Airlines-within-airlines strategies and entry of Low-cost carriers

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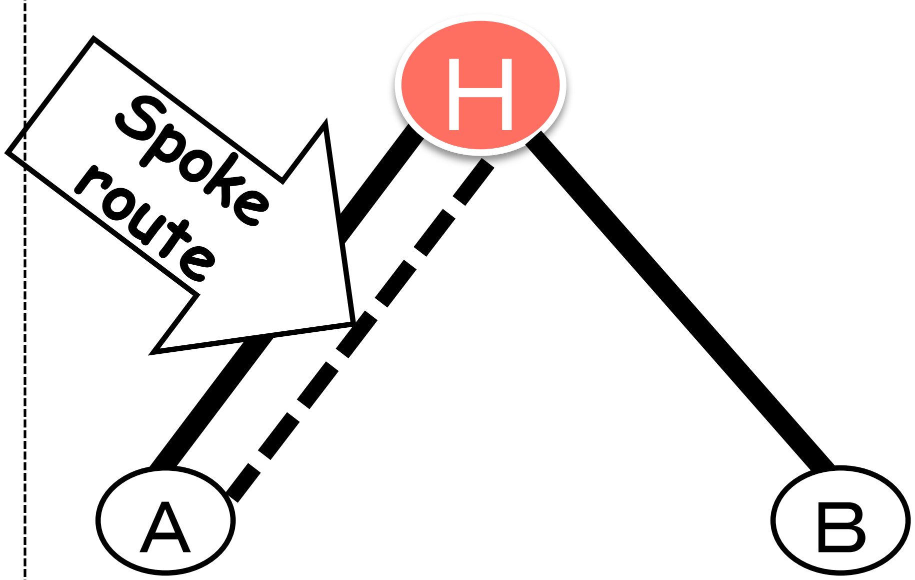
1.Intro. Entry of LCCs

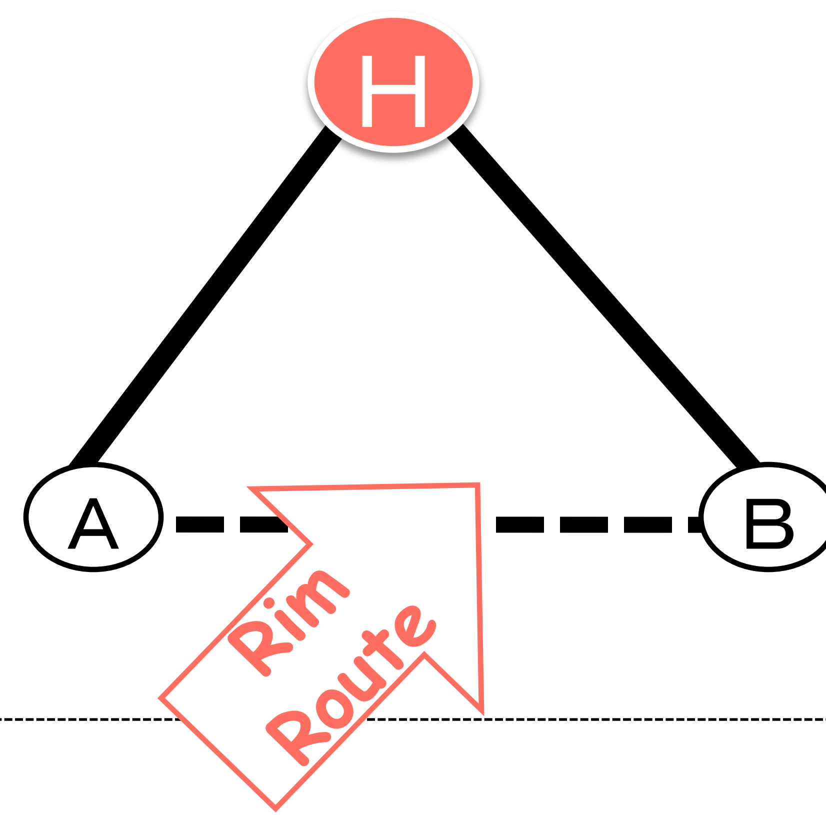
- After airline deregulation, low cost carriers (LCCs) entered the markets.eg., Southwest, American West, Frontier, Jetblue...

- One interesting aspect: LCCs entered in non-hub city-pairs ("rim" routes).

Entry on hub city-pairs (spoke route)



Entry on non-hub city-pairs (rim route)

