

COEXISTENCE OF COPPER AND FIBER UNBUNDLING: ACCESS CHARGES AND INVESTMENT INCENTIVES



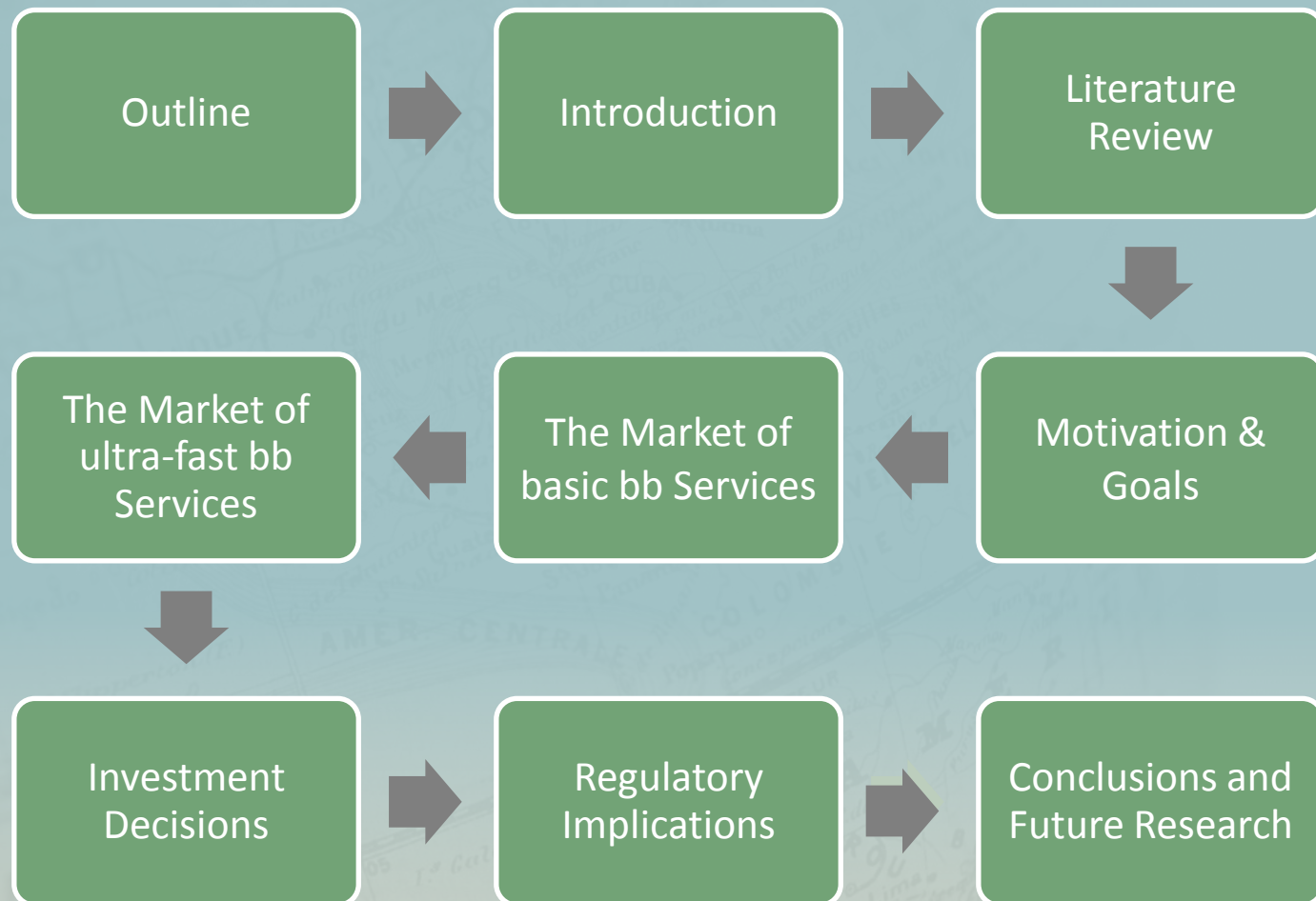
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OUTLINE



INTRODUCTION

- Transition to fiber access networks
 - Technical and economic reasons
- Europe 2020-Digital Agenda for Europe
 - All Europeans will have access to much higher internet speeds of above 30 Mbps
 - 50% or more of European households will subscribe to internet connections above 100 Mbps
- Digital Agenda Scoreboard 2013
 - 30 Mbps are available to 53.8% of homes
 - 2% of European homes subscribing to at least 100Mbps
- The role of access regulation
 - Encourage investments in fiber access networks
 - Preserve the competitive structure inherited from copper unbundling

LITERATURE REVIEW

- The copper access networks are switched off immediately after the fiber deployment
 - All firms need access to the investor's fiber access facilities
 - Study of the optimal price of fiber unbundling
 - See Cambini & Jiang (JTPO, 2009) and Tselekounis, Varoutas & Martakos (JTPO, 2014) for a review of this literature
- When a firm invests in fiber deployment, it completely replaces its copper access network
 - Copper and fiber access networks may coexist
 - Study of the optimal price of copper unbundling
 - Bourreau, Cambini, & Doğan (IJIO, 2012): geographic areas
 - Brito, Pereira, & Vareda (IEP, 2012): entrant's services
 - Study the interplay between prices of copper and fiber unbundling
 - Bourreau, Cambini, & Doğan (JRE, 2014): geographic areas

