

# The economic crisis and the return of Keynes in Next Generation Networks

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*Public /Private interplay in next  
generation communications*

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# Agenda

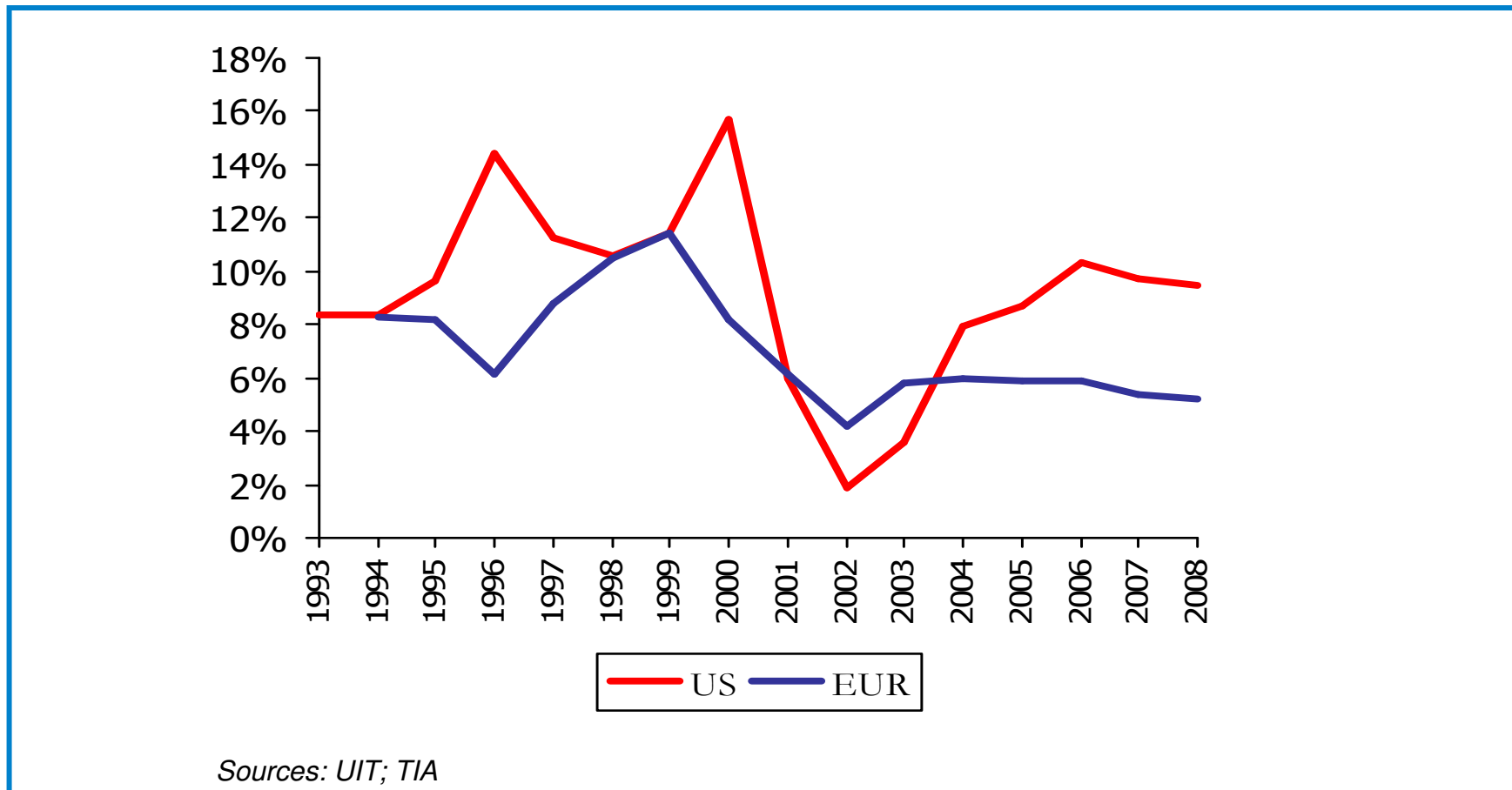
- 1. The impact of the financial crisis and the economic recession in the telecommunications sector**
- 2. The challenge in deploying Next Generation Access Networks**
- 3. A return to Keynes?**

## How will the telecommunications be affected by the current economic crisis?

- The telecommunications sector is not immune to the macroeconomic context
- Furthermore, since the 2001 crisis, the sector has begun to behave as a typical industry affected by expansion and recessionary cycles
- If this is the case, can we characterize the sector as structurally weak and therefore, more exposed to the crisis?