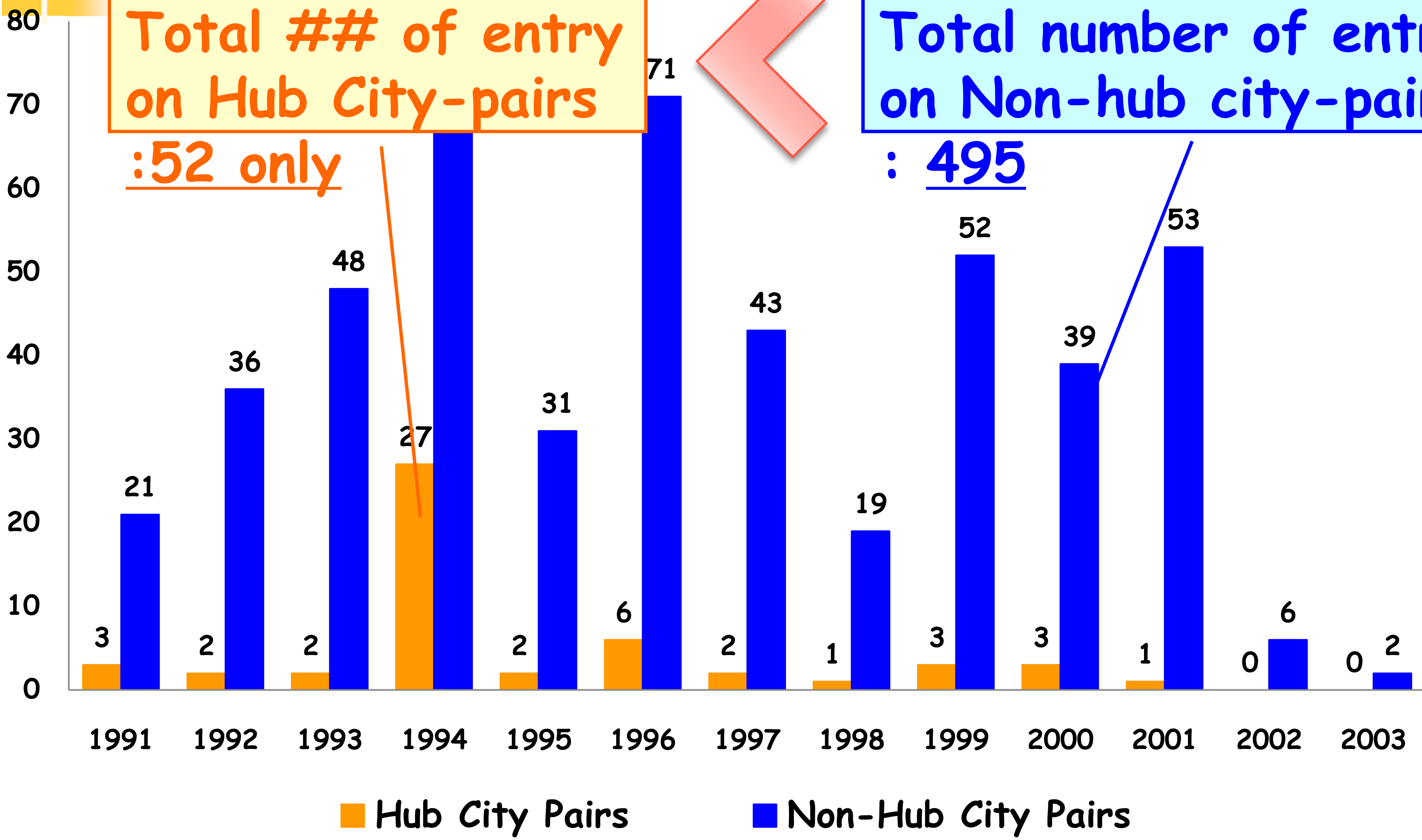


Entry routes by Southwest

By Bamberger and Carlton 2006

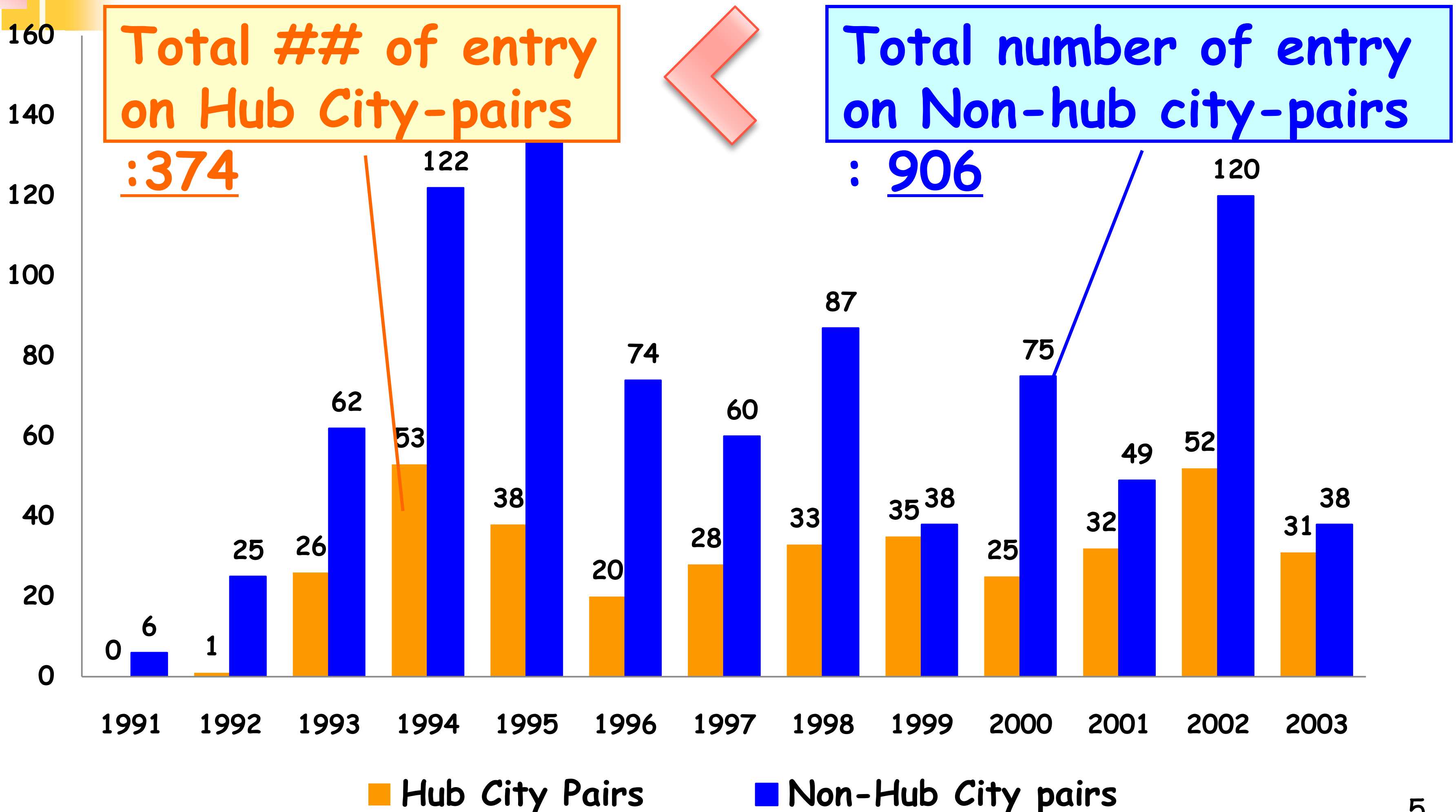
Total ## of entry on Hub City-pairs :52 only

Total number of entry on Non-hub city-pairs : 495



Entry routes by other LCCs

By Bamberger and Carlton 2006



1.Intro. A-in-a strategies

- Hub-spoke carriers establishing "low cost, no frills" divisions to meet LCCs those entered their rim routes.

  [airlines-within-airlines strategy]

in U.S.: major carriers failed on Aina.

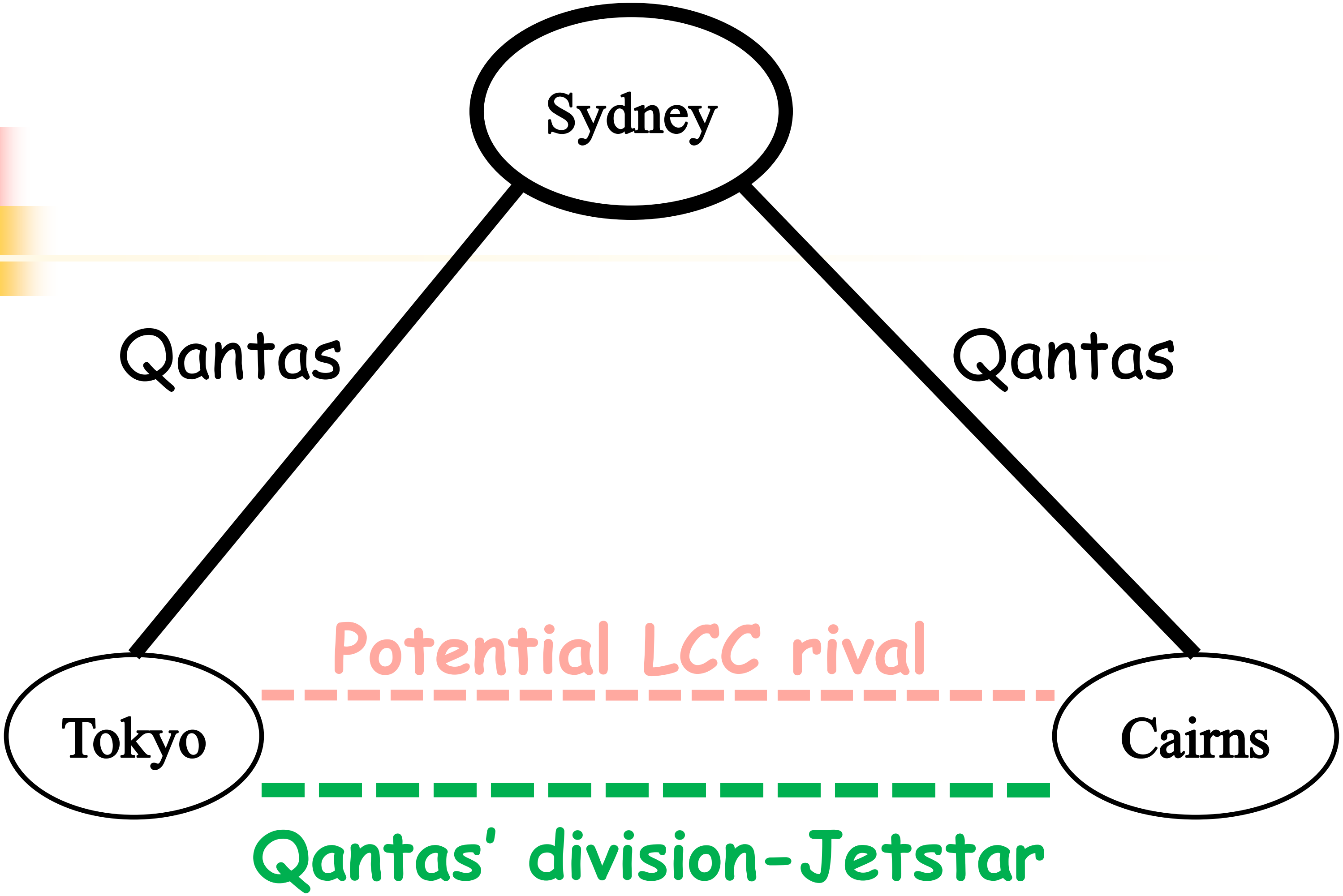
in Europe and Asia Pacific: carriers are now adopting the A-in-a stra.

