Columbia Business School

The Road to UBB: natural monopoly or unnatural oligopoly?

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Ultra Broadband : The next generation of infrastructure and applications

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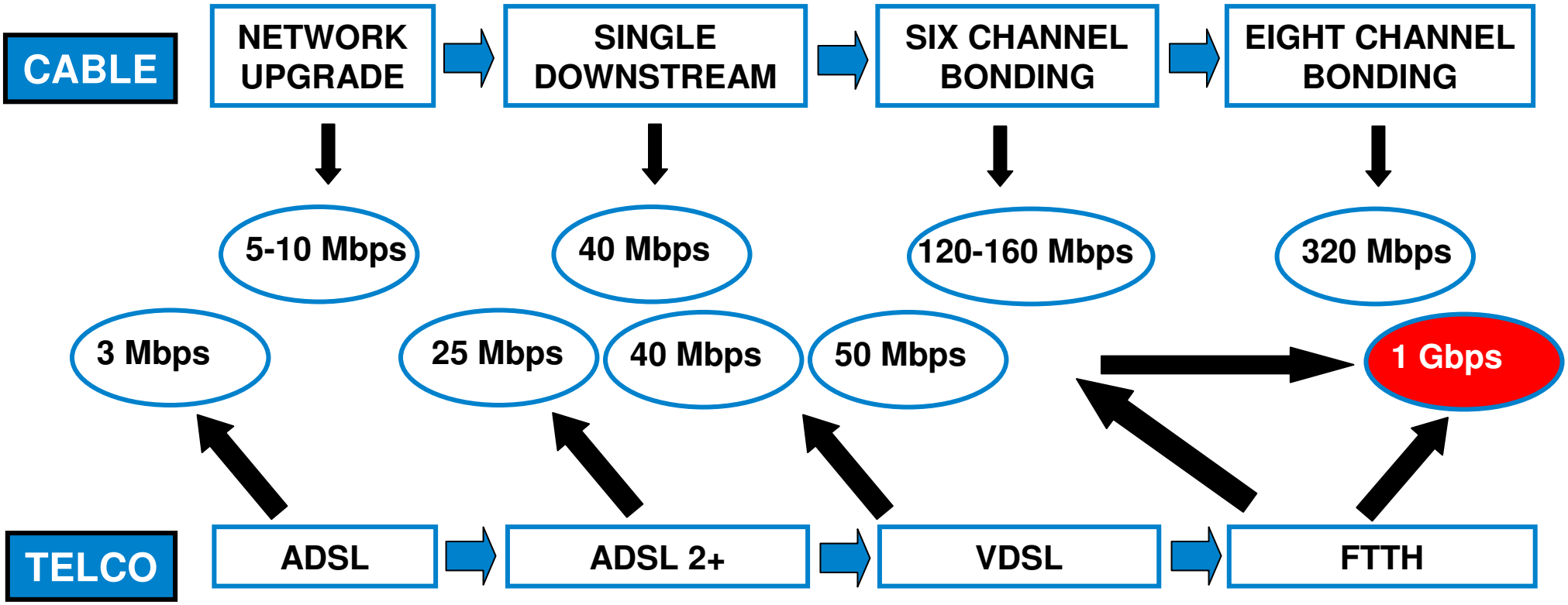
This paper explores the importance of industry structure in conditioning the path to UBB

- The delivery of UBB to the residential market requires significant infrastructure investments
- Deployment of infrastructure capable of supporting UBB through fiber is proceeding in many countries around the world, albeit at different pace
- In our prior paper submitted to the Paris conference, we have linked different pace of deployment to investment model variables demonstrating the financial risk facing the investing operators
- This paper will attempt to test the hypothesis that deployment pace is driven by market structure
  - Experience in the United States and the Netherlands would indicate that a “2.5 market” structure provides the needed incentives for both cable and telecommunications operators to invest in UBB enabling infrastructure
  - However, there are indications that other markets, where despite the absence of a strong cable player, deployment of FTTH is proceeding
  - There are markets like Japan and Korea that are at the top of FTTH deployment, where the industrial policy variable appears to be playing a preeminent role in explaining their success
- To sum up, is market structure important in explaining pace of deployment or not? Even if it is, how do we explain deployment in countries with more concentrated industry structure? What is the relative weight of other variables?
- The study will draw from analysis of the UK, Singapore and Japan. While based on case study data, an attempt will be made at building a quantitative analytical explanation

Agenda

1. Market structure and UBB: the nature of the problem
2. Market structure and UBB: case studies
3. Natural monopoly or unnatural oligopoly?
4. Conclusion

Our starting point is to determine which platforms will enable the UBB future



Hypothesis: industry structures play a key role in the deployment of UBB enabling platforms

- POSITIVE 1: Markets structured around a strong telco and a vibrant cable TV operator should be more prone towards innovation and therefore, invest in ultra broadband facilities (FTTH and DOCSIS 3.0)
- NEGATIVE 1: However, competition entails higher investment risk, with the potential to encourage collusive behavior (Atkinson, 2008)
- NEGATIVE 2: Under a natural oligopolistic market structure, the incentives to deploy UBB platforms could be low (Katz and Shapiro, 1985)
- NEGATIVE 3: Under wholesale access regulation, the incentives to innovate and deploy advanced infrastructure might be low (Aghion et al., 2001)
- Accordingly, rather than deploy UBB facilities, competitors could slow down investment and innovation, which could materialize in several ways
  - Deploy broadband platforms up to ADSL2+ (24 Mbps)
  - Deploy ultra broadband but only under success-based conditions (e.g. greenfield developments), thereby ensuring high share of houses passed
  - Deploy fiber but up to the node, which does not enable ultra broadband speeds
- As a result, competitive dynamics materialize primarily around price, bundling, and limited speed

