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Hub Charges and Ownership Structures

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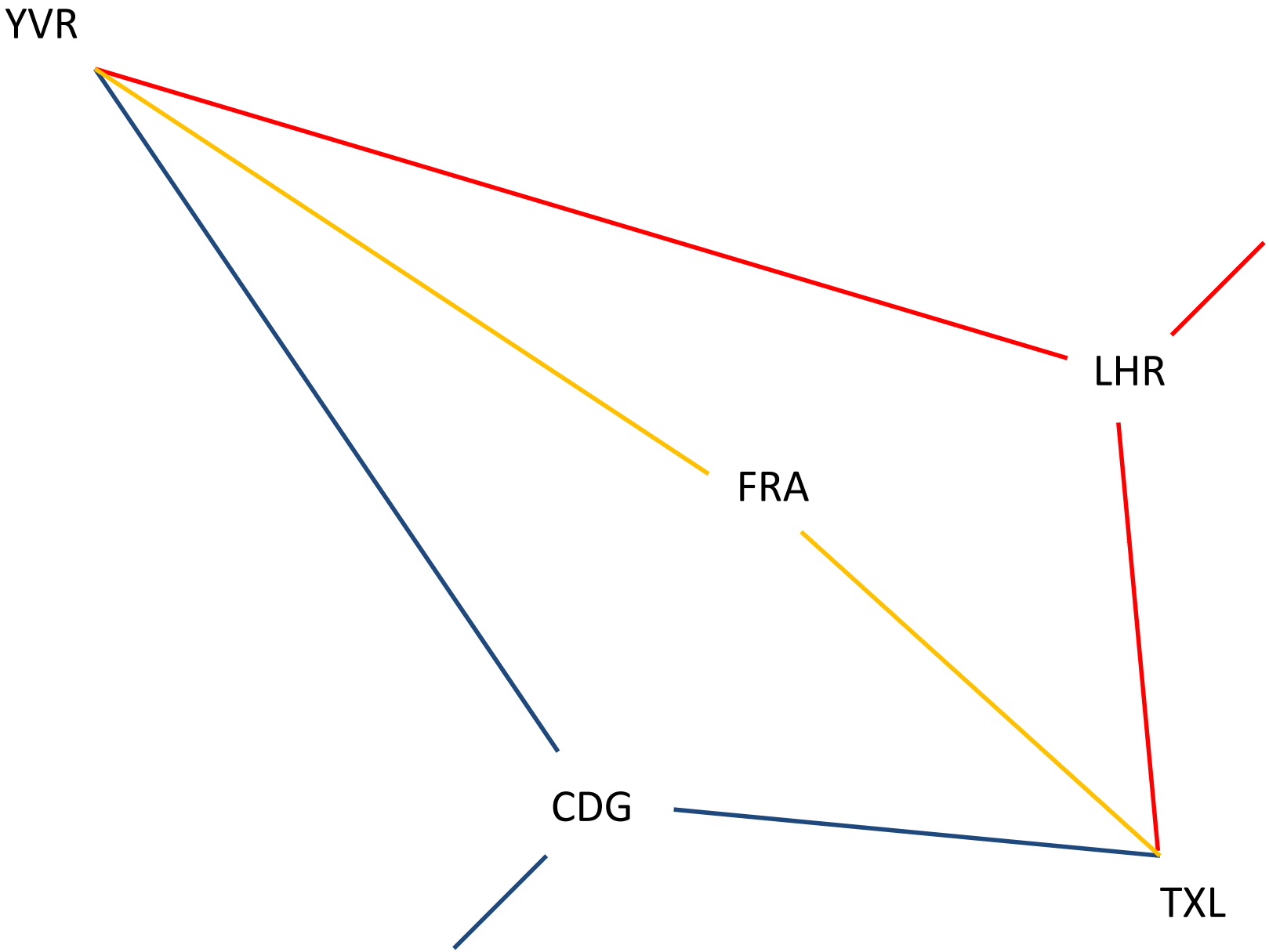
Introduction



Introduction

This scenario features the following elements:

- Local passengers (UK domestic markets) versus foreign transfer passengers (TXL-LHR-YVR)
- Carrier market power and hub competition (TXL-CDG-YVR by Air France-KLM versus TXL-LHR-YVR by British Airways)

What is the local welfare-effect of private infrastructure ownership in a scenario where

- *rival hubs provide transfer services for foreigners and*
- *carriers may belong to foreigners?*

(It is abstracted away from price discrimination and congestion effects.)