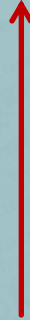
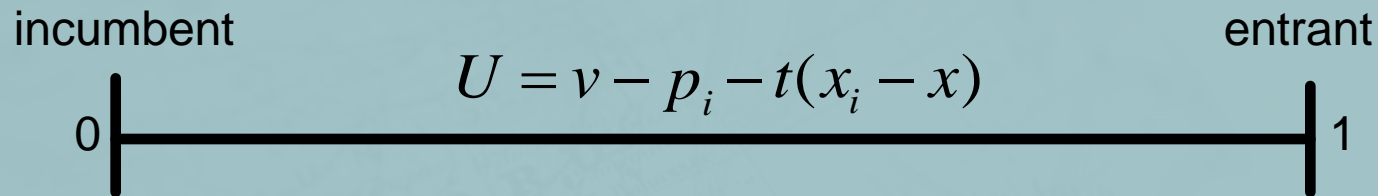
MOTIVATION

- Previous studies assume that each firm provide either:
 - A basic bb service over the copper access network
 - An ultra-fast bb service over the fiber access network
- Bourreau, Lupi, & Manenti (2013):
 - Coexistence of copper and fiber access networks
 - Each firm provides both a basic and an ultra-fast bb service
 - The four services are vertically differentiated
 - Study how the migration from copper to fiber technology is affected by the access price to the copper access network
- Our goal
 - Coexistence of copper and fiber access networks
 - Coexistence of basic and ultra-fast bb services
 - Effect of copper and fiber access prices on investment incentives

TIMING OF THE GAME

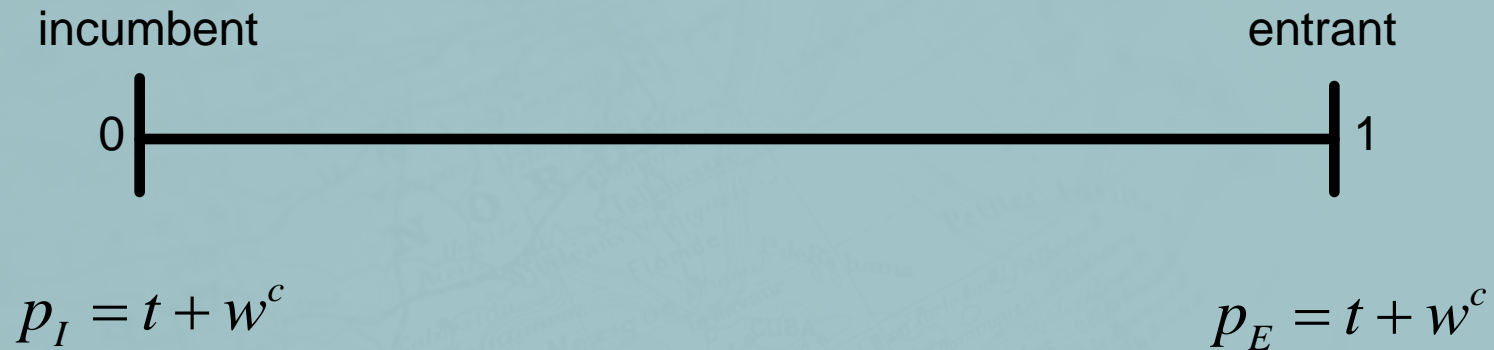
- The regulator sets the access prices of the copper (w^c) and fiber (w^f) unbundling
- The incumbent decides whether to invest in new access facilities or not
 - The incumbent invests when its profit from investing outweighs the investment cost and its profit from not investing
 - $\Pi_I^{inv} = \Pi_I^c + \Pi_I^f > \Pi_I + F$
- The incumbent and the entrant set the retail prices
- Each consumer subscribes to one broadband service according to the available retail services and the corresponding retail prices

NON-INVESTMENT CASE

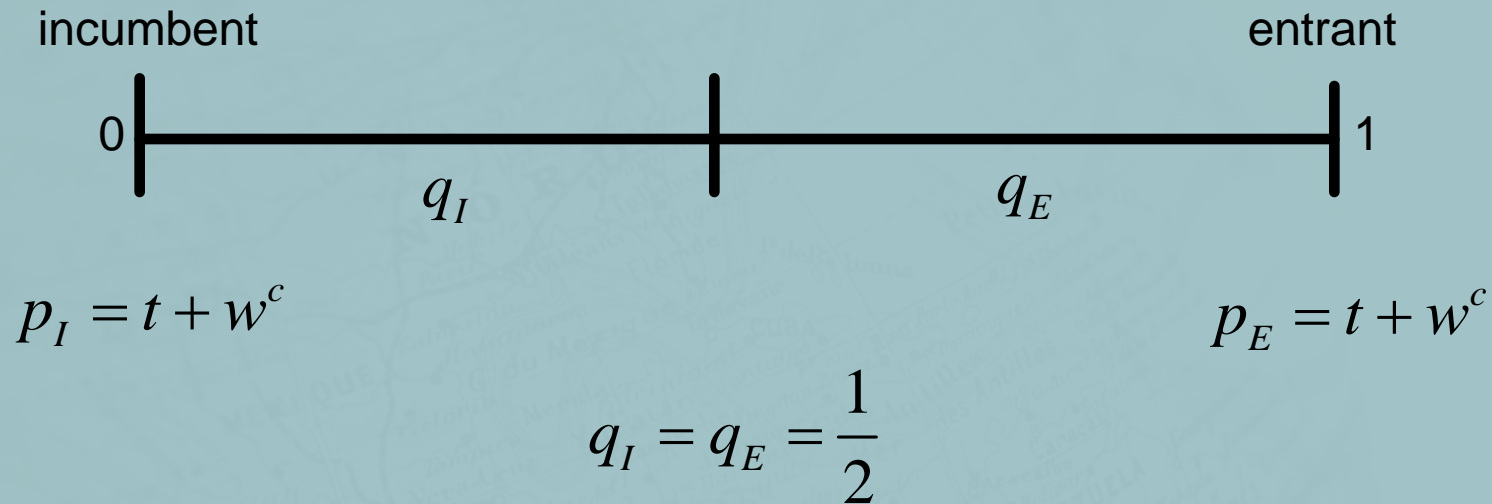


Market of the basic bb service provided
over the incumbent's copper access
network