1.Intro. Examples in US

Major carriers	Delta	United	Continental	Delta	US Airways
Low-cost, nonstop division	Song	Ted	CALite	Delta Express	Metrojet
Start of operation	2003	2004	1993	1996	1998
End of operation	2006	2008	1995	2003	2002
LCC rivals	JetBlue	Frontier, America West			

1.Intro. in EU/Asia Pacific

Major carriers	British Airways	Qantas		Iberia Airline	Thai Airways
Low-cost, nonstop division	OpenSkies	Jetstar	Jetstar	Clickair	Nok Air
Start of operation	Oct.2008	May.2004	Nov.2006	2006	2004
Operation routes	NY-Paris NY-Amst.	in Australia	Australia-Asia	Barcelona-Amst. Barcelona-Athens	Bangkok-Singapore
LCC rivals				Vueling Airlines	Value Air, Tiger Air



Many examples in Dunn (2008)
& new examples in this paper !!

1.Intro. Carriers' concerns

interesting trade-off:

Merit: has cost advan.to comp.with LCCs.

Demerit: cannibalizes network carries' pi

- Is the A-in-a stra profitable for major carriers?

1.Intro. Anti-comp. concerns

- Two complaints to DOT.

Valujet complained US airways:

Air south Continental:

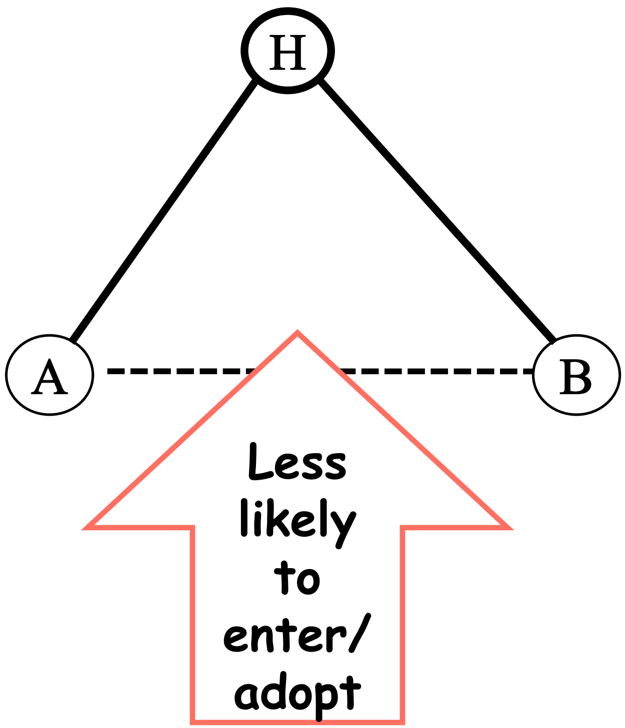
- DOT suggests the A-in-a stra. are difficult to explain as non-predatory.

1.Intro. Previous studies

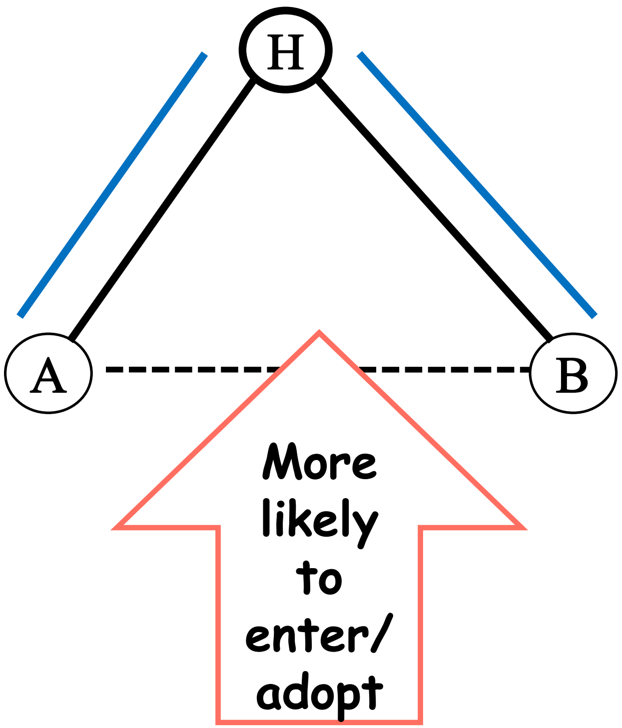
- Morrell (2005) JATM: cost comparison analysis
- Dunn (2008) IJIO: empirical study
- No existing study addresses the issue of A-in-a stra and LCCs' entry theoretically.