## During the crisis of 2001-2, the sector entered into a new stage of development

### *Year to year growth rate of the telecommunications sector*



# At the time, the discussion was held around whether the crisis was a one-time event or the beginning of a new stage of development

## THE PERFECT STORM

- Unique convergence of macroeconomic factors (recessionary cycle, reduction in liquidity)...
- ...,endogeneous
  - Internet bubble
  - Criminal executive behavior
  - Moore's Law exceeds growth of demand
  - Mistakes in demand forecasting
- ...and political (September 11)

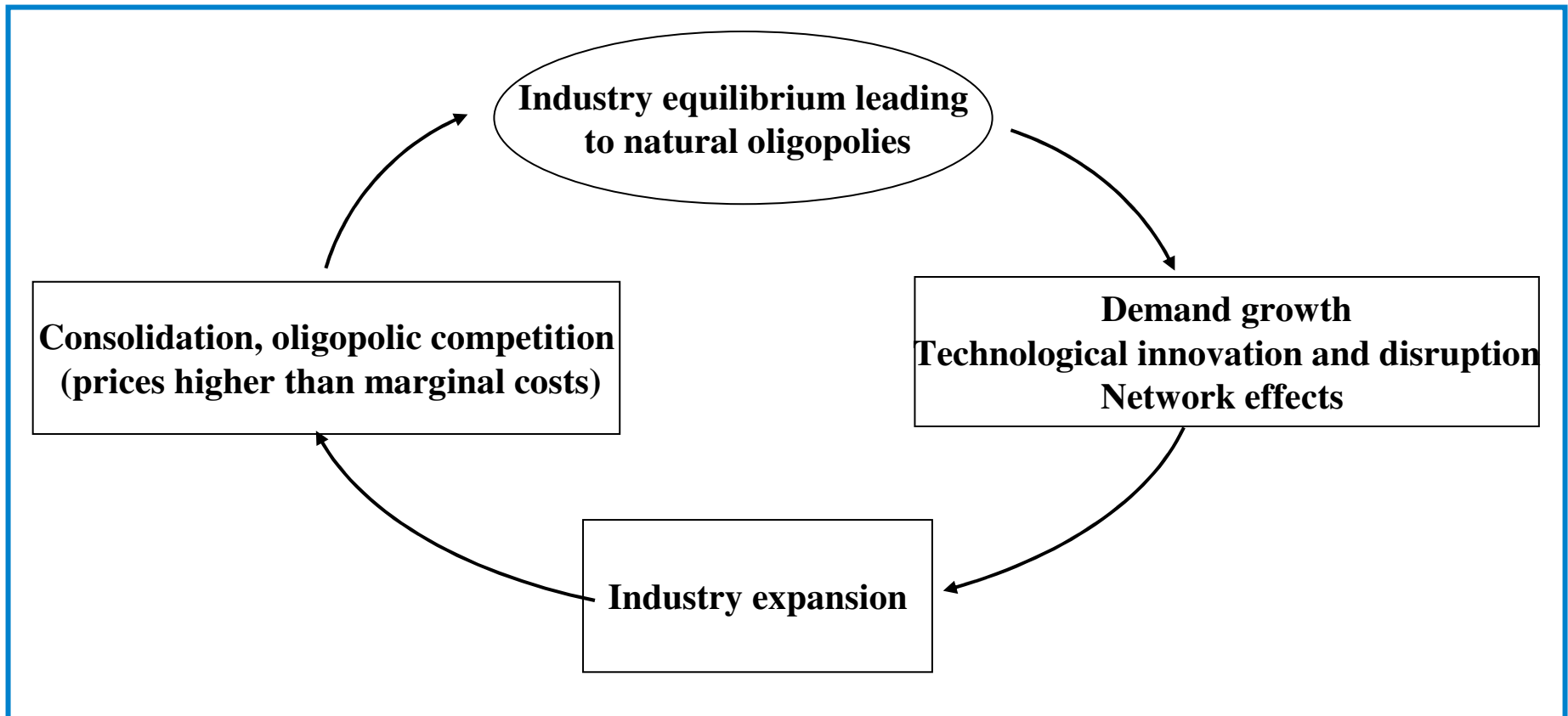


## FUNDAMENTAL CHANGE OF SECTOR DYNAMICS

- Race to achieve economies of scale resulted in over-capacity
- Combination of high fixed costs and low marginal costs resulted in price wars
- Low demand elasticity, network effects and technology commoditization
- Outcome: chronic volatility similar to that of other network industries such as airlines

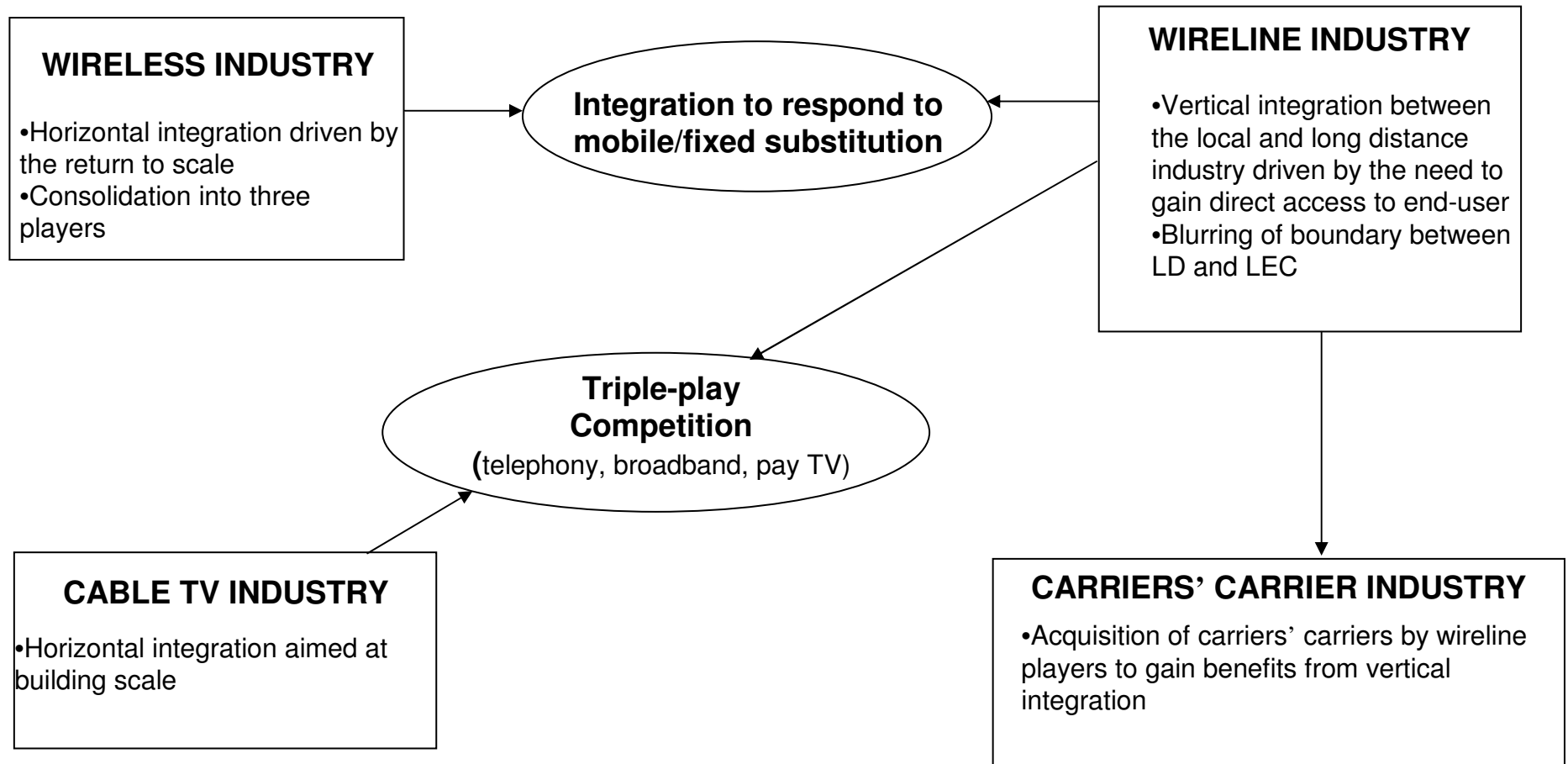
**We believe the 2001 crisis heralded the beginning of a new stage of industry development, characterized by expansions and consolidations**