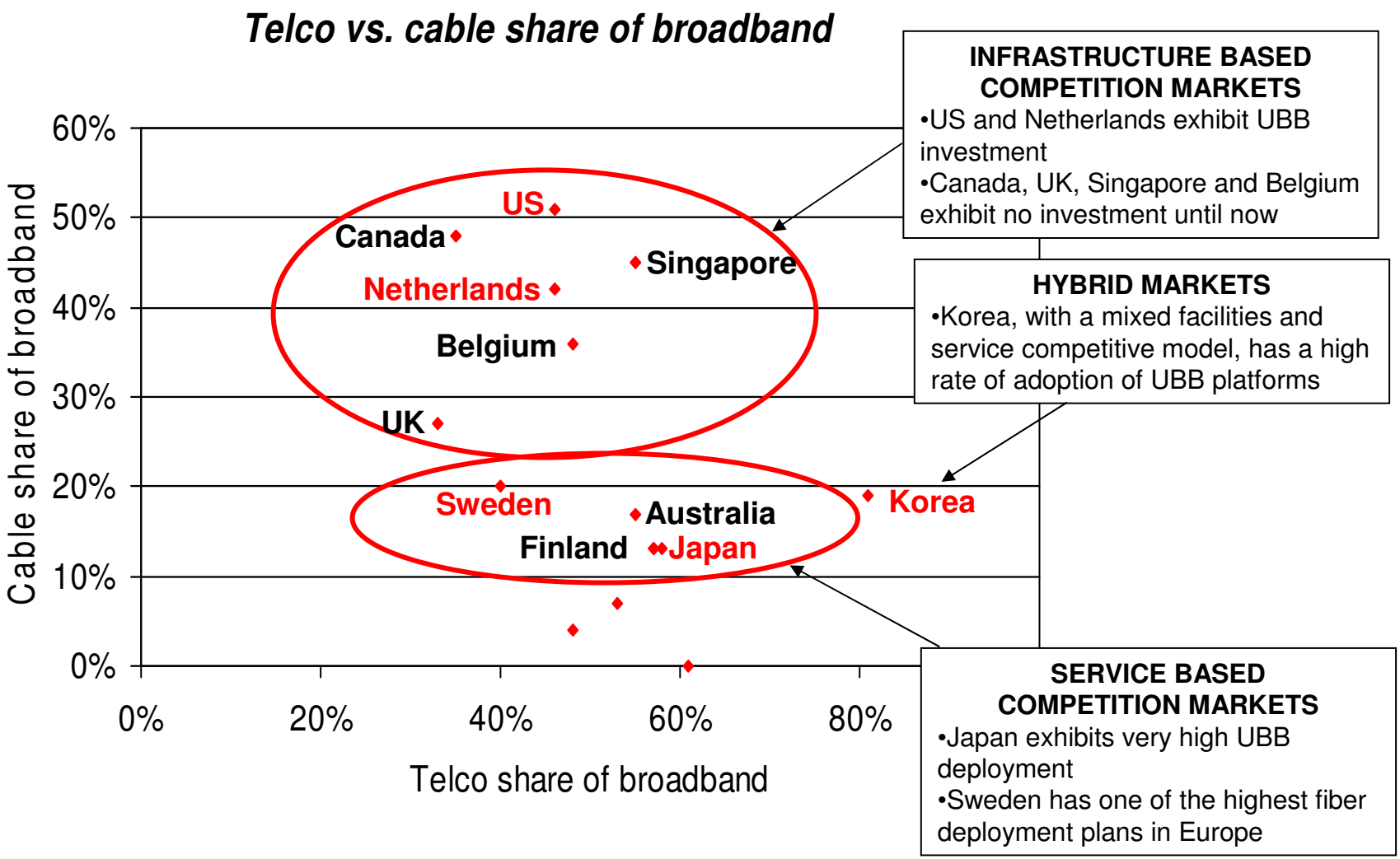
Current situation in key industrialized countries

Country	Broadband subscribers (% households)	Telco retail share of Broadband	FTTH Share of Broadband	Cable retail TV Share of broadband	DOCSIS 3.0 Share of broadband	Other retail share of broadband (*)
Australia	5,742,000 (70%)	55%	0%	17%		28%
Belgium	2,671,826 (57%)	48%	0%	36%		16%
Canada	8,675,197 (87%)	35% (**)	0%	48%	Testing	17%
Denmark	1,157,907 (76%)	58%	4%	13%	Testing	29%
Finland	1,615,270 (61%)	57%	0%	13%		29%
France	16,258,000 (54%)	48%	4%	4%		48%
Germany	17,974,000 (47%)	53%	1%	7%		40%
Italy	10,686,625 (41%)	61%	3%	0%		39%
Japan	29,342,000 (57%)	57%	45%	13%	Already launched	29%
Korea	14,800,000 (91%)	81% (***)	34%	19%		
Netherlands	5,289,000 (78%)	46%	4%	42%	Launch 2009	12%
Singapore	932,900 (88%)	55%	0%	45%		0%
Sweden	2,672,000 (62%)	40%	18%	20%		40%
United Kingdom	12,840,336 (55%)	33%	0%	27%	Launch 09	40%
United States	71,125,000 (60%)	46% (****)	6%	51%	Testing; launch 09	3%

(*) Fixed wireless (Wimax, WLL), Power Line Carrier, ULL
(**) Two telcos
(***) Three telcos
(****) Multiple telcos

Sources: ECTA; OECD; Regulatory Authorities

Only a portion of those markets that are likely to have UBB platforms have effectively adopted them



Industry structure, and more importantly, industrial policy appear to play a role in driving deployment of UBB facilities

Independent variables	Coefficient	Standard error	T-statistics
Cable penetration	0.1336	0.088	1.52
Population density	-0.0063	0.004	-1.78
Government intervention (dummy variable)	10.3353	1.405	7.36
Constant	0.9747	0.587	1.66

R-squared	0.8323
Adj. R-squared	0.7987

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Our case studies are selected to identify factors explaining why countries do not follow expected UBB development paths