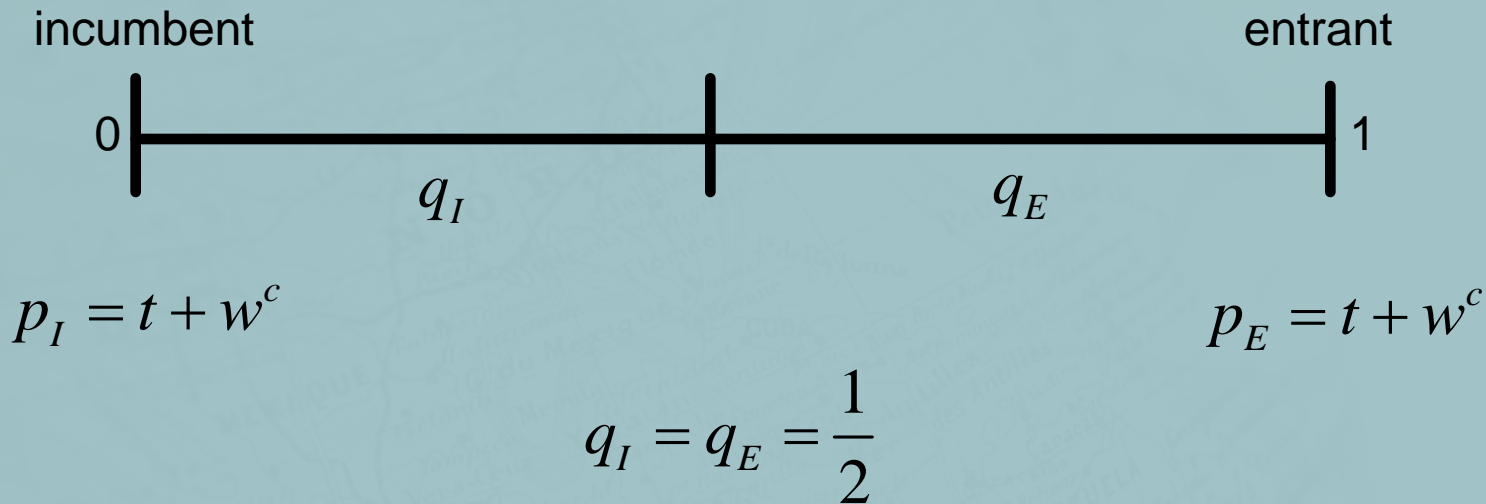
NON-INVESTMENT CASE



NON-INVESTMENT CASE



NON-INVESTMENT CASE



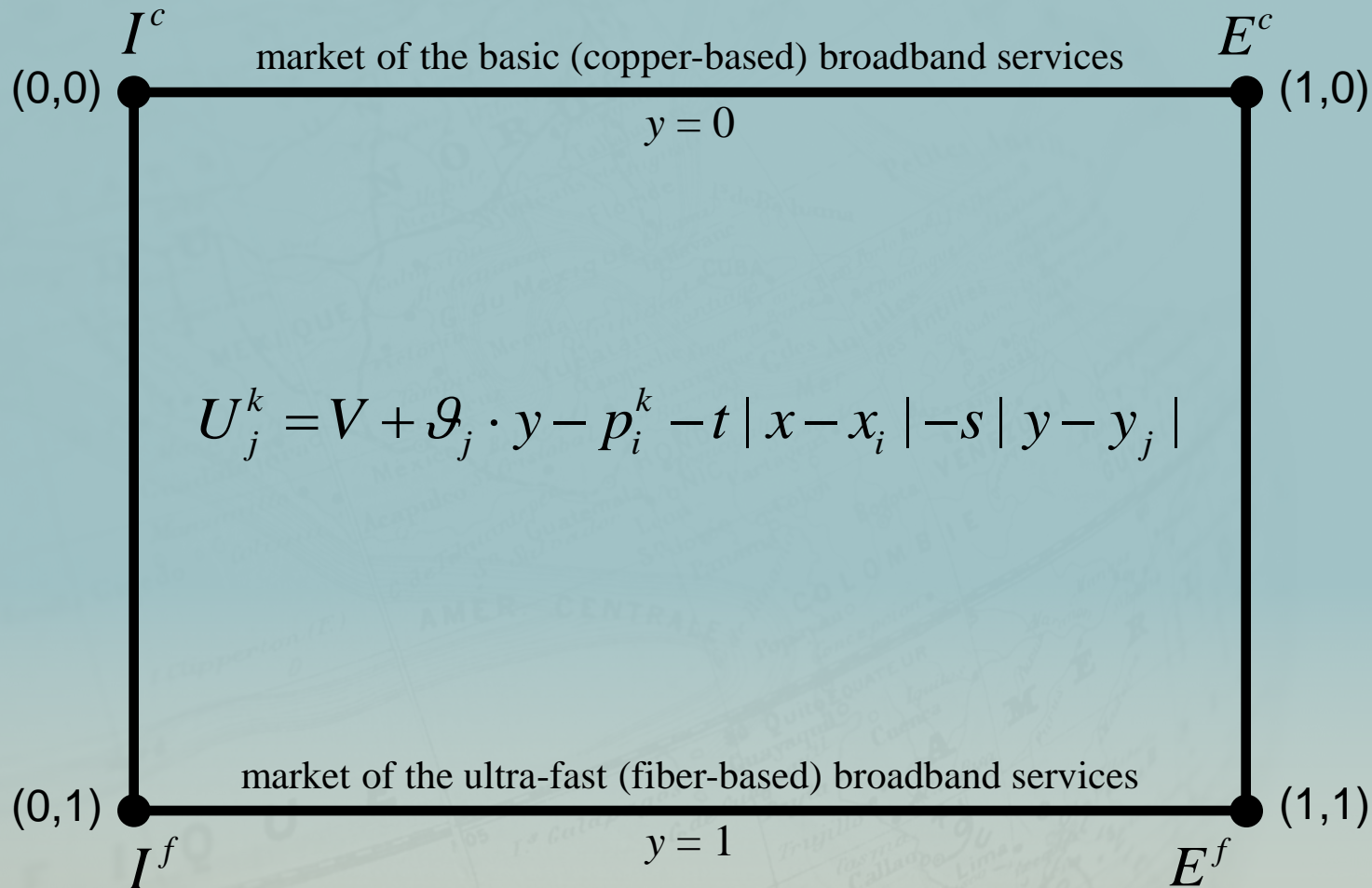
$$\Pi_I = [p_I - c_I^c]q_I + [w^c - c_I^c]q_E$$