### *Industry Cycles*



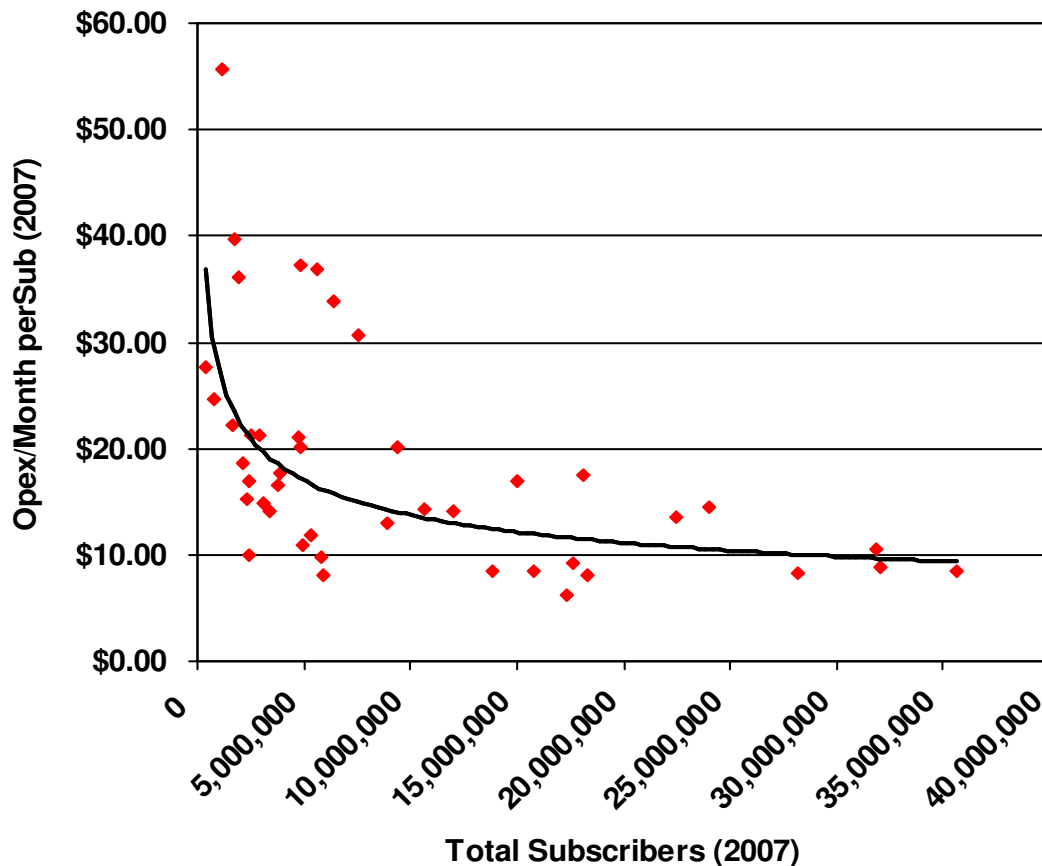
# The sector started consolidating with the objective of building economies of scale, vertically integrating and meeting convergent demands

