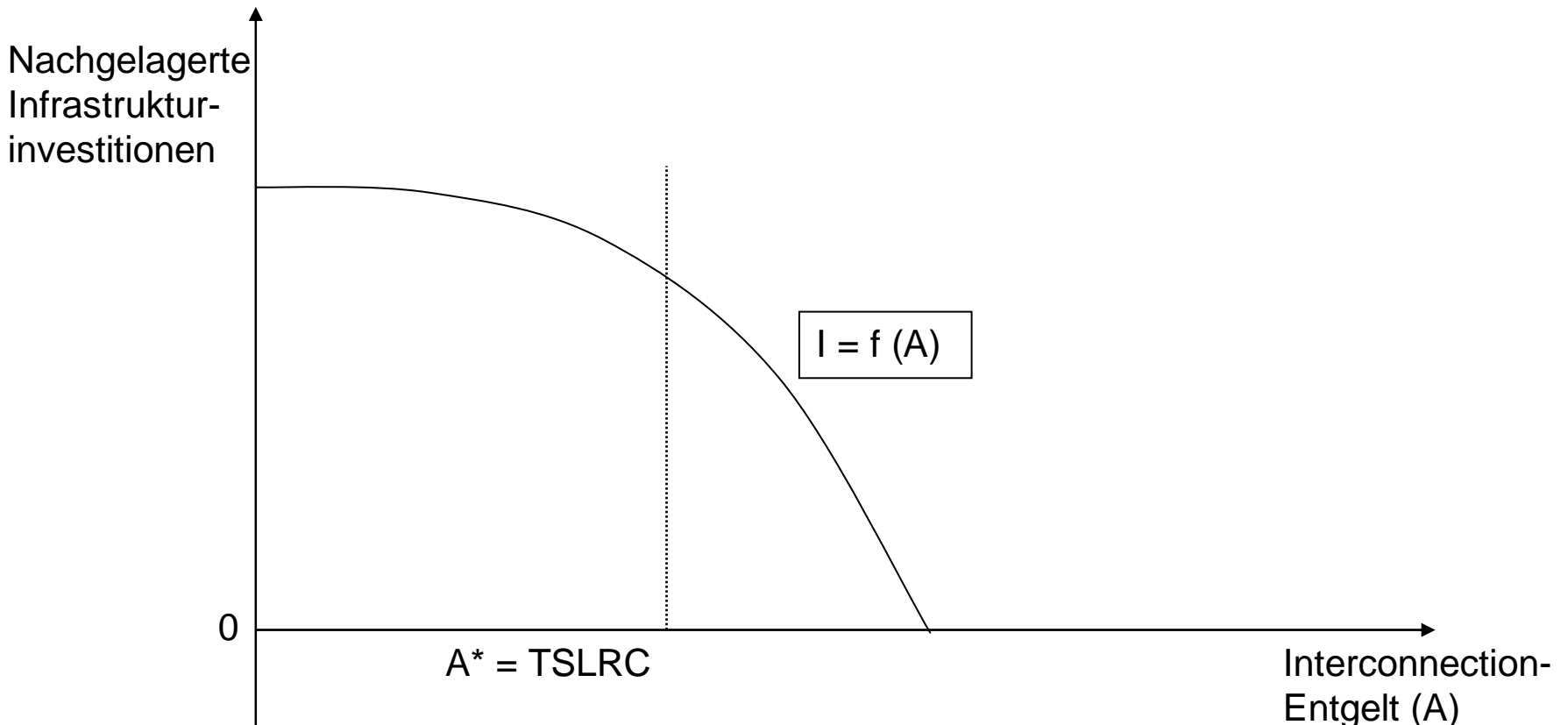
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# *Bypass Investments as a Function of Interconnection Prices*



# Downstream Infrastructure Investments as a Function of Interconnection Prices



# ***Bottleneck regulation and investment***

- **The stricter bottleneck regulation (for given replicability of bottleneck)**
  - **the less entrants invest in bottleneck or bottleneck bypass: High access prices for US long-distance carriers in the 1980s created competitive access providers (CAPs)**
  - **the more entrants invest in replicable network assets that are complementary to bottlenecks**
  - **the less the incumbent will invest in replicable network assets that are complementary to bottlenecks**
  - **the higher the incumbent's cost of capital**
- **Incumbent's output/investment of bottleneck services first increases than decreases as bottleneck regulation becomes stricter (leading to non-price rationing)**

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# *Policy conclusions*

- **Stable regulatory framework: Consistent content and due process**
- **Subsidies only for social reasons (not to enhance investments)**
- **Desirability of competing infrastructures is path dependent**
- **Inter-modal competition → competition policy preferred over bottleneck regulation and end-user regulation**
- **No inter-modal competition → bottleneck regulation preferred over end-user regulation**
- **Vertical separation under weak economies of scope**
- **Since high bottleneck charges risk strangulating competition and low bottleneck charges (below economic costs) reduce bottleneck investments, regulator should aim at charges slightly above costs (knife edge problem).**
- **Cave ladder: The more replicable the higher the price of bottleneck service (relative to costs) → Investment incentives for entrants, not necessarily for incumbents**