$$\Pi_E = [p_E - w^c]q_E$$

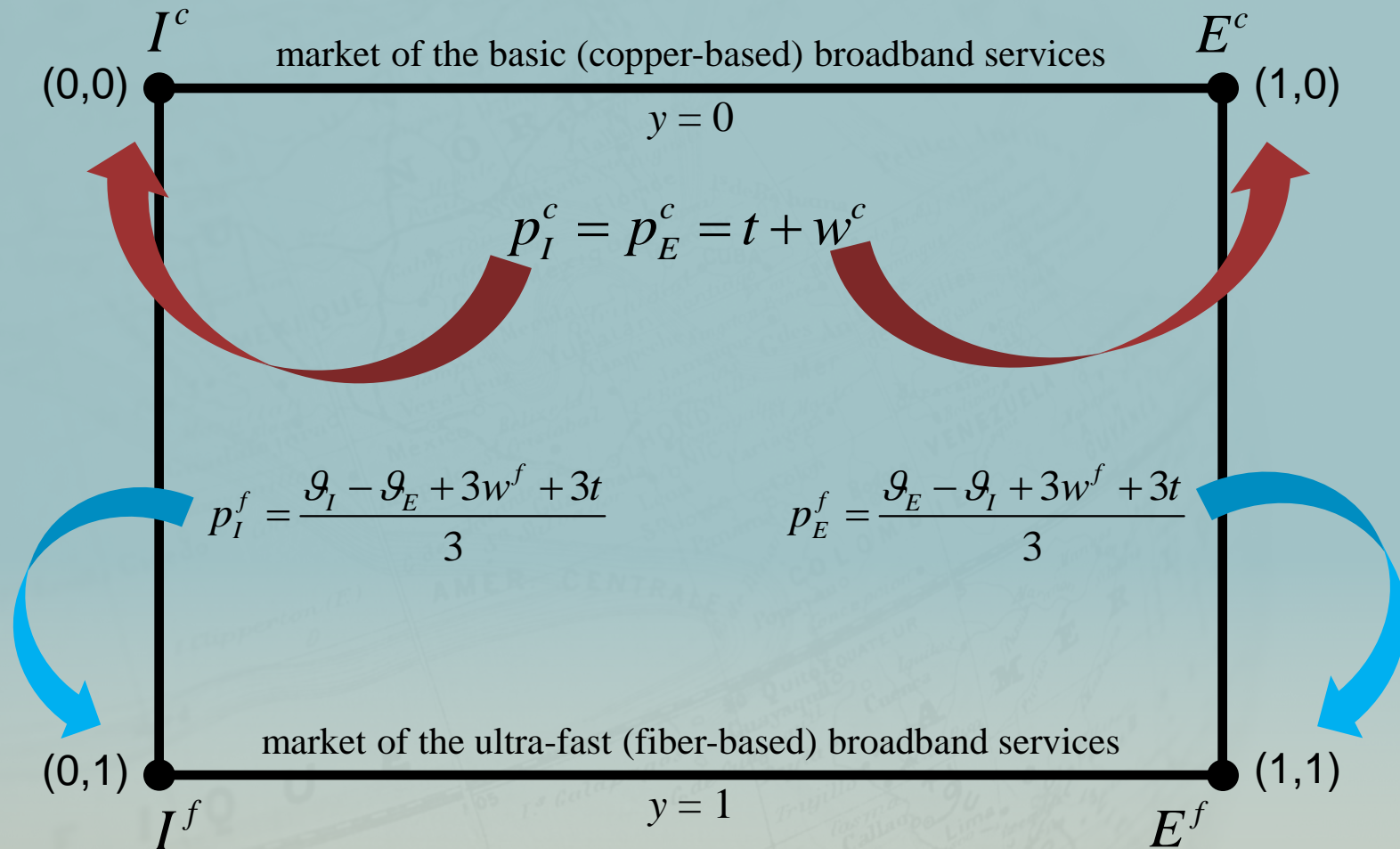
$$\Pi_I = \frac{t}{2} + w^c - c^c$$

$$\Pi_E = \frac{t}{2}$$

INVESTMENT CASE



INVESTMENT CASE



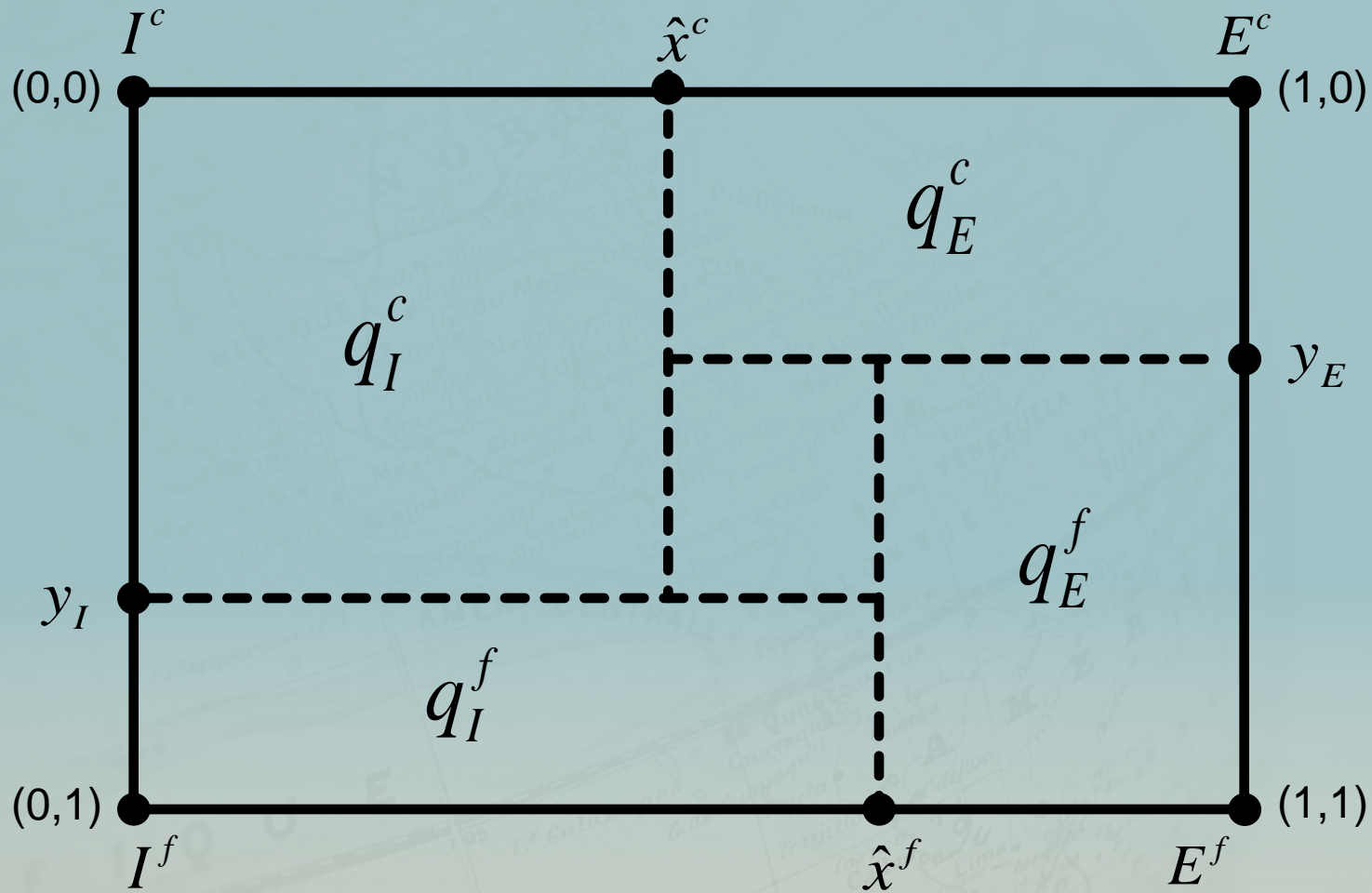
INVESTMENT CASE



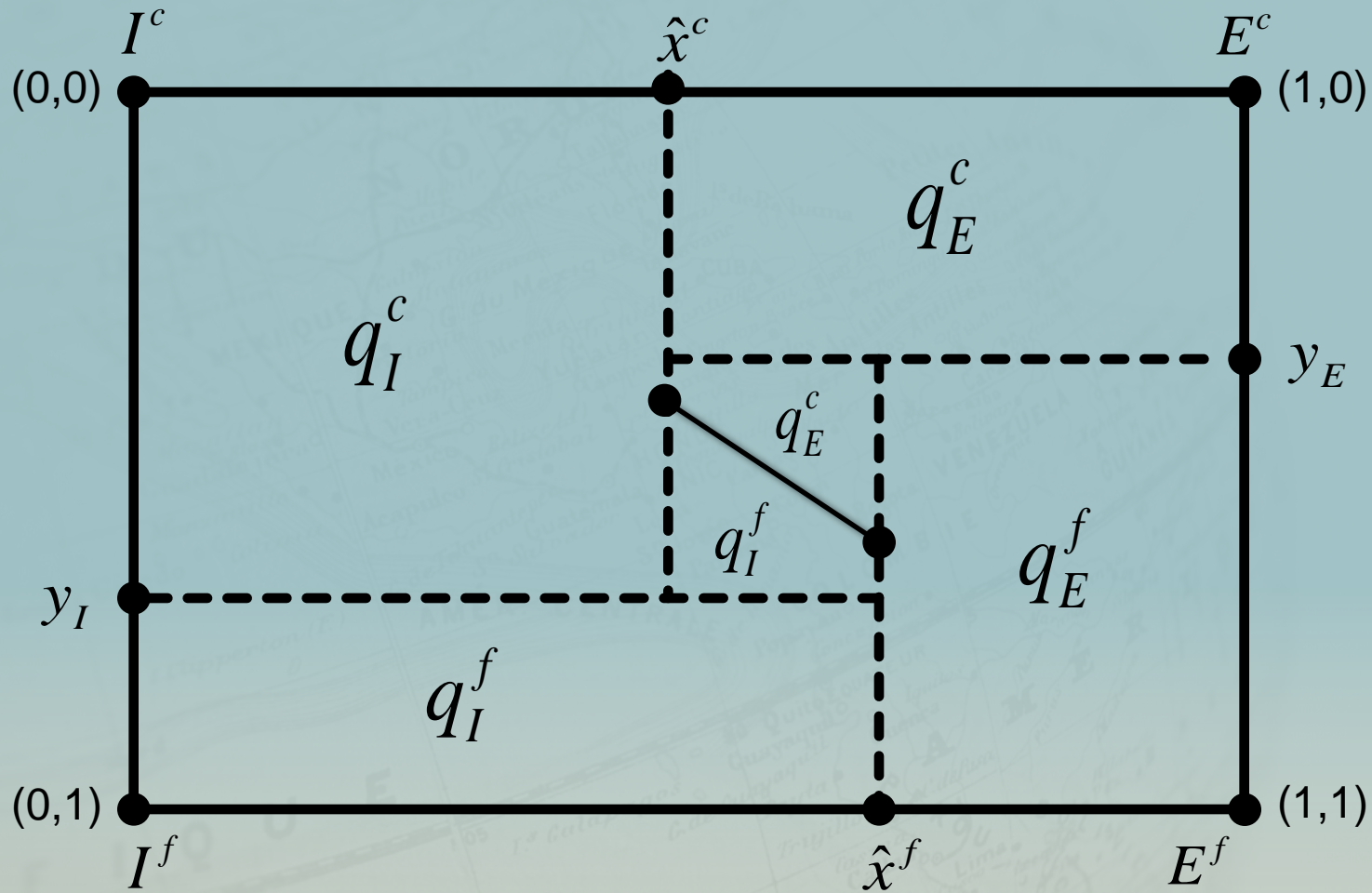