## Consolidation Trends



# Economies of scale in wireless telecommunications are significant

## NA/EUROPEAN MOBILE OPERATOR ECONOMIES OF SCALE (2007)

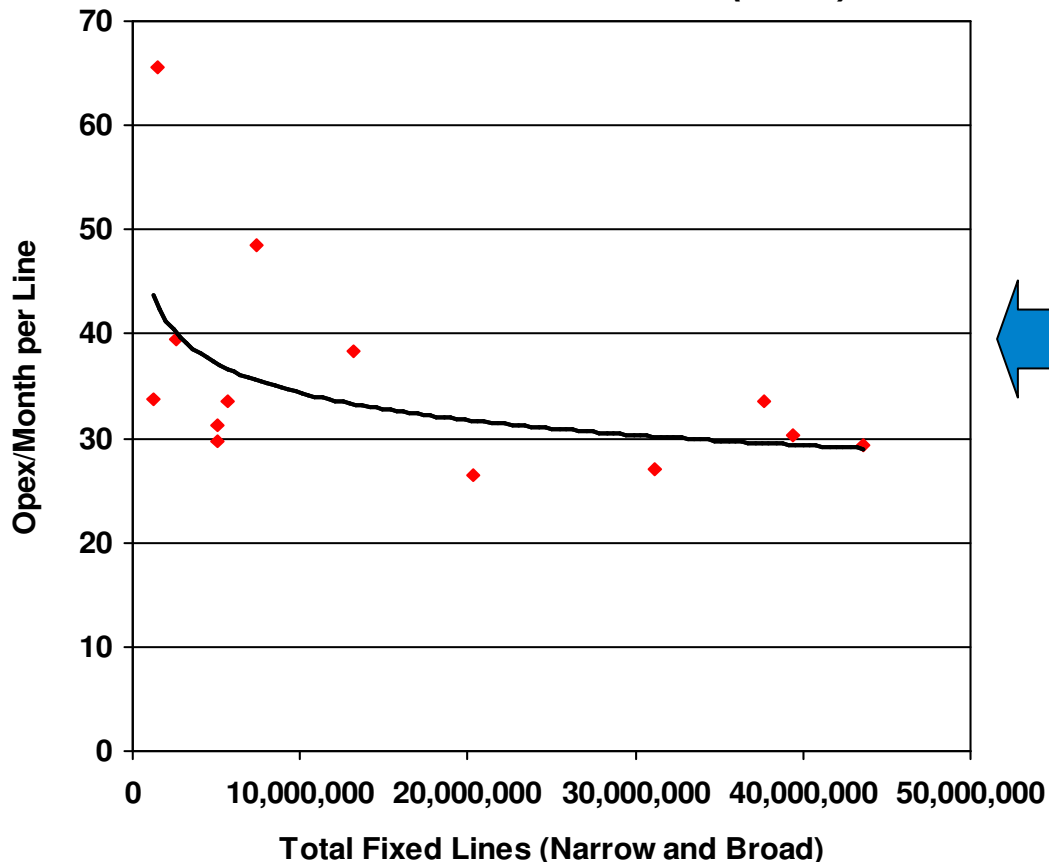


Sources: Merrill Lynch; Analysis by the author

- Large mobile operators enjoy significant cost-per-subscriber advantage over operators half their size
- These economies of scale are driven primarily by the large fixed component of local radio network deployment and infrastructure costs
- Furthermore, aggregate macro-scale in mobile services could be related to the fact that it remains a single product industry, which is governed by volume
- In addition, it is also possible that economies of multi-plant operation (multiple call centers, regional customer service, maintenance and logistics) are also at work in NA/European Mobile Operator Economies of Scale