Transport Economics Literature

- Matsumura and Matsushima (ISER discussion paper 2010): Airport Privatization and International Competition.
- Mantin (2011): Airport Complementarity: Private vs. Government Ownership and Welfare Gravitation.

$\Rightarrow$ Regions may end up in a prisoners' dilemma where they privatize airports although they are better off with public airports. (Analysis is based on specific functional forms.)

Transport Economics Literature

- De Borger et al. (EER, 2005 and JUE, 2007): Road congestion pricing on parallel and serial networks. Public tax competition and transit traffic on a congested hinterland.
- De Borger et al. (JTEP, 2008): Two rival ports. In the first stage, public investments in congested hinterland capacity, while port charges are determined in the second stage by a private or public decision makers.
- Yuen et al. (JTEP, 2008): One gateway, *oligopolistic carriers* and congested hinterland. Gateway chooses prices to maximize gateway and carrier profits. Road charges are chosen to maximize hinterland's welfare.
- Zhang (2008, ITF DP): The impact of hinterland access conditions on rivalry between ports.

$\Rightarrow$ The effect of ownership structure on local welfares is not considered! (We use the collusionary outcome as a benchmark to be able to derive general results.)

Literature on Strategic Delegation

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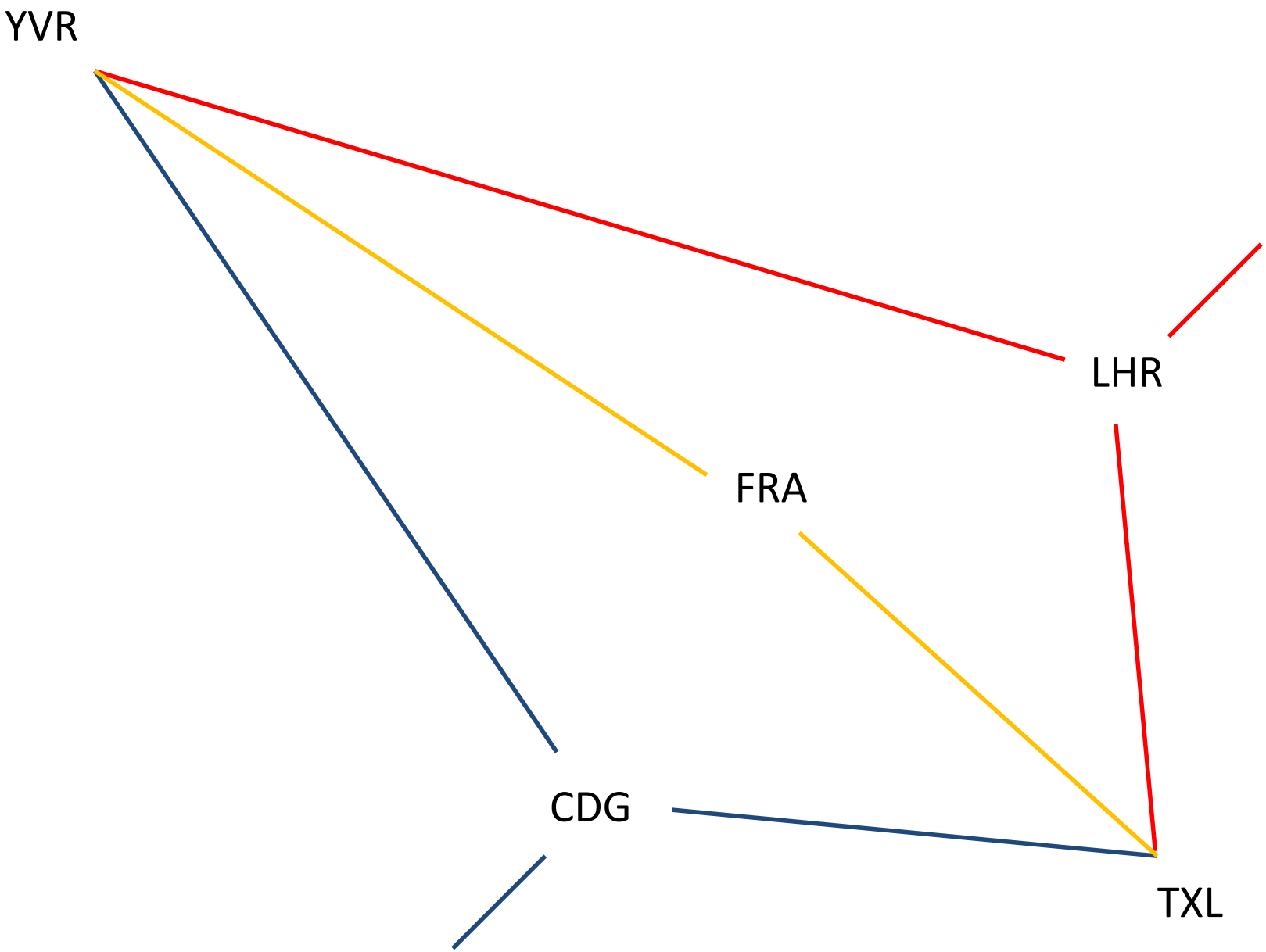
- Vickers (EJ, 1985): Delegation and the theory of the firm.
- Sklivas (RAND, 1987): The strategic choice of managerial incentives.
- Fershtman and Judd (AER, 1987): Equilibrium incentives in Oligopoly.
- Fershtman et al. (IER, 1991): **Observable contracts**: strategic delegation and cooperation.
- Katz (RAND, 1991): Game-playing agents: Unobservable contracts as precommitments.
- Caillaud and Rey (EER, 1995): Strategic aspects of vertical delegation: *"Under mild assumptions, models of price competition between differentiated products involve strategic complementarities: by **precommitting** to a reaction curve with higher prices than in the one-shot game, a firm induces its rival to charge higher prices in equilibrium, which increases its profits."*