1.Intro. Dunn's main results

A hub-spoke network carrier

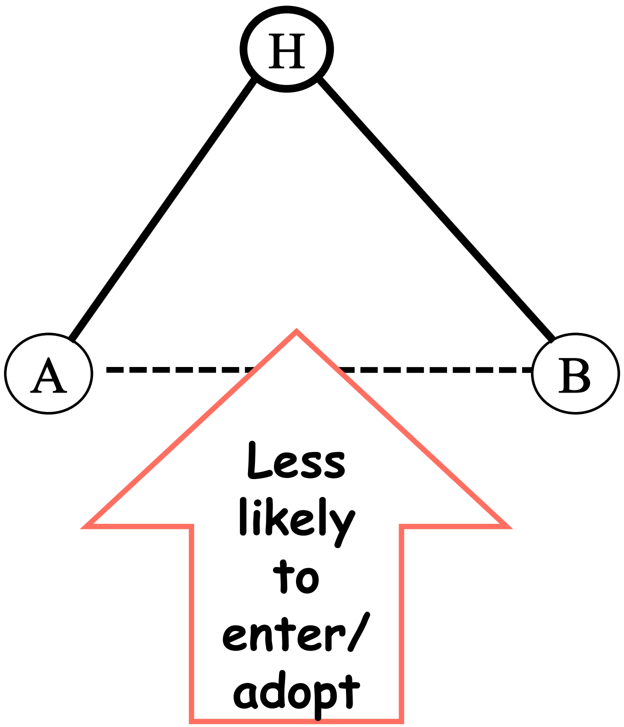


Network carriers' own one-stop service (or their rivals') is low quality

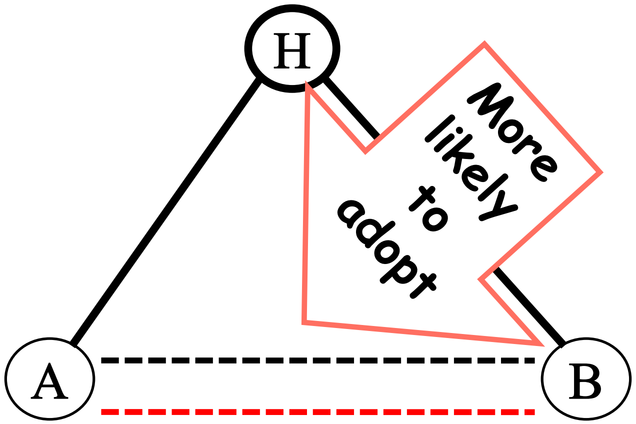


1.Intro. Dunn's main results

A hub-spoke network carrier



hub-spoke network carriers



if non-stop rival exists

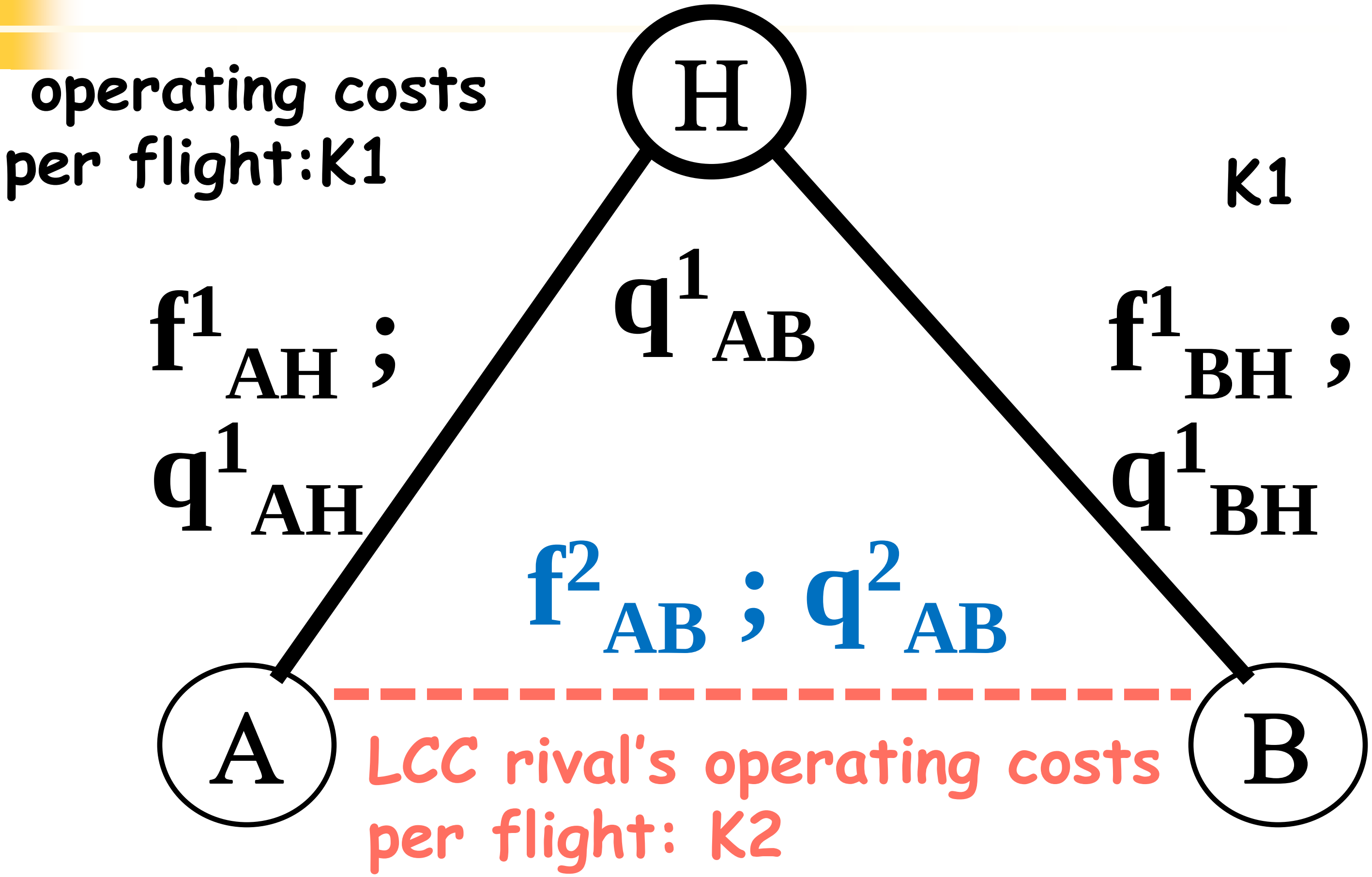
1.Intro. Paper's purpose

- Theoretically investigate profitability of Aina stra.,relevant impacts on LCCs.

Focus and features:

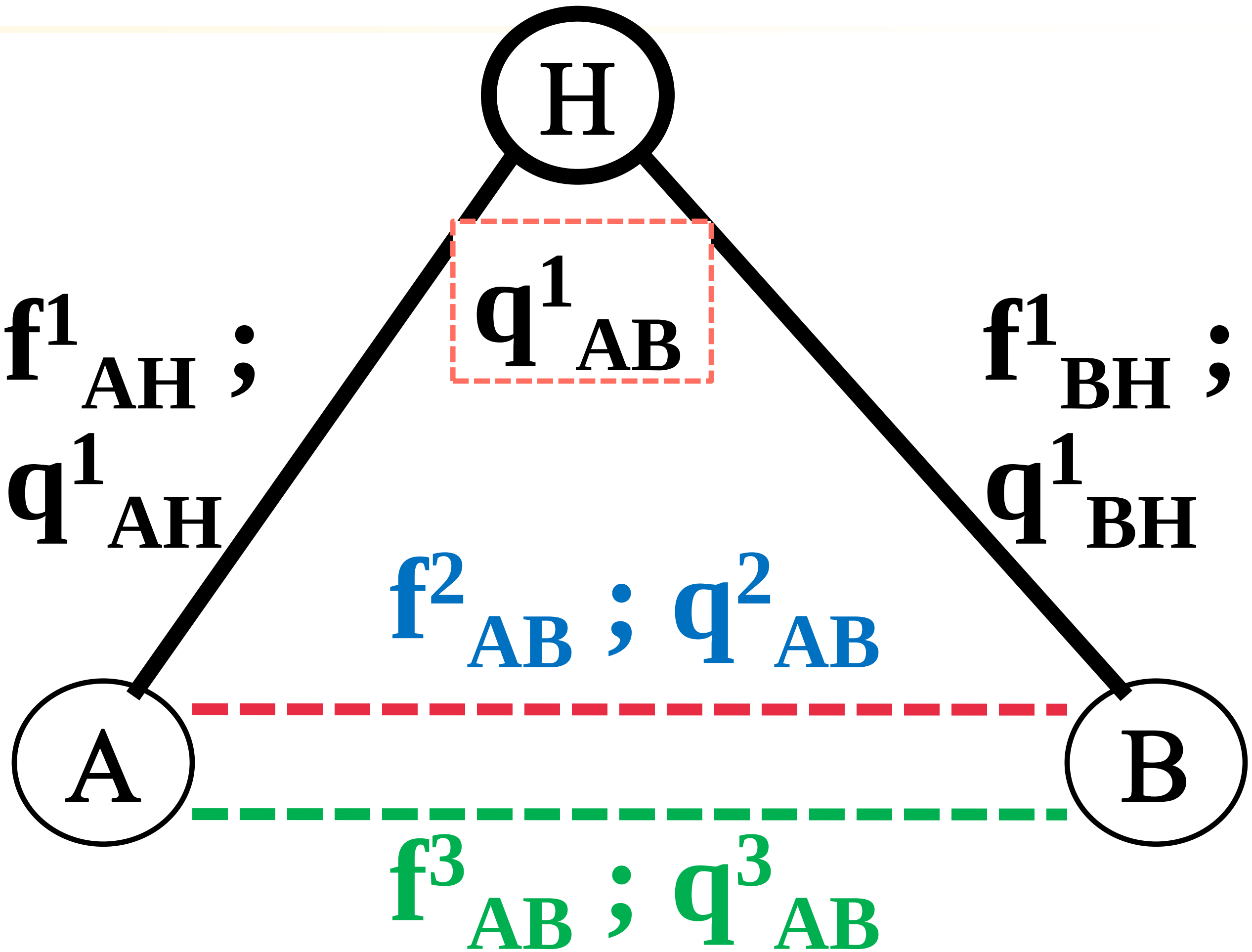
- entry of LCCs
- adoption of A-in-a stra:
  =establish a low cost nonstop division
- flight frequency com.