- UBB investment should be expected, and has not happened yet
  - United Kingdom
  - Singapore
  - Belgium
  - Canada

- UBB investment should not be expected but materialized
  - Japan
  - Korea
  - Sweden

The retail broadband UK market is relatively fragmented

UK Broadband Market (3Q08)

Type of player	Players	Subscribers (000)	Retail Market share	Share of net adds
Facilities-based telcos	BT	4,519	27 %	25 %
Cable TV (*)	Virgin media	3,850	23 %	15 %
Unbundlers	Sky	2,200	13 %	50 %
	Carphone	2,708	16 %	10 %
	Tiscali	1,862	11 %	(10%)
	Orange	1,015	6 %	(10%)

(*)Note: in addition to the incumbent cable operator, a number of small players remain, such as WightCable (in discussions with Virgin), Small World, and Kingston Communications

Source: Company data

The formulation of policy regarding fiber deployment in the UK started with the creation of OpenReach

- At the time of negotiation of BT's functional separation, the Minister of Industry in the Blair cabinet publicly stated that the undertakings represented a disincentive for the investment in fiber
- In September 2007, the government showed signs of concern regarding the lack of fiber deployment in comparison with the plans announced in other countries (see Future Broadband: policy approach to NGA")
- In this context, the Broadband Stakeholder Group was assembled to support the Caio Broadband Commission
- A report to the group concluded that in order to deploy fiber to 50% of the UK households, investment of between GBP 5 billion and 28 billion was required

In order to provide the right investment incentives, defined a number of promotion policies

- Adjust the cost of capital investment in fiber to reflect higher risk
- Avoid setting wholesale prices, therefore allowing the industry to assess risk and prices
- Define product regulation around pricing flexibility, the need to protect consumers and promote pricing restraint

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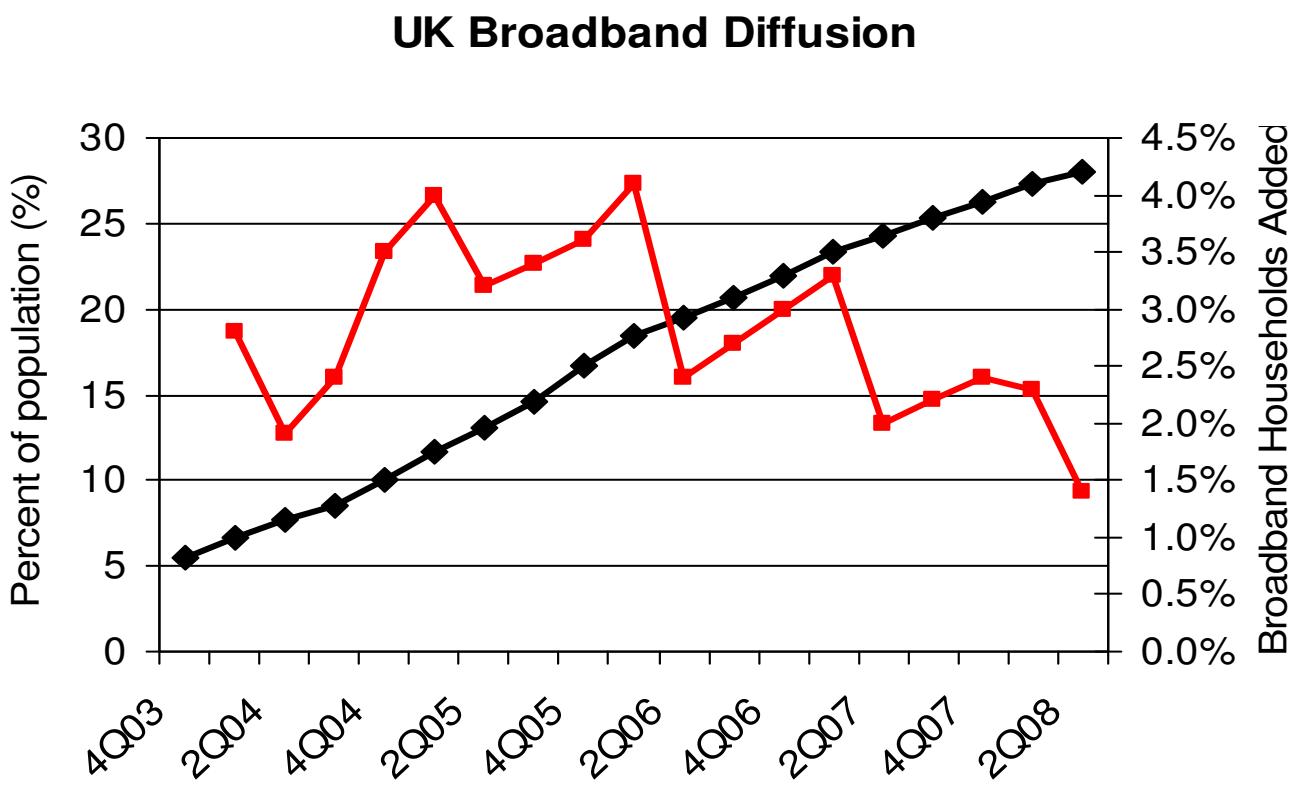
However, there are limited incentives for the UK telco incumbent to invest in fiber

- The broadband market growth is slowing down indicating some level of saturation
- Until now, the competitive threat to invest in fiber coming from the cable industry or the unbundlers is not strong
- The need for the telco incumbent to reduce opex is not as urgent since many initiatives have already been tackled
- The revenue upside of a fiber investment remains speculative at best

The UK broadband market growth is slowing down sequentially



Source: Merrill Lynch

This could be reinforced by worsening trends in the macro picture (e.g. housing market)

Furthermore, the stimulus to reduce telco opex via fiber is also somewhat limited