The Model



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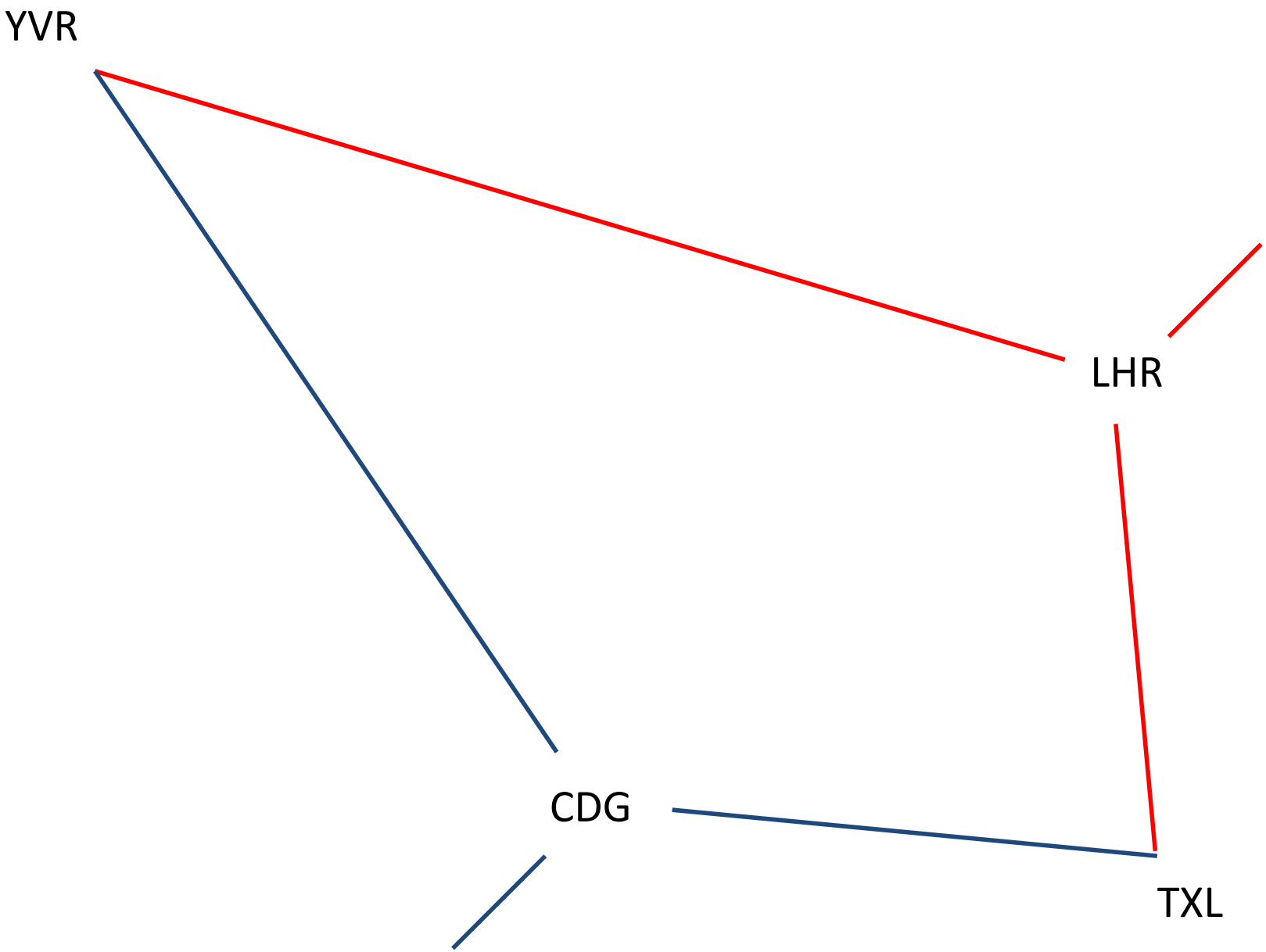