Network for Case-e:
nonstop LCCs rival entered



Network for Case-aI offering q^1_{AB}

Case-aII withdrawing q^1_{AB}



operating costs per flight: K3

2.Model. Utility function

w:will.to pay, uniformly distributed [-∞, W]

- Symmetric AH, BH spoke markets

$$u_j = w + \left(f_j^1\right)^{1/2} - p_j^1, j = AH, BH$$

- Connecting AB market (hub-through extra cost:T)

$$u_{AB} = \begin{cases} u_{AB}^{nonstop}: \text{if using Airline i's nonstop service, } i = 2,3 \\ \quad u_{AB}^{onestop}: \text{if using Airline 1's onestop service} \end{cases}$$

$$u_{AB}^{nonstop} = w + (f_{AB}^i)^{1/2} - p_{AB}^i$$

$$u_{AB}^{onestop} = w + (f_j^1)^{1/2} - p_{AB}^1 - T$$

2.Model. Demand functions

Case-e: without q^3AB, P^3AB

Case-aI:

$$P_j^1 = W + (f_j^i)^{1/2} - q_j^1,\ j = AH, BH$$

$$P_{AB}^1 = W + (f_j^i)^{1/2} - (q_{AB}^1 + q_{AB}^2 + q_{AB}^3) - T$$

$$P_{AB}^2 = W + \left(f_{AB}^2\right)^{1/2} - (q_{AB}^1 + q_{AB}^2 + q_{AB}^3)$$

$$P_{AB}^3 = W + \left(f_{AB}^3\right)^{1/2} - (q_{AB}^1 + q_{AB}^2 + q_{AB}^3)$$

Case-aII: without q^1AB, P^1AB

2.Model. Cost differential

Following Brueckner & Zhang 2001,

Kawasaki 2008

Air.i's oper.costs/per direct flight: $K_i, i=1,2,3$

- K_i=fixed cost+constant marginal cost($\equiv 0$)
- $K_1 \geq K_2 \equiv 1$, K_3 larger/smaller than k_2.
- Entry/establishment costs are ignored.

2.Model. Profits functions

Case aI:

$$\Pi_1 = p_{AH}^1 q_{AH}^1 + p_{BH}^1 q_{BH}^1 + p_{AB}^1 q_{AB}^1 - \left(f_{AH}^1 + f_{BH}^1\right) K_1 + \left[p_{AB}^3 q_{AB}^3 - f_{AB}^3 K_3\right]$$

$$\pi_2 = p_{AB}^2 q_{AB}^2 - f_{AB}^2 K_2$$

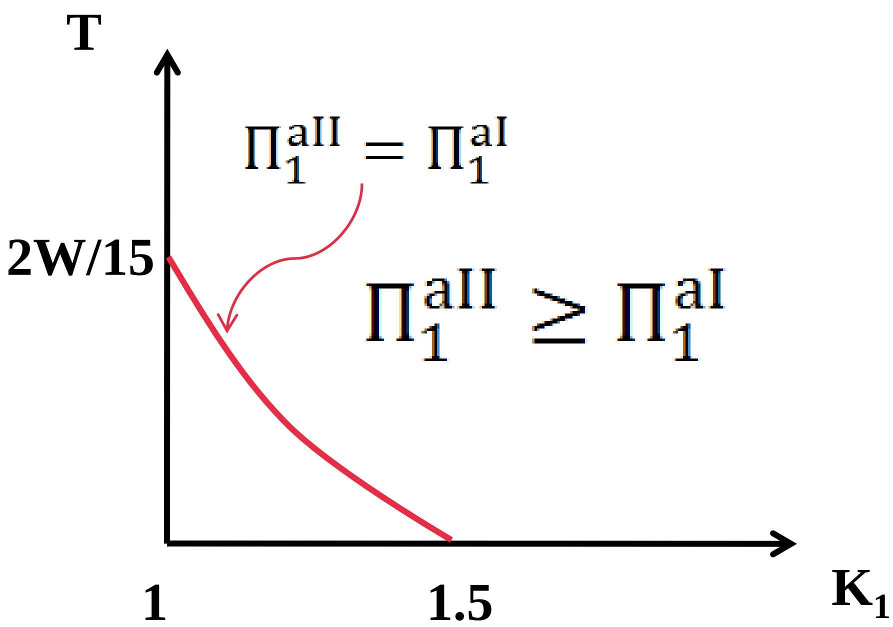
3.Outcomes for three cases

See Table A.1, A.2 in Appendix

4.Adoption of A-in-a stra.

Lemma 1. benchmark case: K2=K3

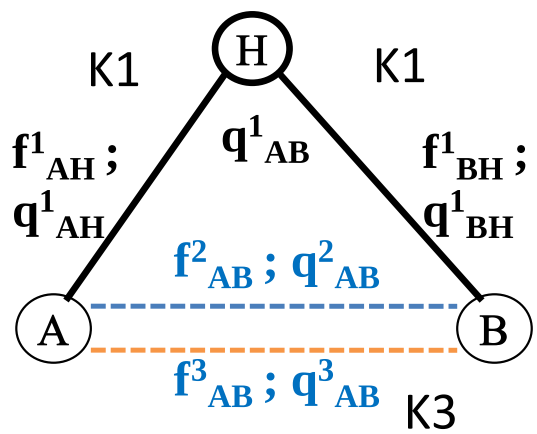
$$\Pi_1^{aII} \geq \Pi_1^{aI} \; if \; T \geq T_L^a \equiv [2(3-2K_1)/5(4K_1-1)]\,W$$



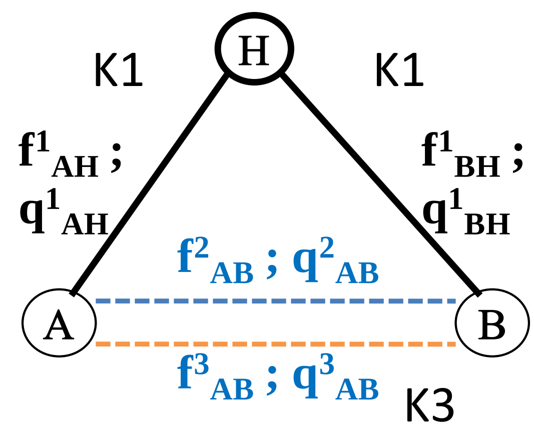
A-in-a strategy with Sce.II (withdraw the one-stop service) is preferable, except costs (T,K1) is small

4.Intuition for lemma 1

Network for Case-aI



Network for Case-aII

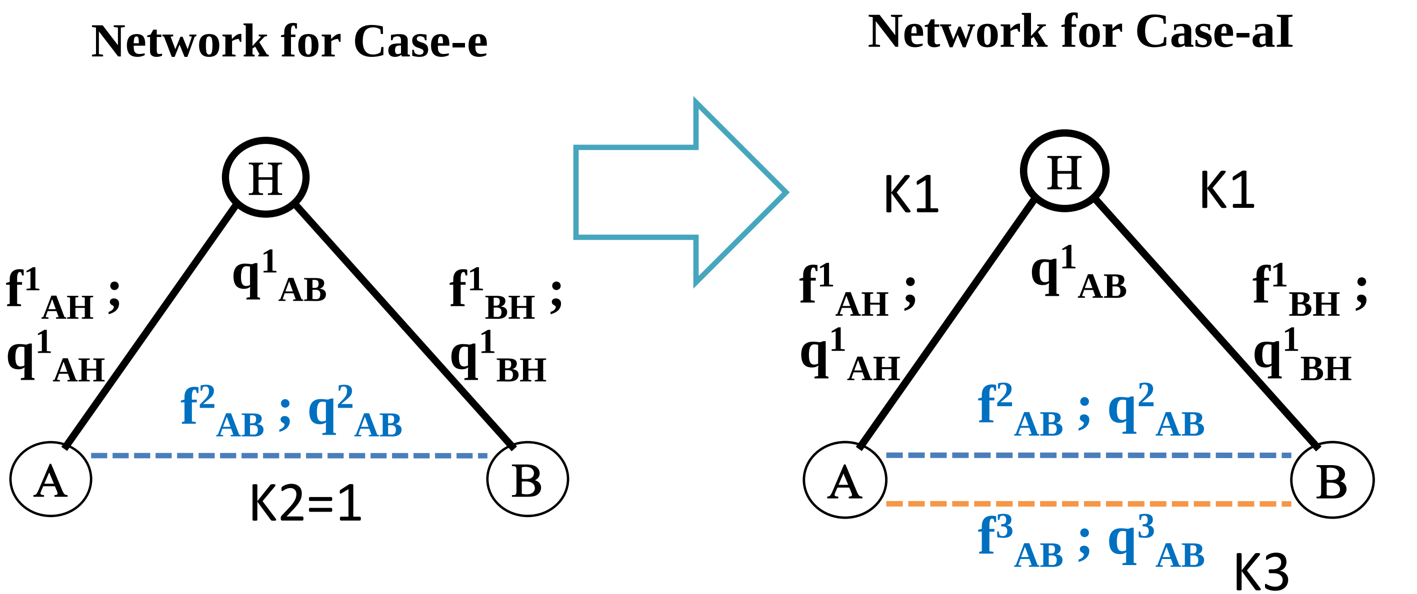


Merit: enjoy Network Freq. Eff. by joint-production
Demerit: cannibalization effect

Demerit: cannot enjoy Network Freq. Eff.
Merit: without cannibalization

(T,K1) small: Air.1 remains one-stop to enjoy NFE.
(T,K1) large: then give up NFE, derives larger profits by Air.3 with lower cost K3.