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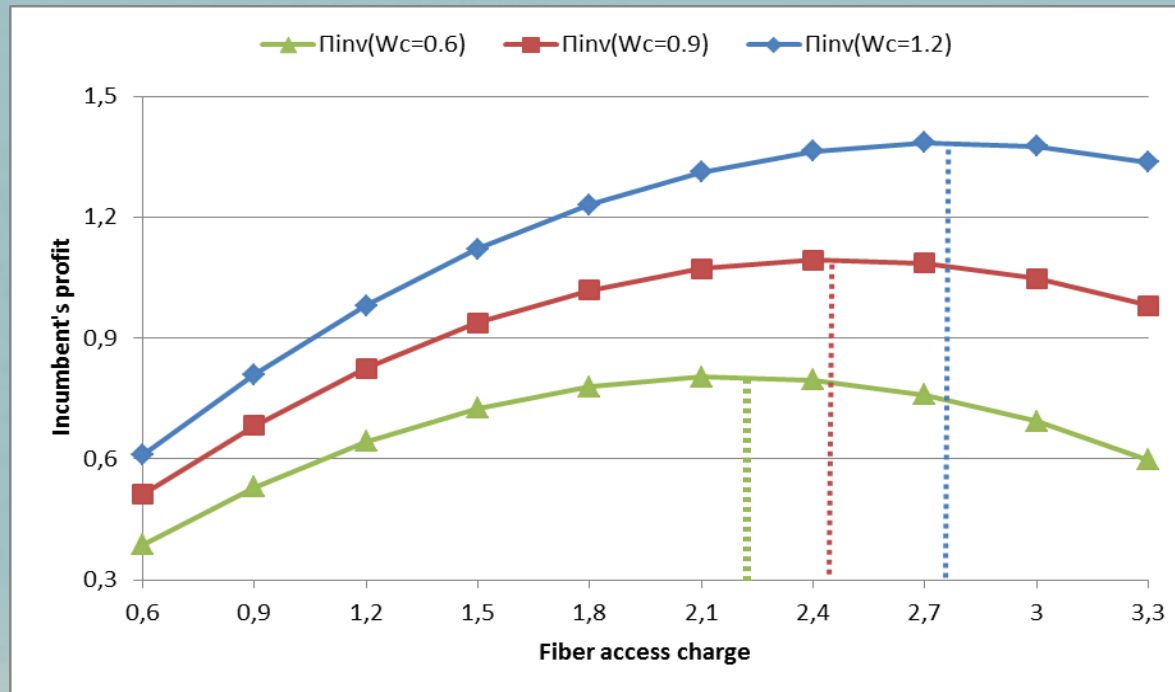
INVESTMENT CASE

- The total profit of the incumbent is the sum of its profit derived from the use of its copper and fiber access networks minus the investment cost F , where:
 - $\Pi_I^c = [p_I^c - c_I^c]q_I^c + [w^c - c_I^c]q_E^c$
 - $\Pi_I^f = [p_I^f - c_I^f]q_I^f + [w^f - c_I^f]q_E^f$
- The total profit of the entrant is the sum of its profit derived from using the incumbent's copper and fiber access networks:
 - $\Pi_E^c = [p_E^c - w^c]q_E^c$
 - $\Pi_E^f = [p_E^f - w^f]q_E^f$