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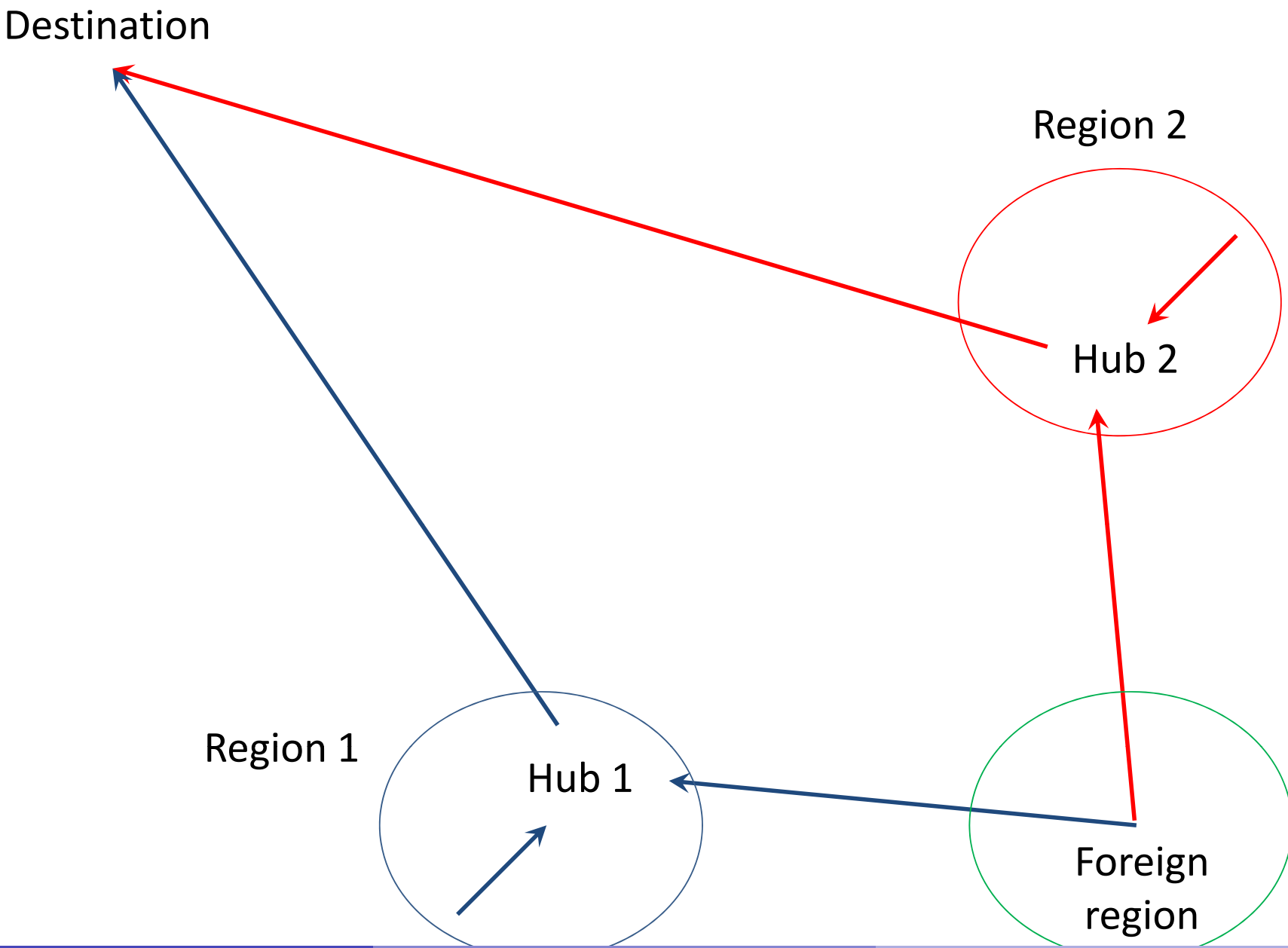