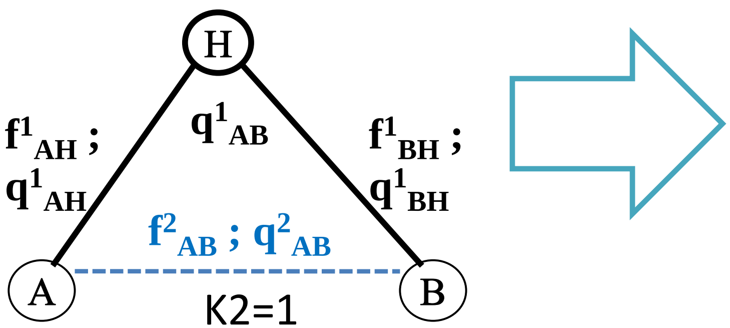
4.effects for A-in-aI



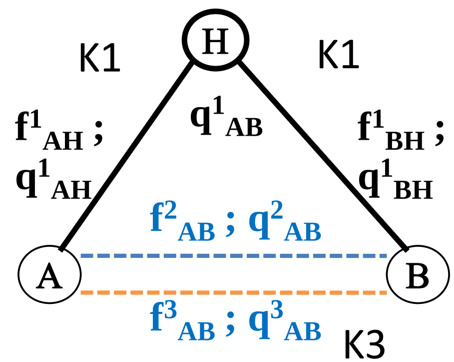
Prop. 1: A-in-a I always ↓Π1, ↑π2. This holds, even though K3<<K2=1

4.Intuition for Prop.1

Network for Case-e



Network for Case-aI



Merit: enjoy network freq. eff.
by joint-production
Demerit: cannibalization effect

establishing 3 cannibalizes 1's demand of one-stop service
→ 1 has to ↓spokes' f1s.→ f1s,q1s, ↓ $\Pi 1^{HS}\downarrow > \pi 3 \uparrow \Rightarrow \Pi 1 \downarrow$

[q1ABe] >[q1ABaI+q3ABaI] ⇔ [q2ABe]<[q2ABaI] ⇒ $\pi 2\uparrow$

4.effects for A-in-aI

comparative-static analysis of K3

Corollary 1 to Prop. 1:
(a) $d\Pi 1/dK3<0$、$d\pi 2/dK3>0$. ← transparent
(b) $d\Pi 1^{HS}/dK3<0$、 $d\pi 3/dK3>0$. ← unusual

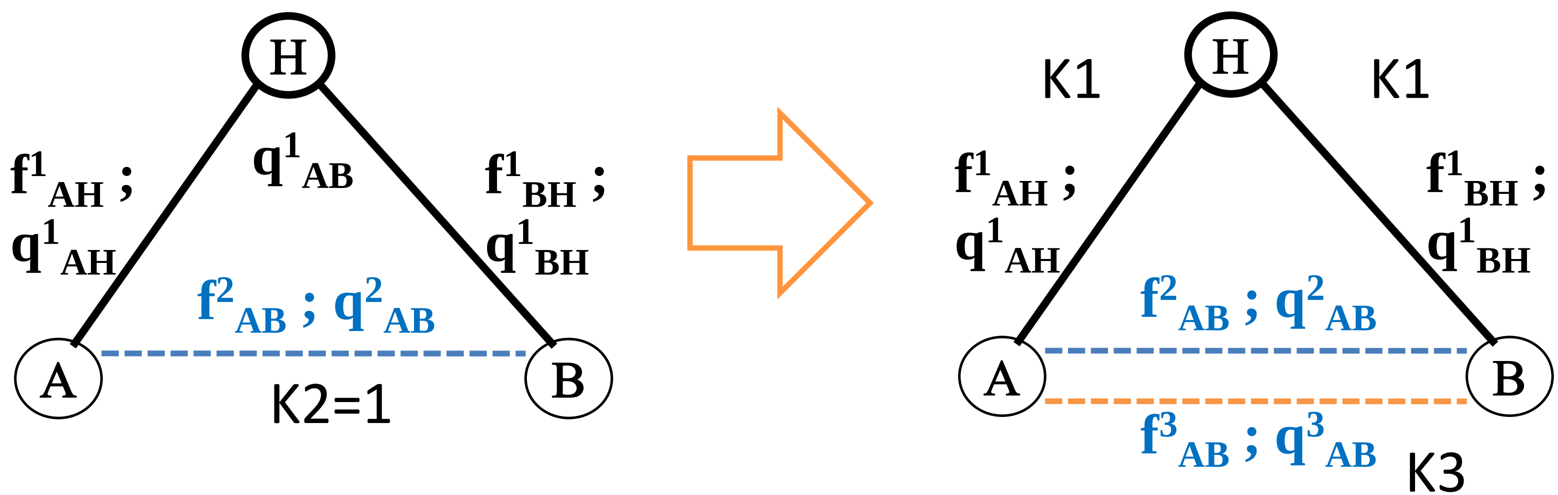
K3↓→ 3↑f3AB → bring new demand into the market!
However this created demand is absorbed by 1

i.e.,[1↑spokes f1s → f1s,q1s ↑⇒ $\Pi 1^{HS}$↑]