- A task-by-task analysis of wireline operations indicates that mass-deployed FTTP can significantly reduce costs in four categories (e.g. Customer contact: 61%, Central office: 48%. Outside Plant Operations: 81%, Network operations: 33%)
- Having said that, BT has already been focusing on cost savings through its 21C network upgrade
- The disposal of exchange buildings (a key benefit in KPN's fiber plan) has already been done
  - Dismantling exchanges and automating provisioning and repair processes can yield savings
  - However, unlike KPN, which has estimated that it can finance the cost of its fiber investment by selling off redundant exchanges, BT has already sold and leased back its central offices
  - As a result, it could only save rent on those exchanges that will be closed

The revenue opportunity of a fiber upgrade remains doubtful

- High pay-TV penetration (over 40% controlled by Sky and Virgin) means that new service offerings (e.g. multi-set HD TV) will be launched as replacement
- The incumbent telco relative absence in the TV market (BT's Vision IPTV product has reached 282,000 subs, but results in limited stand-alone revenue opportunity) significantly impacts the return profile of a fiber build
- Broadband diffusion is slowing down indicating some level of saturation
- Consistent with the Korean, US and Japanese markets, there appears to be low willingness to pay for higher bandwidth

The government incentive notwithstanding, the first stimulus for UBB investment was an announcement of Virgin Media, the cable incumbent

- Cable incumbent, Virgin Media, a merger of Virgin, NTL and Telewest, covers 49% of the territory (England: 52%; Scotland: 38%; Wales: 24%)
- Virgin has 3,800,000 broadband subscribers and 2,800,000 TV subs; all purchase telephony services
- With share of net adds in 3Q08 at 15 %, cable has been losing absolute share
- Currently offering services up to 10 Mbps
- Company announced in April 2008 that it is upgrading its network to DOCSIS 3.0 offering speeds of up to 50 Mbps broadband service to gain share from BT
  - 70% of its customer base by end 2008
  - 95% in 2009
- Partly due to financial difficulties (debt carryover from prior bankruptcies), the industry and the regulator are having a “wait and see” attitude as to whether they are going to be able to achieve their targets
- Alternatively, they might offer the 50 Mbps service only to premium customers for retention purposes

In response to Virgin's DOCSIS announcement, BT presented a plan to deploy FTTH to10 million homes by 2012

- 40% of UK households
- Geographies are undecided
  - Commitment is to equally deploy in urban and rural areas
  - BT offers to partner with local and regional bodies to decide where and when to focus the deployment
- Committed to wholesale the services at higher prices than copper (intent: protect competition but allow BT to recover some part of the value lost to unbundlers)
- Incremental investment of GBP 1 billion over five years

	2008	2009	2010	2011	2012	Total
Baseline plan	3.1	3.0	2.7	2.7	2.6	14.1
Fiber plan	.1	.1	.264	.264	.264	1.0
Total	3.31	3.14	2.94	2.93	2.92	15.24

A comparative analysis of the proposal indicates that this is hardly a bold move

- In comparative terms, BT's investment is one of the more conservative plans of European carriers

	Coverage Ranking	Investment Ranking
KPN	1 (100%)	6 (E 0.90 bn)
TeliaSonera	2 (50%)	7 (E 0.48 bn)
Belgacom	3 (47%)	8 (E 0.30 bn)
Telefonica	4 (40%)	5 (E 1.00 bn)
BT	5 (38%)	4 (E 1.90 bn)
Swisscom	5 (38%)	2 (E 4.38 bn)
Telenor	6 (36%)	9 (E 0.25 bn)
Deutsche Telekom	7 (27%)	3 (E 3.00 bn)
France Telecom	8 (16%)	1 (E 6.00 bn)

Source: company announcements

- It is also back loaded, which means that until next decade, Britain will still lose ground to other countries

The stock market has not reacted positively to BT's fiber announcement

- BT stated that the GBP 1 billion incremental capex aimed at paying the program would be funded in its entirety by suspending the GBP 0.7 billion share buyback, and that it might not affect dividend payments
- However, it is estimated that the BT pension trustees, who had agreed in 2006 to a restructuring of pension funding, might be likely to demand a resumption of funding
- If that is the case, the dividend might be at risk
- This resulted in BT shares dropping 4.8% on the day of the fiber announcement

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To foster the development of a UBB fiber network, the Singaporean government issued an RFP

- Build and operate a next generation national network (Next Gen NBN)
- Offer competitively priced ultra-high speed broadband (100 Mbps, 50 Mbps downstream) services
- Government will provide a grant of S$ 750 million to support rollout
- Structure would be as follows:

Layer 1	Passive infrastructure	Netco is responsible for designing, building and operating
Layers 2 and 3	Active infrastructure	OpCo is responsible for designing, building and operating
Retail services		Retail service providers purchase connectivity from OpCo and provide services to end-users

The RFP requested that the NetCo had to be separated from both the Opco(s) and the Retail Service Providers

- Netco is expected to be a monopoly
- OpCo operates as a standalone entity
  - Located in separate premises
  - Makes its own decisions on assets and commercial policies
  - Directors must not have any responsibility in a an affiliated operator or have their compensation linked to an affiliated company's performance
- NetCo and Retail Service Providers have to be structurally separated, meaning "no effective control"