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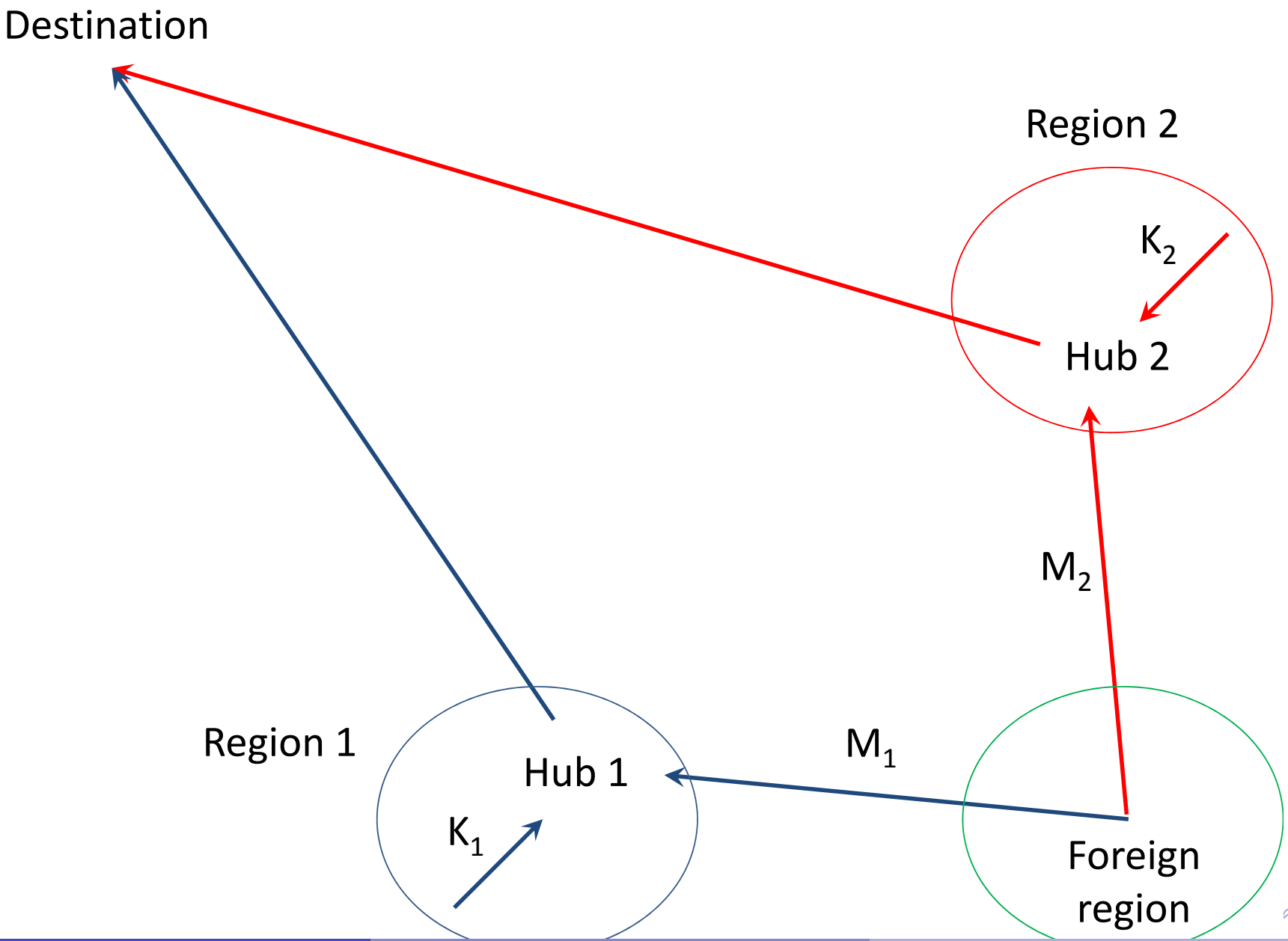