⇔ q3AB↓⇒ $\pi 3$↓

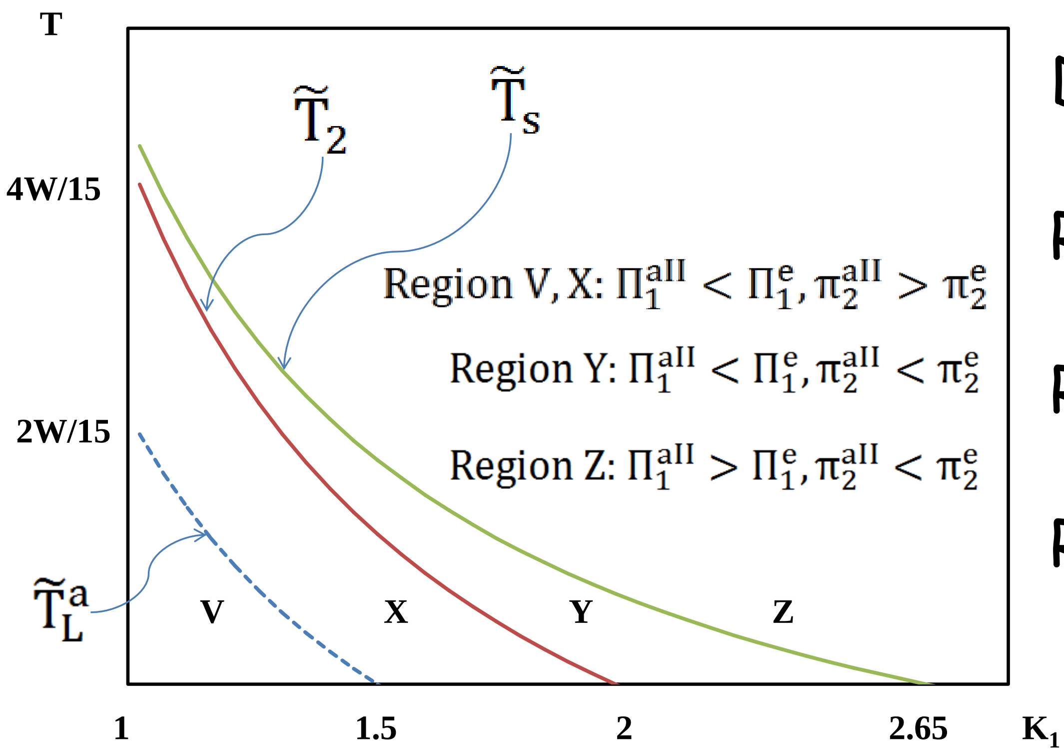
4.effects for A-in-aII

Network for Case-e **Network for Case-aII**



4.effects for A-in-aII

Prop.2: holds when K3=K2=1



Due to the A-in-aII

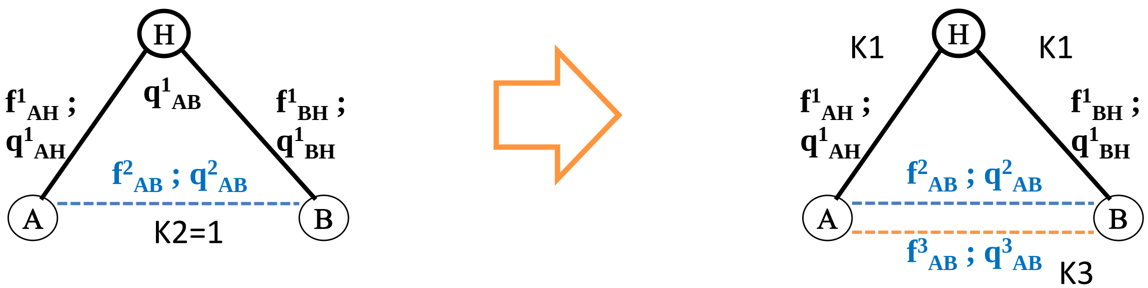
Reg. Z: $\Pi 1 \uparrow$, $\pi 2 \downarrow$

Reg. Y: $\Pi 1 \downarrow$, $\pi 2 \downarrow$

Reg. V,X: $\Pi 1 \downarrow$, $\pi 2 \uparrow$

4.Intuition for Prop.2

Network for Case-e Network for Case-aII



Reg. Z (T,K1) large:

large K1 leads 1 to withdraw q1AB, to ↓ expensive f1s

large T leads 1 to shift its one-stop service to its division's nonstop service with low cost K3.

3 greatly steals 2's AB demand ⇒ π2 ↓

Reg. V,X (T,K1) small:

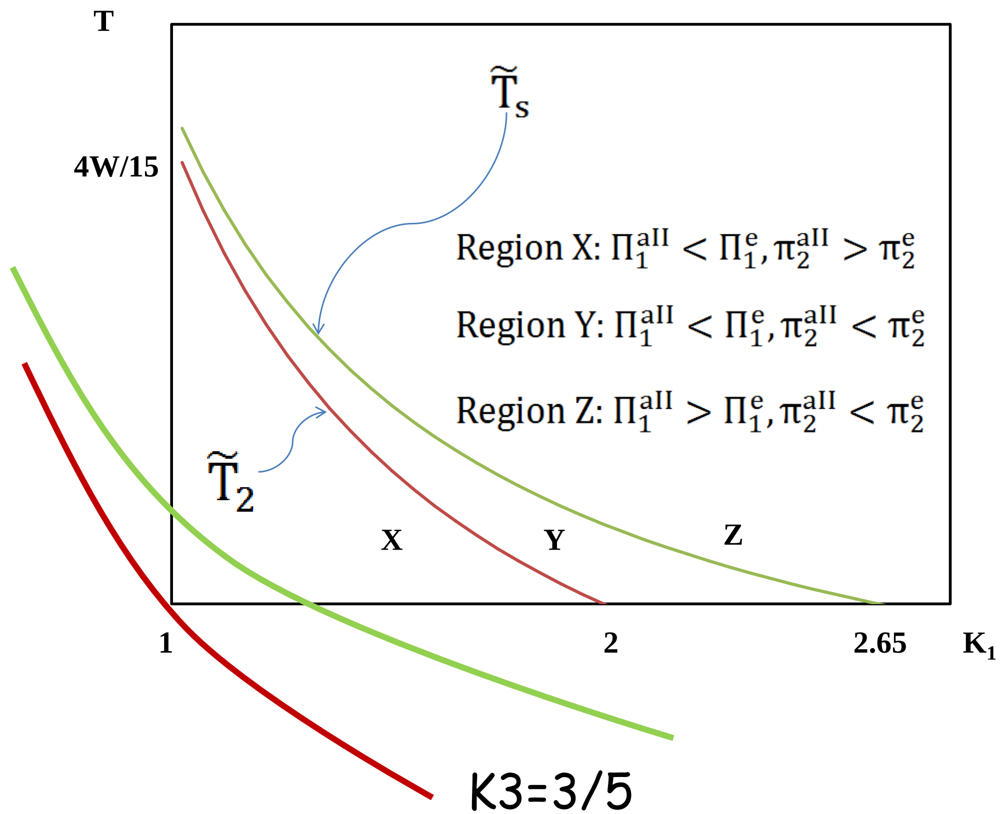
1 not adopt Aina, so as to enjoy large NFE. If adopt Π1 ↓ , π2 ↑

Reg. Y (T,K1) intermediate:

If adopt, $q^1AB < q^3AB \rightarrow q^2AB \downarrow \Rightarrow \pi2 \downarrow$, But the loss on the two spokes (the cost for giving up NFE)> π3+ ⇒Π1 ↓

4.effects for A-in-aII

Corollary 2 to Prop.2: $d\Pi 1/dK3<0$、$d\pi 2/dK3>0$.



5.Conclusion-Contribution 1

implications for a HS network carrier

- to meet its nonstop LCC rivals, Aina stra.could be profitable only if the HS network operating costs are suff.ly large. But importantly, has to withdraw the one-stop
- if it aims to enjoy NFE by remaining HS network (ie, remain one-stop service), while to seek cost advantage by A-in-a stra. then even though its division is relatively cost efficient, the stra. is unprofitable overall.

5.Conclusion-Contribution 2
with Dunn's empirical results

- Dunn (2008): it is not unusual that network carriers entering markets with nonstop service, even though they also offer one-stop service through a hub, in particular, when their one-stop service is of low-quality.
- This theoretical paper: if the quality of network carriers' one-stop service is low (e.g., the hub-through extra cost is large), then it is sensible for network carriers to adopt the *A-in-a stra*, but importantly it has to withdraw the one-stop service.

5.Conclusion-Contribution 3
new insight into airline studies

- Previous studies showed: HS network is useful for deterring the entry on spoke markets.

- This paper found that in certain circumstance the Aina stra. may hurt LCCs, implicitly implies the possibility of

point-to-point network formed by Aina stra. may play a role of deterring the LCCs' entry on rim markets.

5.Conclusion-future works

- the relationship between the parent airlines and their low-cost divisions

- to consider the choices of aircraft size (the relationship between frequencies and total traffic volume)

- to consider the timing of LCCs' entry and the establishment of low-cost divisions. Using a dynamic game to explicitly investigate how Aina stra. affects the entry decision of LCCs.

Thank you for your attention ♪

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Hereafter for references

4.Intuition for Prop.1-note

Why [q1ABe] >[q1ABaI+q3ABaI] ?

larger -1 +1

Establishing 3 → hedonic price is the same

→ total demand does not change.