Two consortia competed for the bid

OpenNet

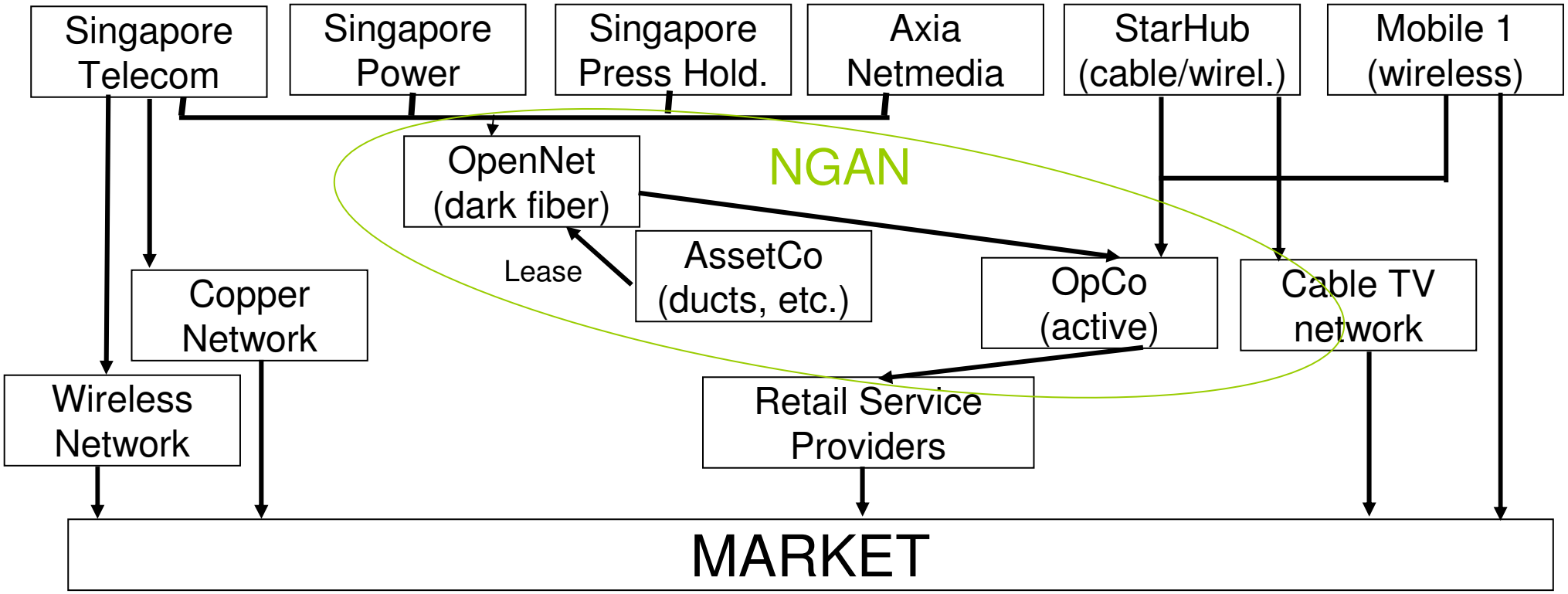
- Singapore Telecom (30%)
- AXIA Netmedia (Canadian group) (30%)
- Singapore Press Holdings (Southeast Asia's largest newspaper publisher) (25%)
- Singapore Power Telemedia (electric utility telecom unit) (15%)

Infinity

- StarHub (cable TV operator and wireless)
- MobileOne (3rd wireless player)
- Quatar Investment Authority (sovereign fund)

There is expectation that the Infinity consortium will now focus on winning the OpCo bid

SINGAPORE: POTENTIAL INDUSTRY STRUCTURE



The framework chosen by the Singapore government has some problems: Potential scenario

- OpCo RFP submits a wholesale price to RSP that enables them to recoup their investment; the RSP adds its own margin to recover its costs and make a profit

NetCo price= S$15 + OpCo cost + OpCo Margin = OpCo Wholesale + RSP Cost + RSP Margin = Market Price

- Fiber access price is too high vis-à-vis consumers willingness to pay and we witness price-shifting (see Japan and Korea cases)
- Either the OpCo lowers price or the RSPs buy access from legacy networks (copper and cable)
- It is not clear that the interests of NetCo and OpCos should be aligned (in fact, past experience in telecoms indicates that misaligned interests along the value chain might lead to collective demise rather than collaboration)
- Fiber network remains underutilized
- But Singtel has already recouped its S$ 2 Billion investment through its agreed upon wholesale price, and 5 year stake in Asset Co

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The retail fixed broadband Japanese market is split between facilities-based telcos, unbundlers and cable TV operators

Japanese Fixed Broadband Market (2Q08)

Type of player	Players	Homes Passed	Subscribers (000)	% of Homes Passed	Retail Market share	Territory covered	Share within territory
Facilities-based telcos	NTT East	…	7,743	…	31 %		…
	NTT West	…	6,317	…	25 %		…
	Power utilities	…	1,334	…	5 %		…
	USEN	…	641	…	3 %		…
	KDDI	…	798	…	3 %		…
	Total	…	16,833	…	57%		
Cable TV(*)	Total	…	3,956	…	13%		…
ULL	Softbank	…	4,277	…	15 %		…
	ACCA	…	1,093	…	4 %		…
	E Access	…	1,610	…	5 %		…
	Other	…	1,573	…	5 %		…
	Total	…	8,553	…	29 %		
TOTAL			29,342				

Source: Ministry of Internal Affairs and Communications; Morgan Stanley; TAS analysis

(*) Includes Jupiter Telecom (owned by Liberty Global)
(**) includes thousands of small carriers