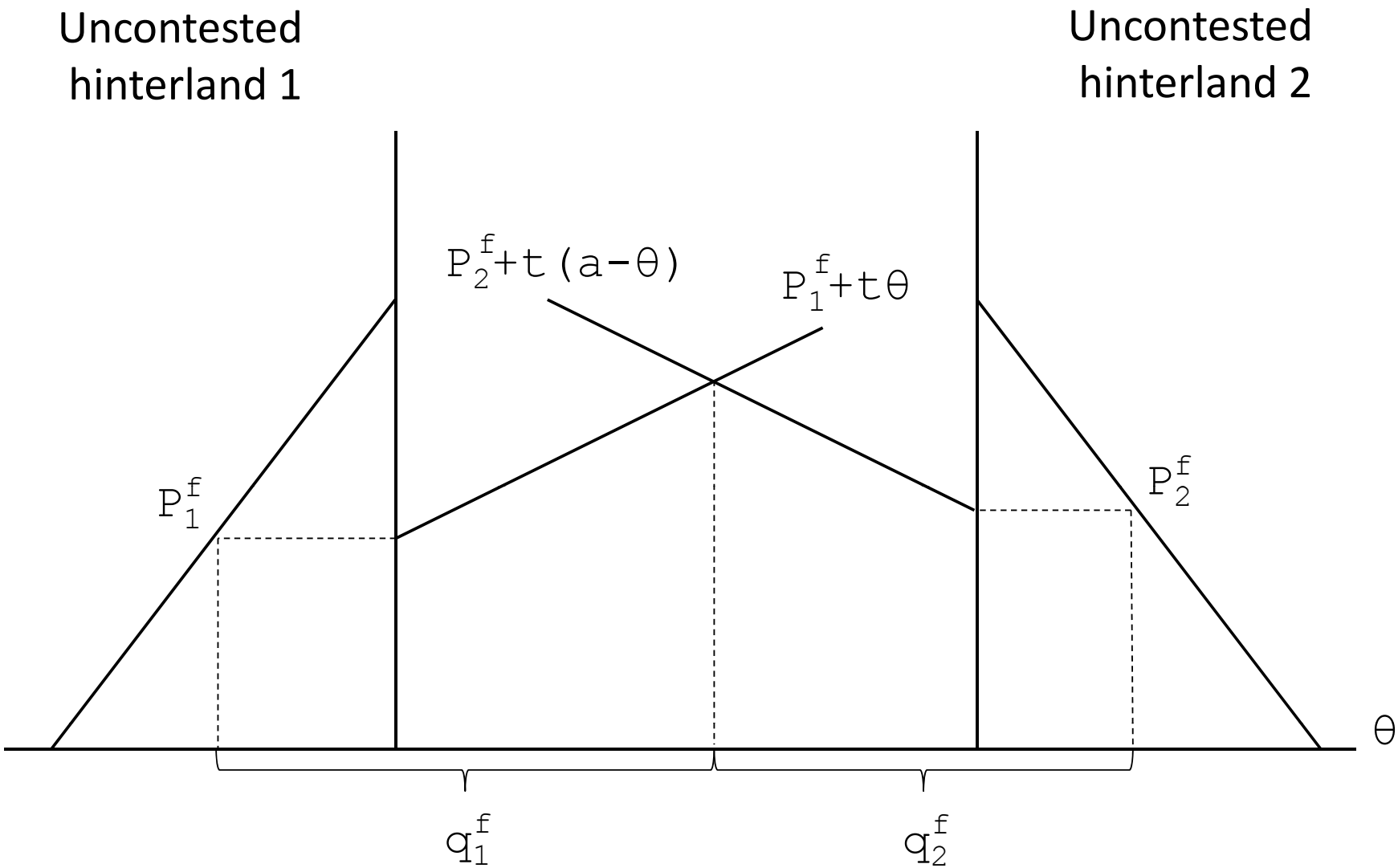
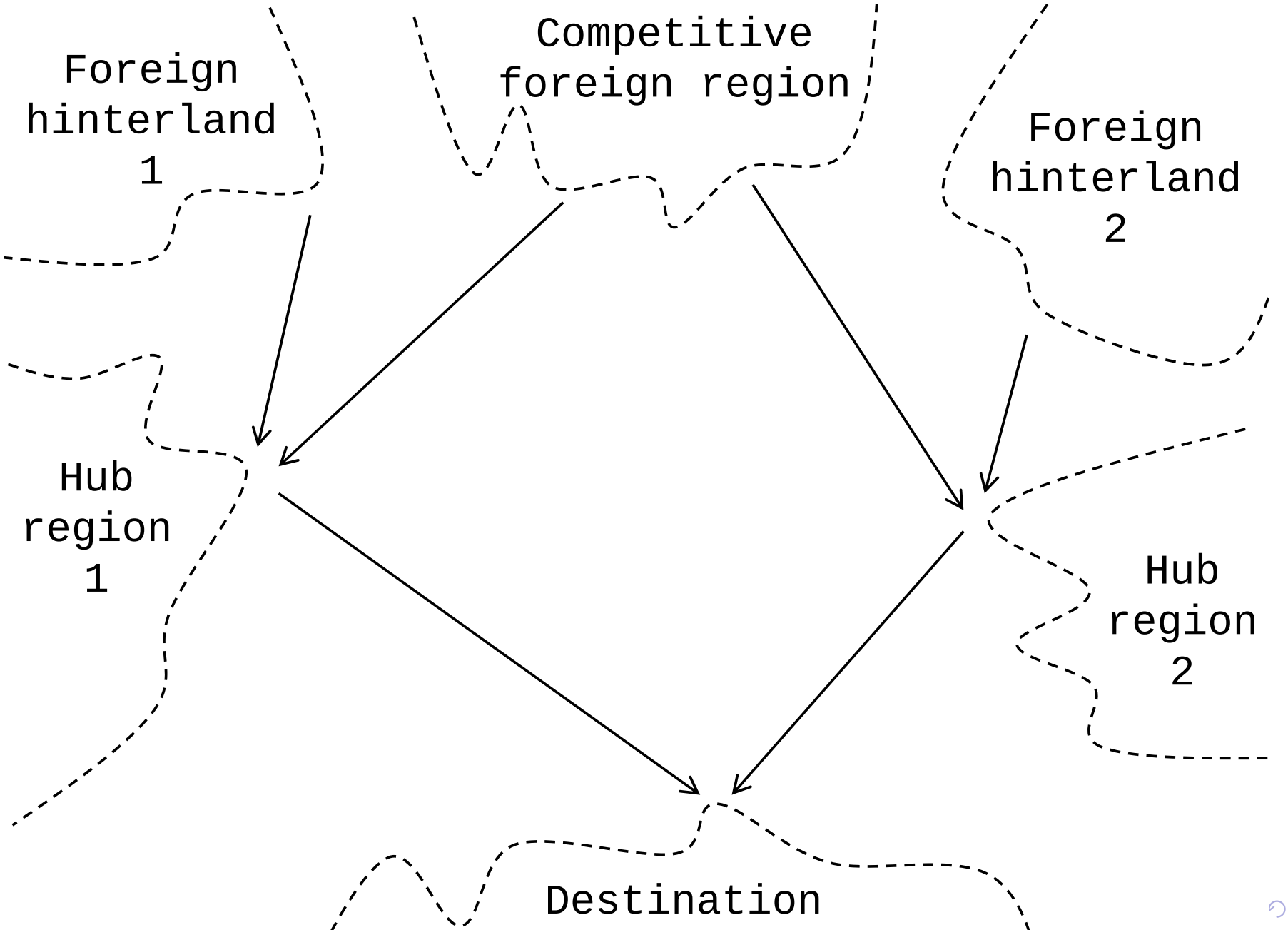