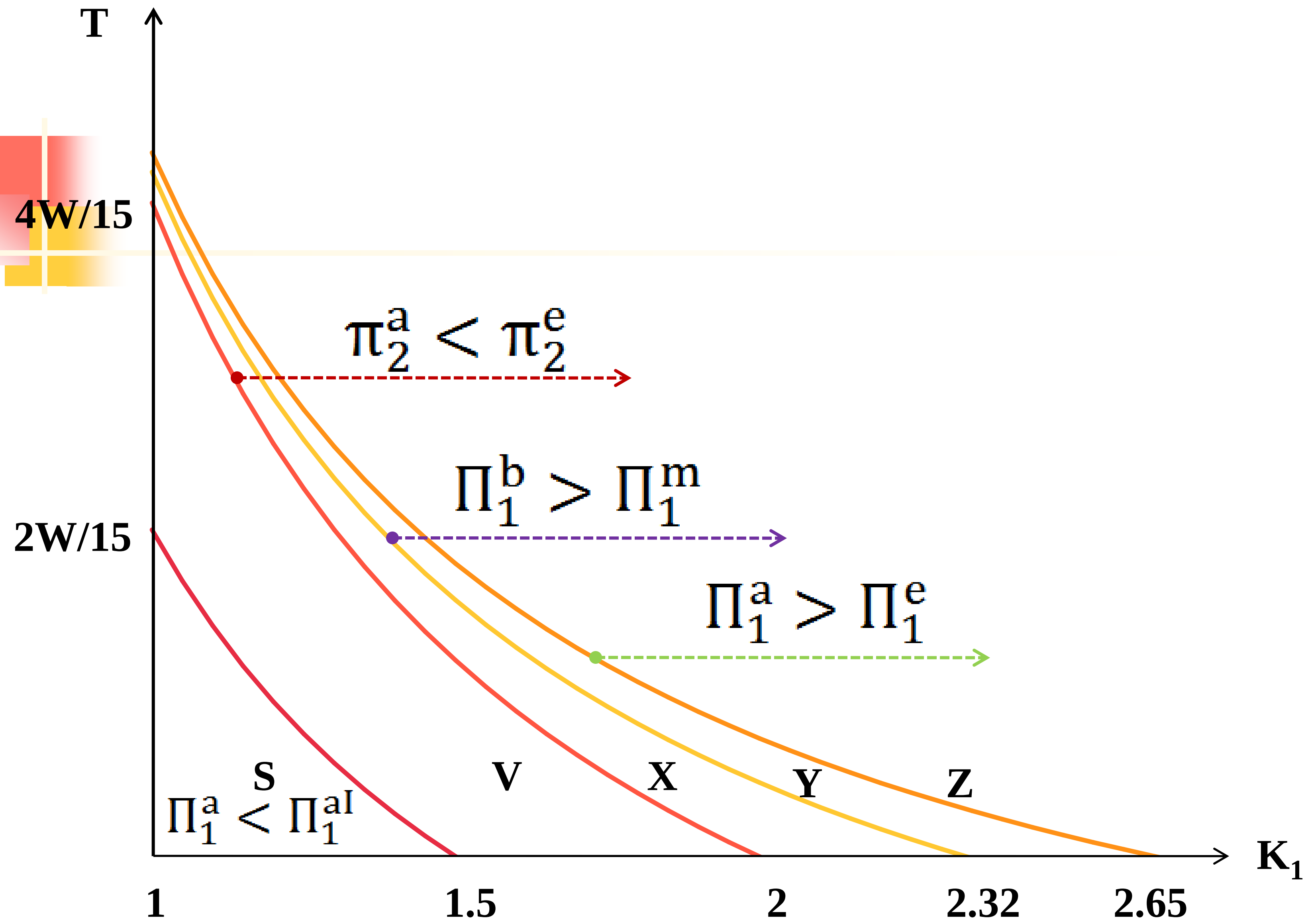
If q3AB and q1AB are identical →

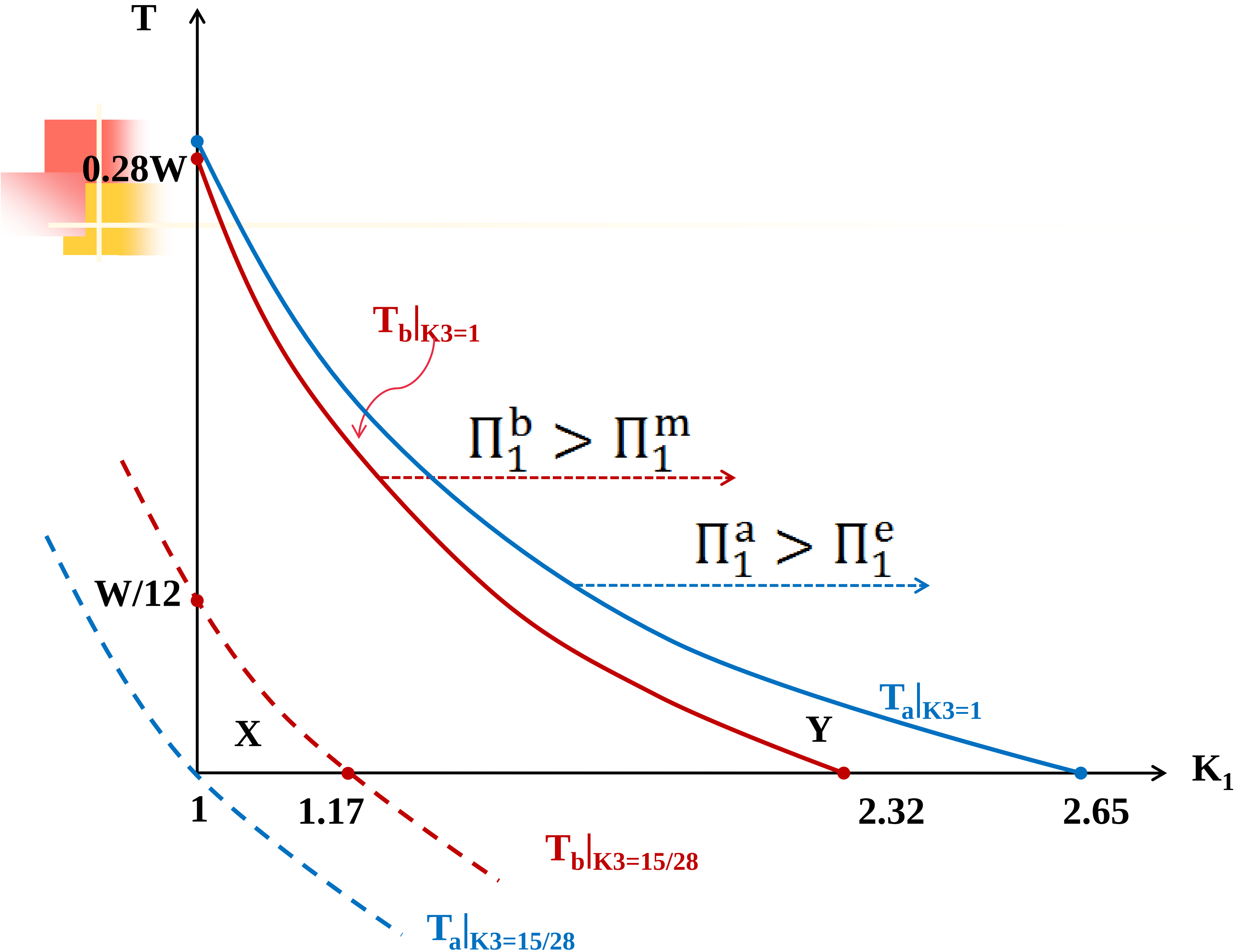
[q1ABe]=[q1ABaI+q3ABaI]

-1 +1

But! Network frequency effect exist

q3AB+1 →q1AB -1 → f1AH(q1AH) ↓→ q1AB↓ more


T
4W/15
2W/15
$\pi_2^a < \pi_2^e$
$\Pi_1^b > \Pi_1^m$
$\Pi_1^a > \Pi_1^e$
S
$\Pi_1^a < \Pi_1^{al}$
V
X
Y
Z
K_1
1
1.5
2
2.32
2.65


T
0.28W
$T_b|_{K3=1}$
$\Pi_1^b > \Pi_1^m$
$\Pi_1^a > \Pi_1^e$
W/12
$T_a|_{K3=1}$
X
Y
K_1
1
1.17
2.32
2.65
$T_b|_{K3=15/28}$
$T_a|_{K3=15/28}$