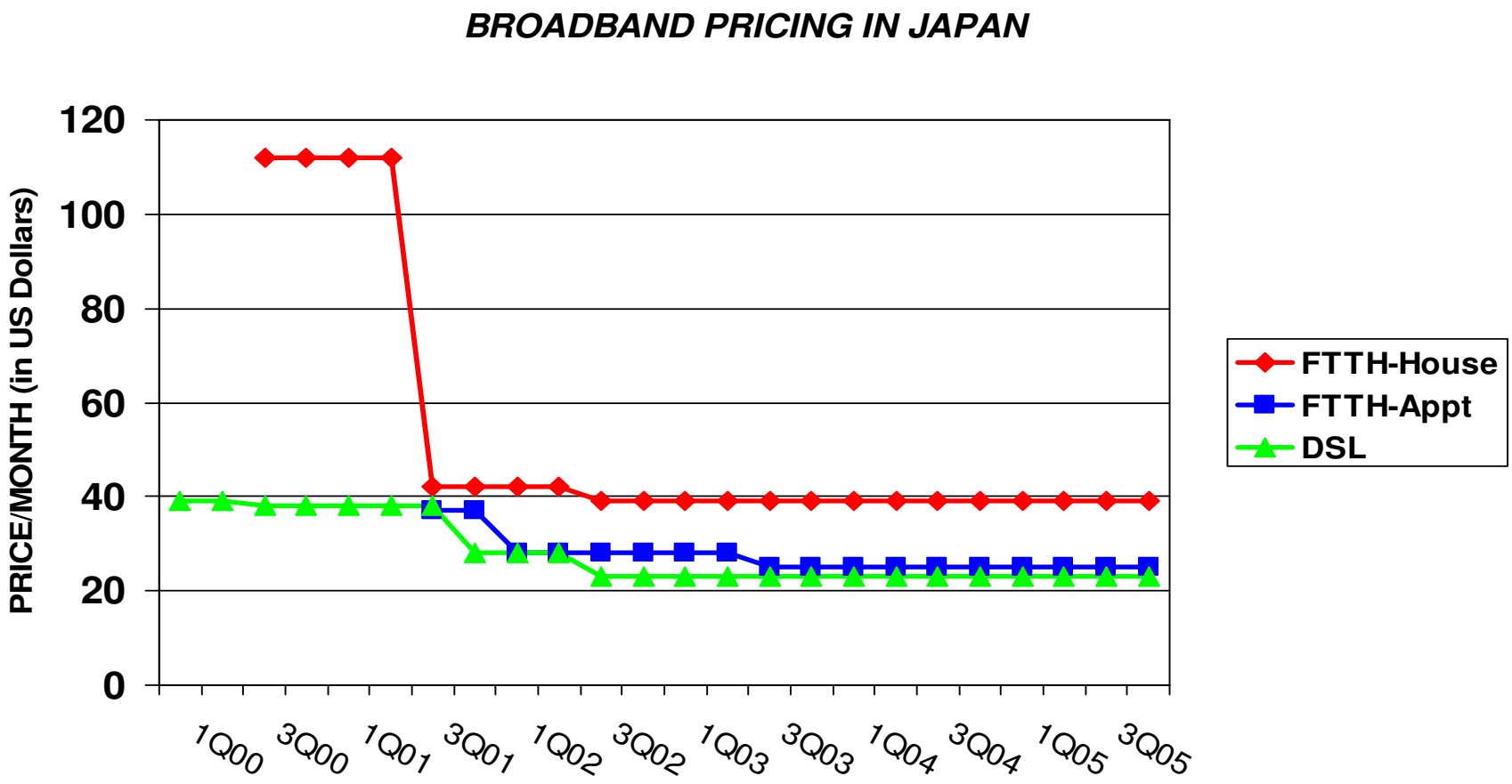
Fiber optic deployment is considered to be a responsibility of the private sector, but fiber unbundling has been enacted by the regulator

- The role of the government is limited to ease the financial burden of the operators
- Two types of incentives for deployment are provided:
  - Loan systems with interest rates lower than the market rate are made available to any carrier with a fiber network installation plan
  - Tax deductions are assigned to carriers engaged in fiber deployment
- Unbundling rules are stipulated for Optical subscriber lines, differentiated from copper lines
- Interconnection with major suppliers is handled at the operator's exchange
- Rates determined by the LRIC model

Since FTTP launch, NTT had been affected by severe fiber price competition from unbundlers and share loss in ADSL

- NTT ADSL share dropped to 38%
- Wholesale access charges for fiber were set up a such a low level, that NTT faced strong competition from unbundlers
- Additionally, limited introduction of new services prevented them to raise the fiber ARPU
- A published ARPU of 5,085 yen ($ 49.8 or 33 Euros) (Source: NTT Annual report) does not appear to be enough to generate a positive return

Unable to price discriminate, NTT had to cut FTTH prices by 60%



Source: NTT

NTT is pushing to shift the regulatory regime

- Shift from *ex ante* regulation to *ex post*
- Enact a facility-based competitive model, deemphasizing asymmetric regulation
- However, the bargaining situation of a dominant carrier is seriously hampered by having already made the investment prior to extracting regulatory changes from the government (obsolescent bargaining position)

In that sense, there is a lot that can be learned from the Japanese experience

- Aggressive roll-out of FTTP needs to necessarily supported by financial stimulation (e.g. government low interest loans, tax exemptions)
- If fiber is to be included in the unbundling regime, it is imperative to review the LRIC methodology not to create an inherent disadvantage to the wholesaler
- In order for the incumbent to reach a positive ROI in the fiber investment, it needs to aggressively search for reduction of opex and additional services
- Power utilities are interim investors rather than long term