# Turning now to wireline, aggregate data indicates also the existence of scale economies

## EUROPEAN FIXED LINE OPERATOR ECONOMIES OF SCALE (2007)

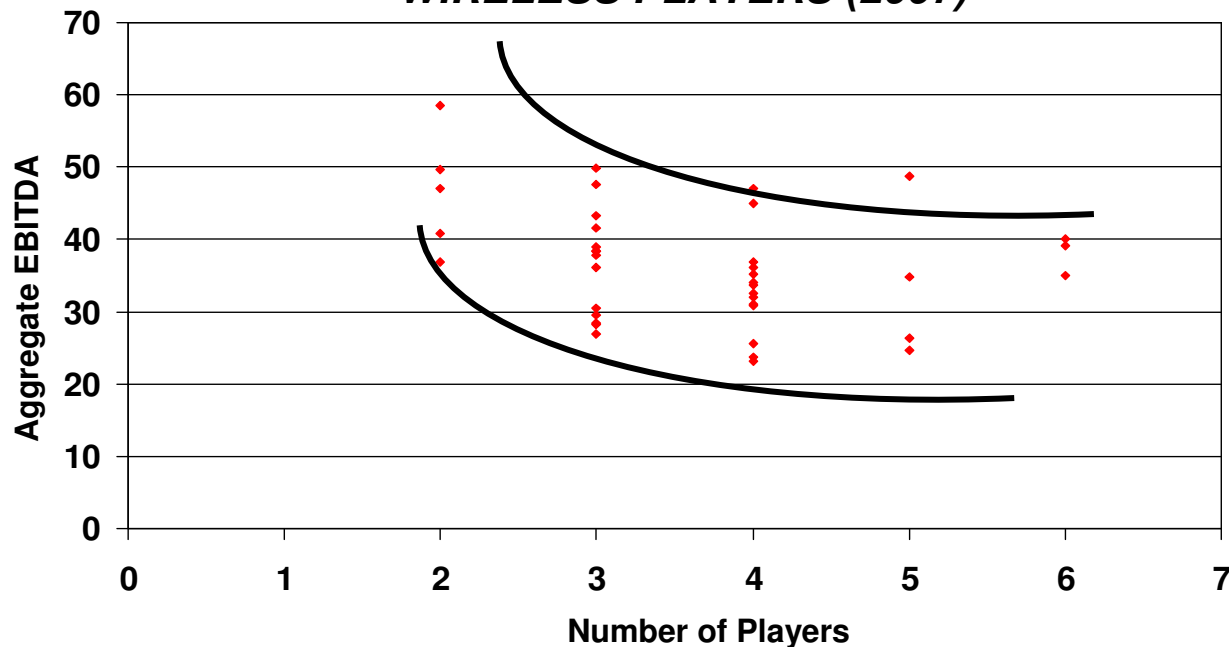


Sources: Merrill Lynch; Company Reports; Analysis by the author

- Economies of scale in fixed telephony exist, although they appear to be slightly less stronger than in the case of wireless
- This is partly due to the multi-product nature of fixed telephony (voice, broadband, video) which temper down a portion of the scale effects
- Industrial organization economics indicates that single product businesses tend to have stronger scale effects than multi-product
- Having said that, economies of scale in fixed telephony is driven by four major factors
  - Procurement (Benefits in consolidation of function within a single company)
  - Advertising (Economies of large scale promotion proven both across firms and in company mergers)
  - Wire centers (Systemic scale in wire center design)
  - Call centers (Significant scale in infrastructure, workforce management and training)

# In addition to returning to scale, consolidated wireless industry structures lead to higher price discipline and, consequently, higher profits