INVESTMENT CASE

FIBER ACCESS CHARGES

- The price for copper unbundling is exogenously given

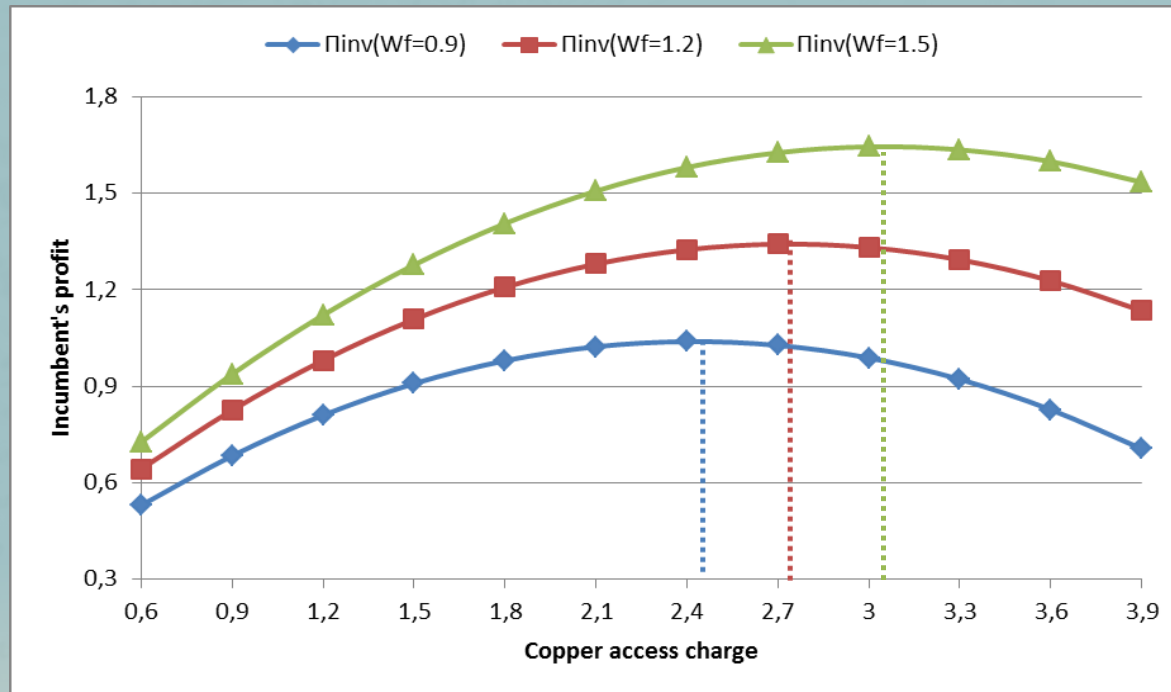


- There is a positive correlation between the fixed level of the copper access charge and the incumbent's profit-maximizing fiber access charge which leads to higher profit for the incumbent

INVESTMENT CASE

COPPER ACCESS CHARGES

- The price for fiber unbundling is exogenously given

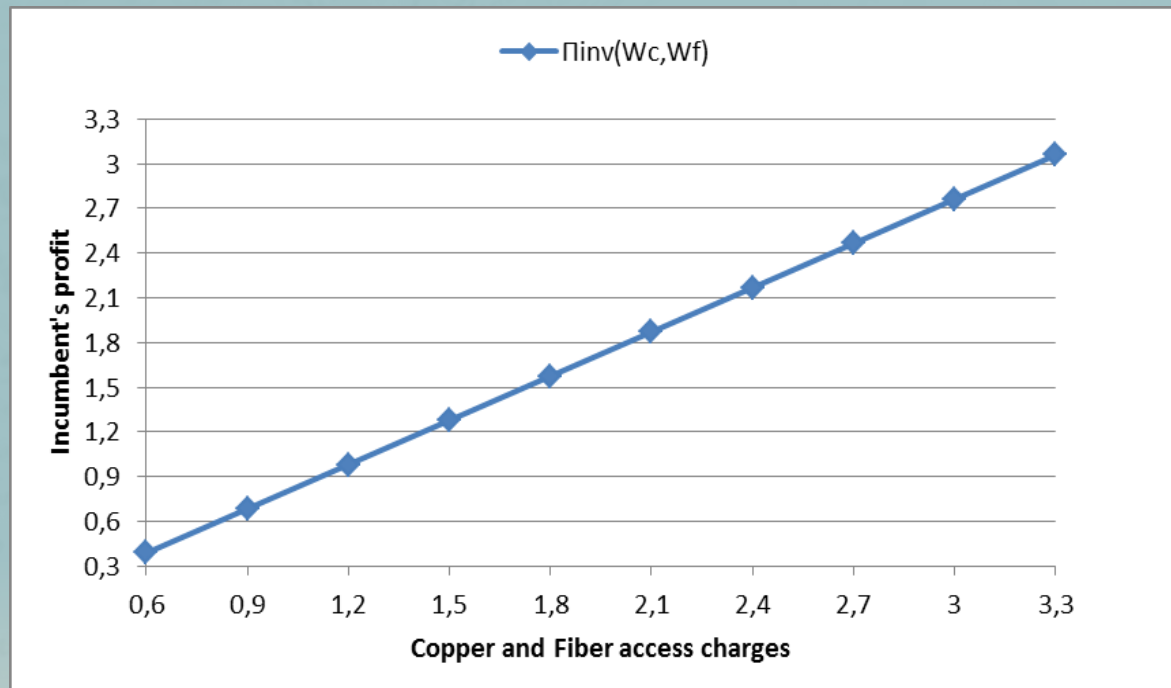


- There is a positive correlation between the fixed level of the fiber access charge and the incumbent's profit-maximizing copper access charge which leads to higher profit for the incumbent