Destination
Region 2
K_2
Hub 2
M_2
Region 1
Hub 1
M_1
K_1
Foreign region

The Model

The foreign market



The Model


Foreign hinterland 1
Competitive foreign region
Foreign hinterland 2
Hub region 1
Hub region 2
Destination

Course of the Analysis

- Single hub
  - carrier equilibrium
  - optimal hub charge
  - foreign carrier ownership
- Rival hubs
  - carrier equilibrium
  - equilibrium hub charges
  - foreign carrier ownership
  - equilibrium ownership structures

Optimal Hub Charge of a Single Hub

Proposition *In a scenario with a single public hub where all carriers belong to the hub region: (i) if and only if the local carrier market is atomistic and the foreign carrier market is monopolistic, the passenger numbers that maximize hub region 1's welfare can be reached, and (ii) the hub region 1's welfare-optimal hub charge can be decomposed as follows:*

$$\tau_1 = c_1 - \frac{d\tau_1}{d(q_1^l + q_1^f)} \left[\frac{P_1^l}{\varepsilon^l K_1} \frac{dq_1^l}{d\tau_1} - \left(1 - \frac{1}{M_1}\right) \frac{P^f}{\varepsilon^f} \frac{dq_1^f}{d\tau_1} \right]. \qquad (1)$$

Set-up for Rival Hubs

- Welfare in hub region i is

$$W_i = \Pi_i + \left(CS_i + \pi_i^I + \pi_i^f \right). \tag{2}$$

- To analyze the effect of infrastructure ownership, **ownership parameters** β_i are introduced.
- The hubs' objectives are

$$\Omega_i = \Pi_i + \beta_i \left(CS_i + \pi_i^I + \pi_i^f \right). \tag{3}$$

- Two-stage game: In the first stage, hubs simultaneously and independently choose hub charges. In the second stage, carriers are in Cournot competition.