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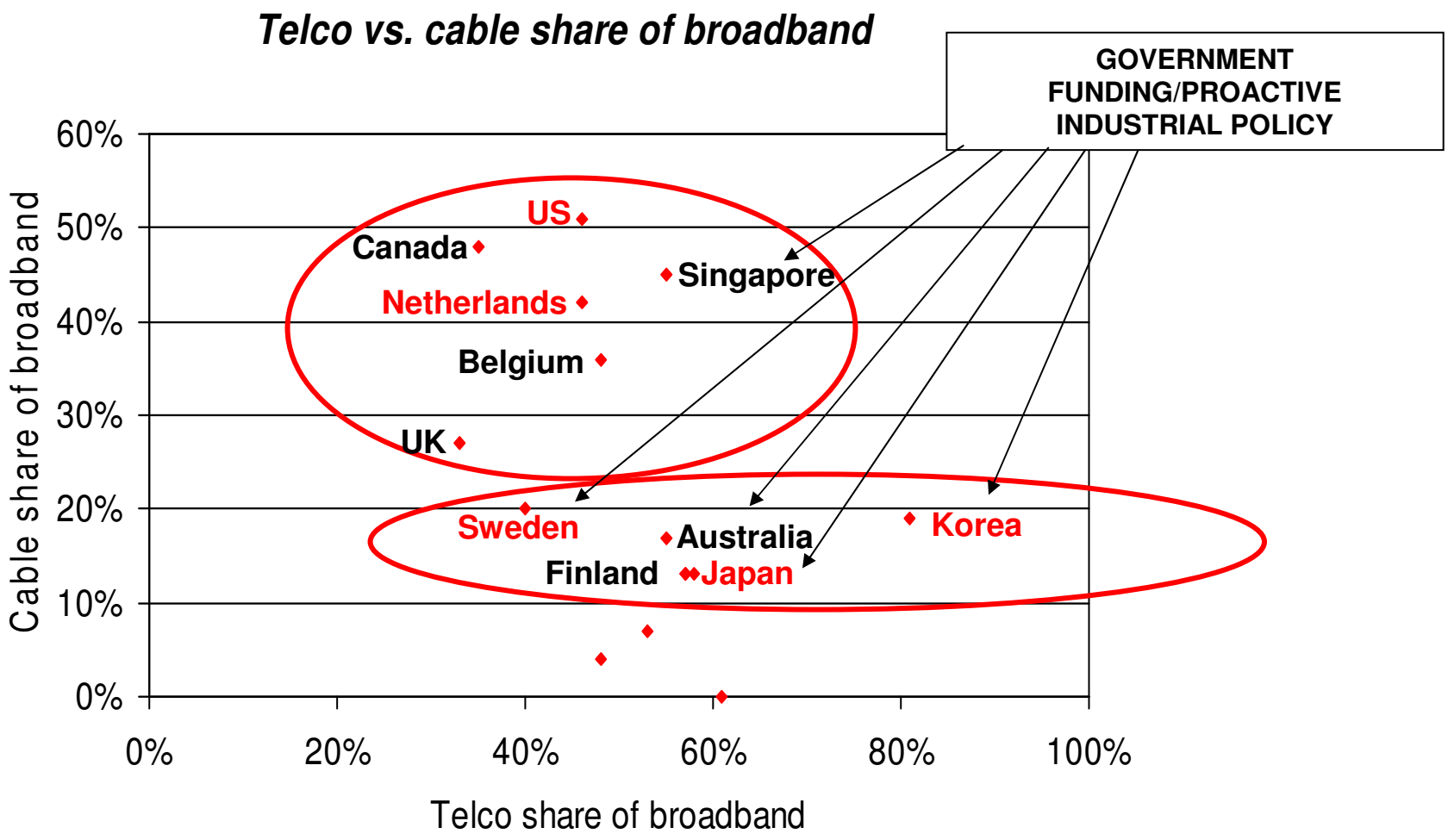
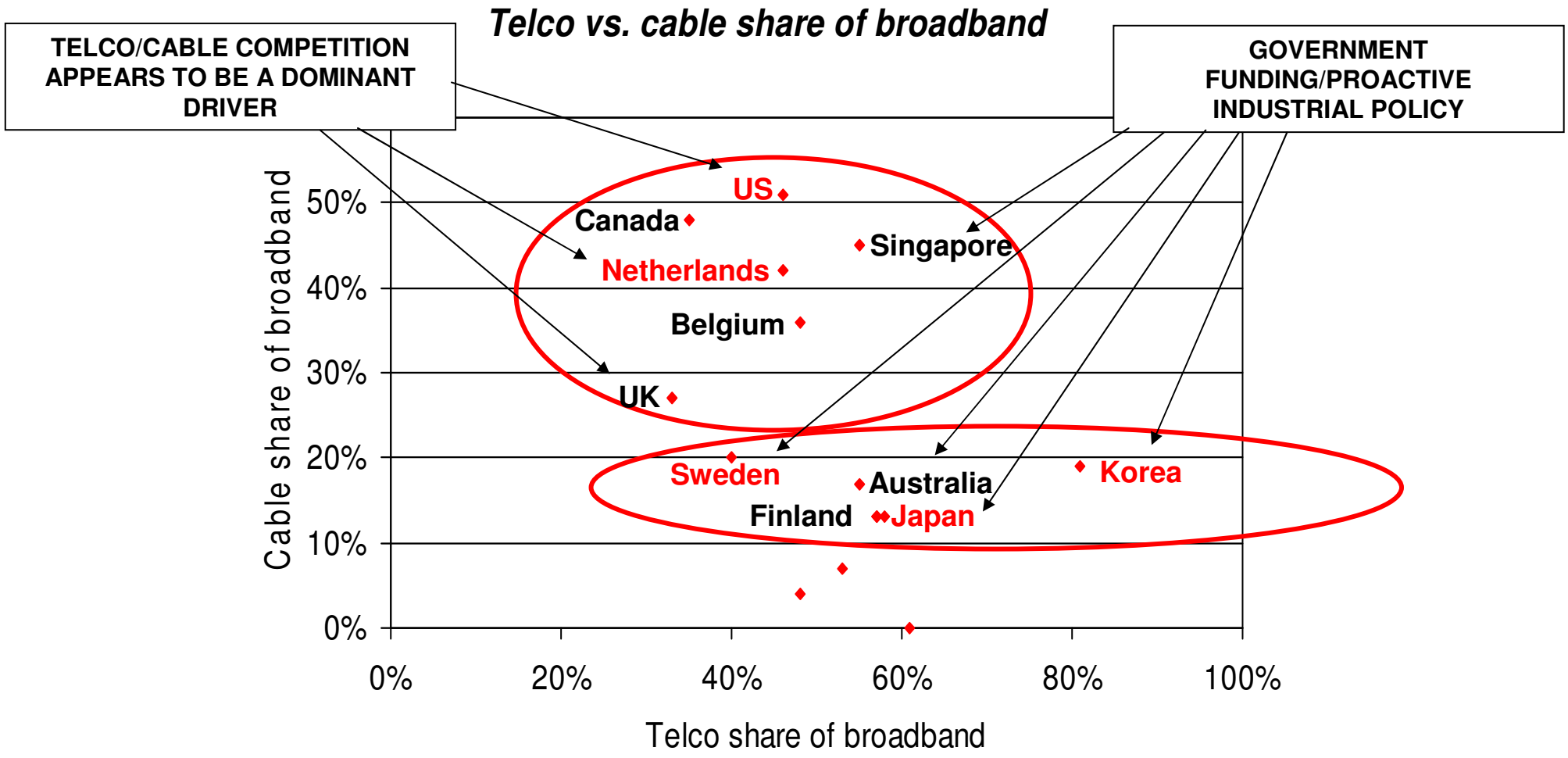
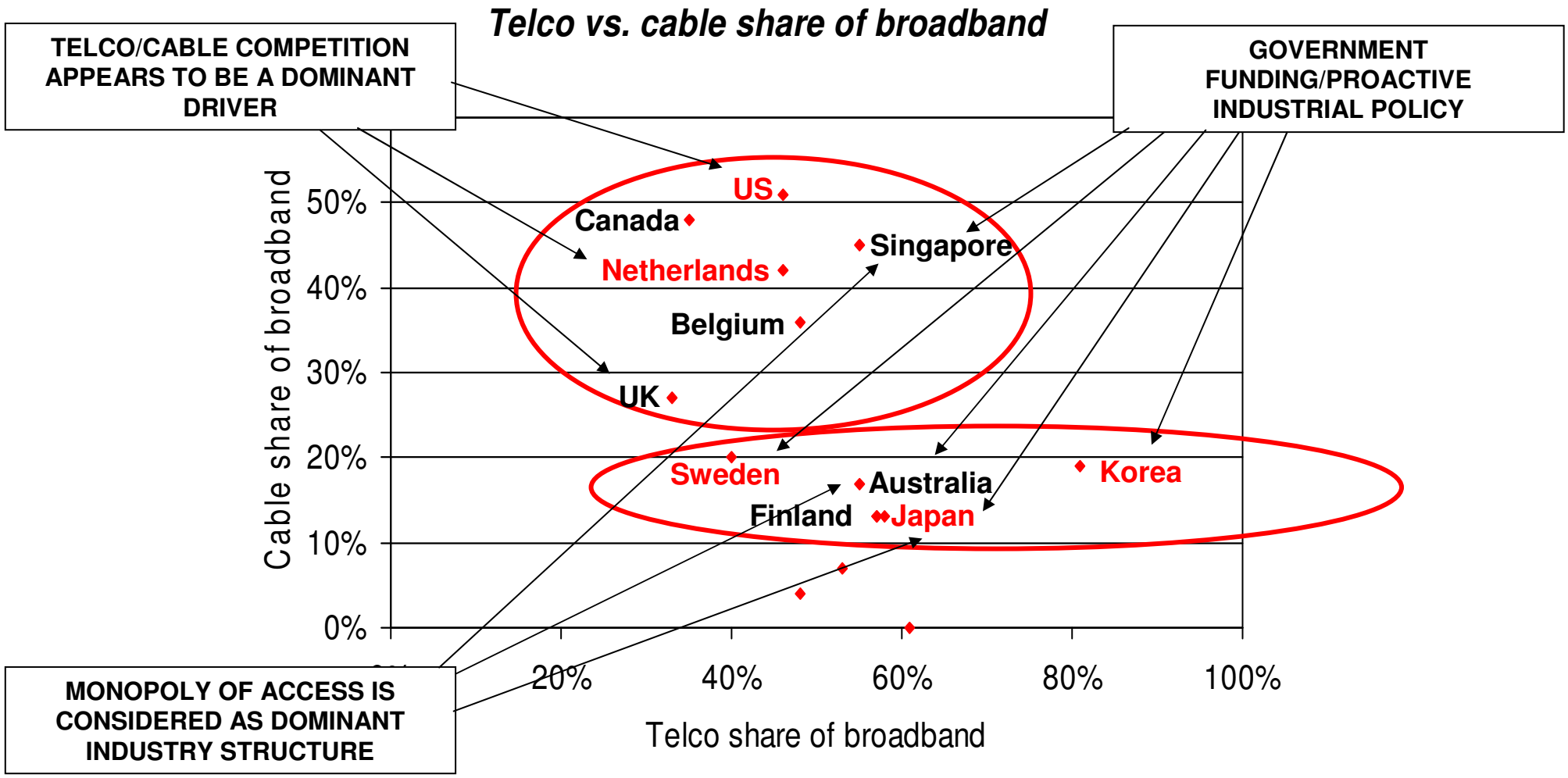
Government plays an active financial role



Cable/telco competition



Monopoly


Telco vs. cable share of broadband
TELCO/CABLE COMPETITION APPEARS TO BE A DOMINANT DRIVER
GOVERNMENT FUNDING/PROACTIVE INDUSTRIAL POLICY
MONOPOLY OF ACCESS IS CONSIDERED AS DOMINANT INDUSTRY STRUCTURE
Cable share of broadband
50%
40%
30%
20%
10%
0%
20%
40%
60%
80%
100%
Telco share of broadband
US
Canada
Netherlands
Singapore
Belgium
UK
Sweden
Australia
Korea
Finland
Japan

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Conclusions: hypothesis for further research

- Market structure (1.5, 2.5 players) might not be a strong enough predictor of UBB deployment
- Natural oligopolies, entailing unique symmetric equilibrium conditions, might face reduced incentives to invest in UBB platforms
- This can lead to some firms exiting the market in the long run, returning to a natural monopoly (Australia, Singapore)
- Government intervention through co-investment might reinforce this trend