INVESTMENT CASE

COPPER AND FIBER ACCESS CHARGES

- The regulator freely sets the copper and fiber access prices

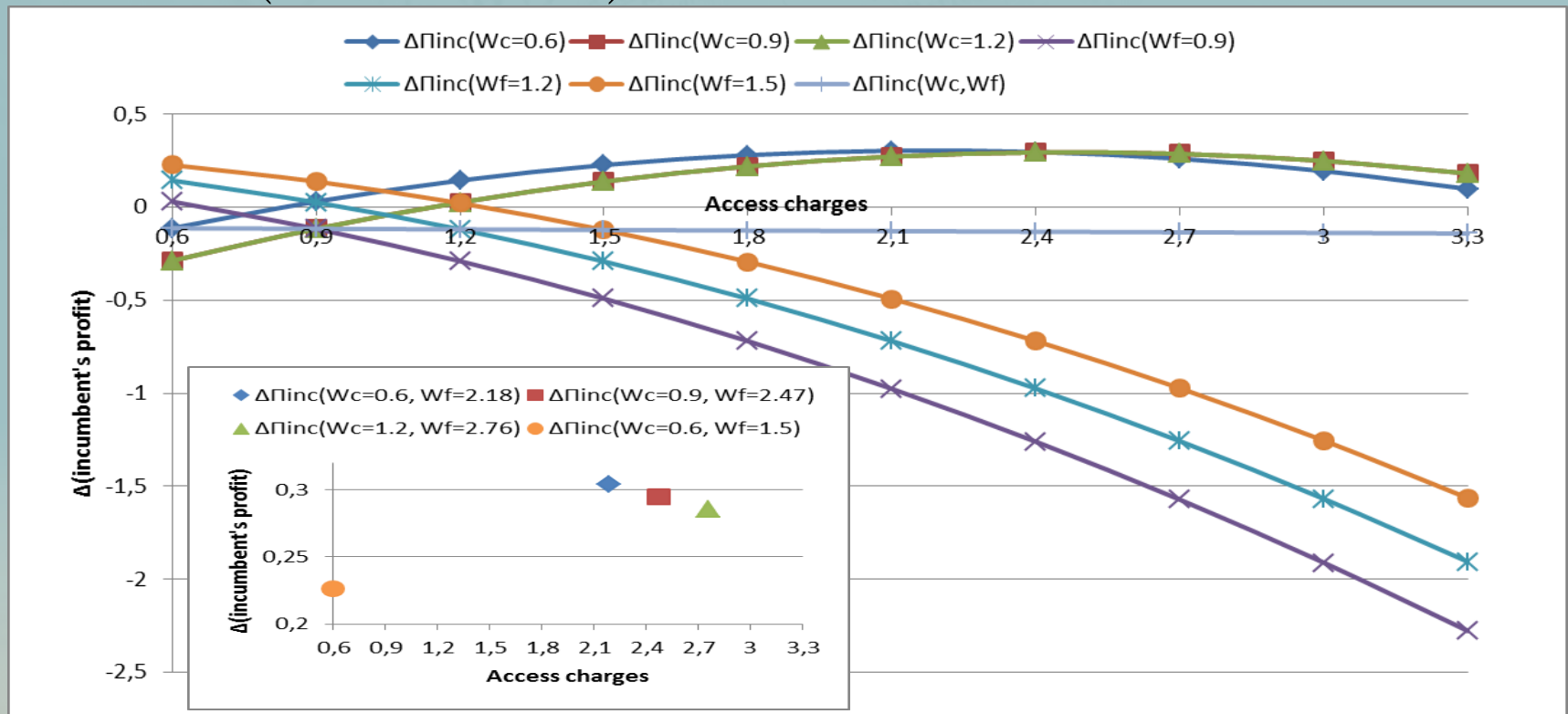


- As the copper and the fiber access prices increase, the incumbent's profit increases as well. The profit of the incumbent is maximized when it becomes a pure reseller of its upstream services

INVESTMENT DECISION

- The incumbent invests in fiber access infrastructures when

$$\Delta\Pi_I = (\Pi_I^c + \Pi_I^f - \Pi_I) > F$$



REGULATORY IMPLICATIONS (I)

- The regulatory policy that leads to
 1. A cost-based access charge of copper unbundling
 2. A fiber access price which maximizes the incumbent's profit after the investment provided the cost-based regulation of the copper unbundlingreflects the optimal regulatory policy in terms of investment incentives
- The proposed regulatory policy does not affect the competition between the two firms in a negative way since:
 1. The two firms almost share each market
 2. The entrant's profit only marginally decreases compared to its profit derived by the non-investment outcome

REGULATORY IMPLICATIONS (II)

- Our findings support the EC Recommendation on “consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment” (EC, 2013) which recommends:
 - *A costing methodology capable of generating cost-oriented wholesale copper access prices serving as an anchor for NGA services*
 - *A certain degree of pricing flexibility for the investor provided that there is a demonstrable retail price constraint resulting from a price anchor stemming from cost-oriented wholesale copper access prices*

CONCLUSIONS

- Investments in NGA networks lead to coexistence of networks and services at least for a certain period of time
- The investment decision of an incumbent is affected by both copper and fiber access prices
- The incumbent invests when its expected profit from the investment outweighs the actual and the opportunity investment cost
- The regulator should set the fiber access price at the level that maximizes the incumbent's total profit given a cost-oriented wholesale copper access price
- This policy: (i) promotes investment in NGA networks; (ii) preserves the competitive structure; (iii) is in line with the latest EC Recommendation
- Future research is needed to assess the impact of the proposed regulatory approach on the socially efficient outcomes, both from a static and a dynamic perspective

THANK YOU!



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