The "Externality Ratio"

Private ports internalize the effect on own profits

$$\frac{\partial \Pi_i}{\partial \tau_i} \tag{4}$$

but not the effects on (i) passengers and carriers in the local region and (ii) the foreign region

$$\frac{\partial CS_i + \pi_i^l + \pi_i^f}{\partial \tau_i} \quad \text{or, respectively,} \quad \frac{\partial W_j}{\partial \tau_i} \tag{5}$$

for $j \neq i$. So, these are externalities. The ratio

$$\Psi_i = \frac{d(P_j^f - c_j)\, q_j^f)/d\tau_i}{-d(CS_i + \pi_i^l + \pi_i^f)/d\tau_i} \tag{6}$$

is called the "externality ratio".

The "Right" Ownership Structures

- The ownership structures are "right" if they yield the collusive outcome in the subgame-perfect equilibrium of the two-stage game.
- Assume that the collusive choice of hub charges is determined by the first-order conditions $\frac{d}{d\tau_i}\sum_j W_j = 0$, which can be written as

$$\frac{dW_i}{d\tau_i} + \frac{dW_j}{d\tau_i} = \frac{dW_i}{d\tau_i} + \frac{d(P_j^f - c_j)\, q_j^f}{d\tau_i} = 0 \tag{7}$$

  for $j \neq i$.
- Assume further that the individual choice of hub charges is determined by the first-order conditions

$$\frac{d\Omega_i}{d\tau_i} = \frac{d\Pi_i}{d\tau_i} + \beta_i \frac{d\left(CS_i + \pi_i^l + \pi_i^f\right)}{d\tau_i} = 0. \tag{8}$$

The "Right" Ownership Structures

By the first-order conditions in (7) and (8), the independent choice of hub charges implies the collusive outcome only if

$$\beta_i = 1 - \Psi_i \tag{9}$$

for $i = 1, 2$ with

$$\Psi_i = \frac{d(P_j^f - c_j)\, q_j^f)/d\tau_i}{-d(CS_i + \pi_i^l + \pi_i^f)/d\tau_i}. \tag{10}$$

Proposition 5: *In a scenario with two rival hub regions it holds: (i) If the collusive outcome implies $\Psi_i = 0$ for $i = 1, 2$, the collusive outcome is achieved by public hubs; (ii) if the collusive outcome implies $\Psi_i = 1$ for $i = 1, 2$, the collusive outcome is achieved by private hubs; (iii) if the collusive outcome implies $\Psi_i = 0$ and $\Psi_j = 1$ for $j \neq i$, the collusive outcome is achieved when hub i is public and hub j is private.*

The "Right" Ownership Structures

Example 5 (Linear demands): Inverse demands are ($j \neq i$)

$$P_i^l = 1 - q_i^l \quad \text{and} \quad P_i^f = 2 - \frac{1}{11}\left(8\, q_i^f + 3\, q_j^f\right). \tag{11}$$

	τ_i	W_i	Π_i	π_i^l	π_i^f	q_i^l	q_i^f
Public	0.40	1.61	0.72	0.08	0.28	0.40	1.40
Private/coll	0.69	1.74	0.93	0.02	0.19	0.20	1.14

Tabelle 1: Outcomes when both hubs are public or private.
Parameters: $K_i = 2, M_i = 5$ for $i = 1, 2$.

Conclusions and Discussion

- Collusion between hub regions may lead to lower hub charges.
- Hub regions may achieve the collusive outcome that maximizes the sum of the hub region's welfare by privatizing their infrastructure.
- Our analysis specifies the conditions under which this occurs.
- Since the public is typically informed about and involved in privatization activities, this makes privatization a credible form of strategic delegation.
- Many constellations exist where regions keep hubs private, while they would be better off with private hubs.
- Foreign carrier ownership may invoke a move towards private hubs.

Thank you.