**EBITDA MARGINS VERSUS NUMBER OF WIRELESS PLAYERS (2007)**



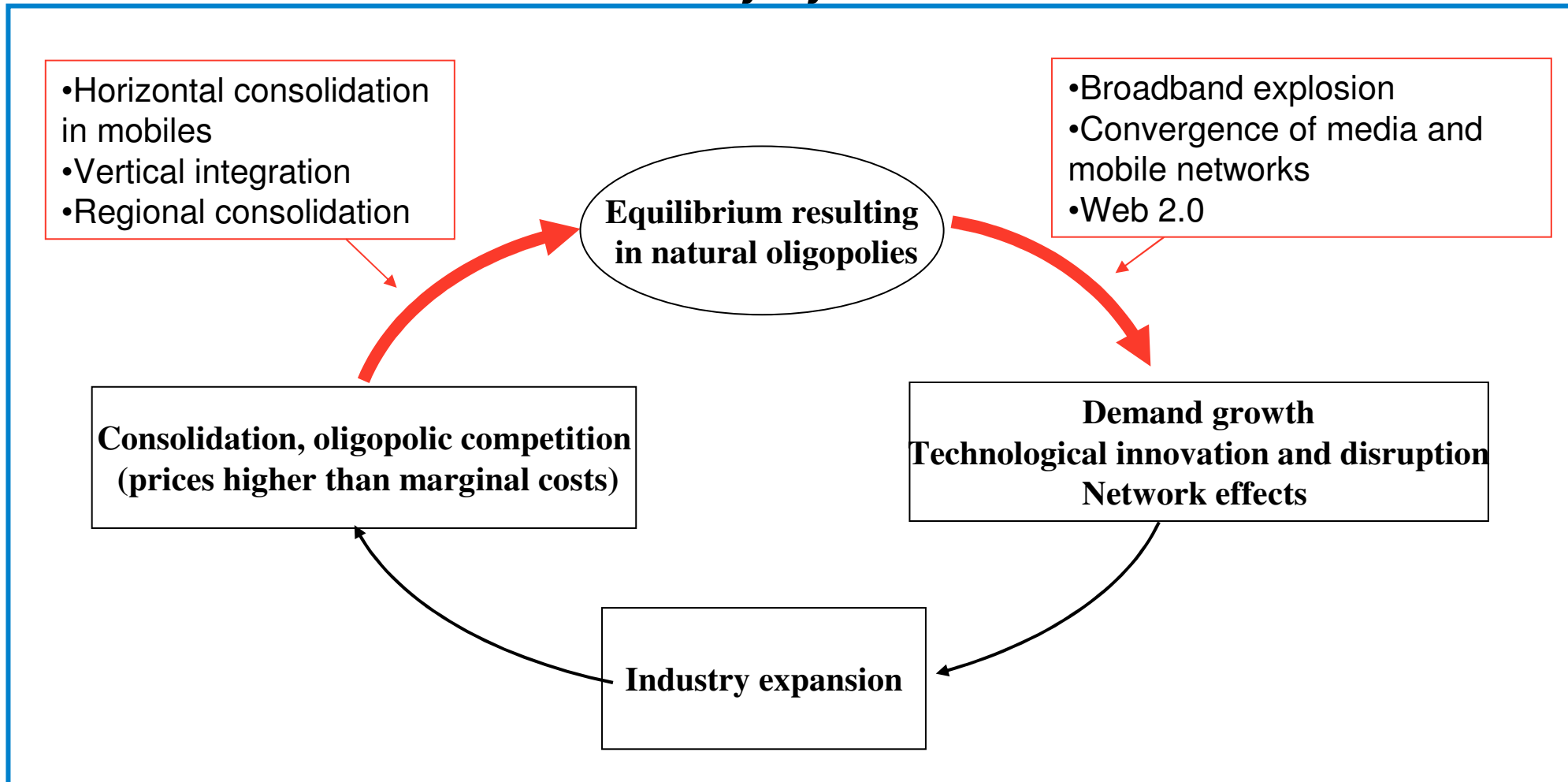
Source: Merrill Lynch; analysis by the author

(\*) Two cases of symmetrical markets are Poland and the UK

- A comparison of wireless industry structures (in terms of number of players) across countries indicates that aggregate industry profits (as measured by EBITDA) is directly linked to the number of players
- Stable wireless industry structures with sustainable margins are typically oligopolies with moderate competition
- Industries with more than four players witness their EBITDA margins drop, not only due to irrational price competition but also to the inability of players to leverage economies of scale
- The wide range of EBITDA margins in industries with four and three players is explained by concentration levels within the country
  - Higher profitability resulting from one or two of the four players being scale driven oligopolies, while the remaining carriers operate under the price umbrella of the former
  - Lower profitability results from four equally balanced operators (\*)

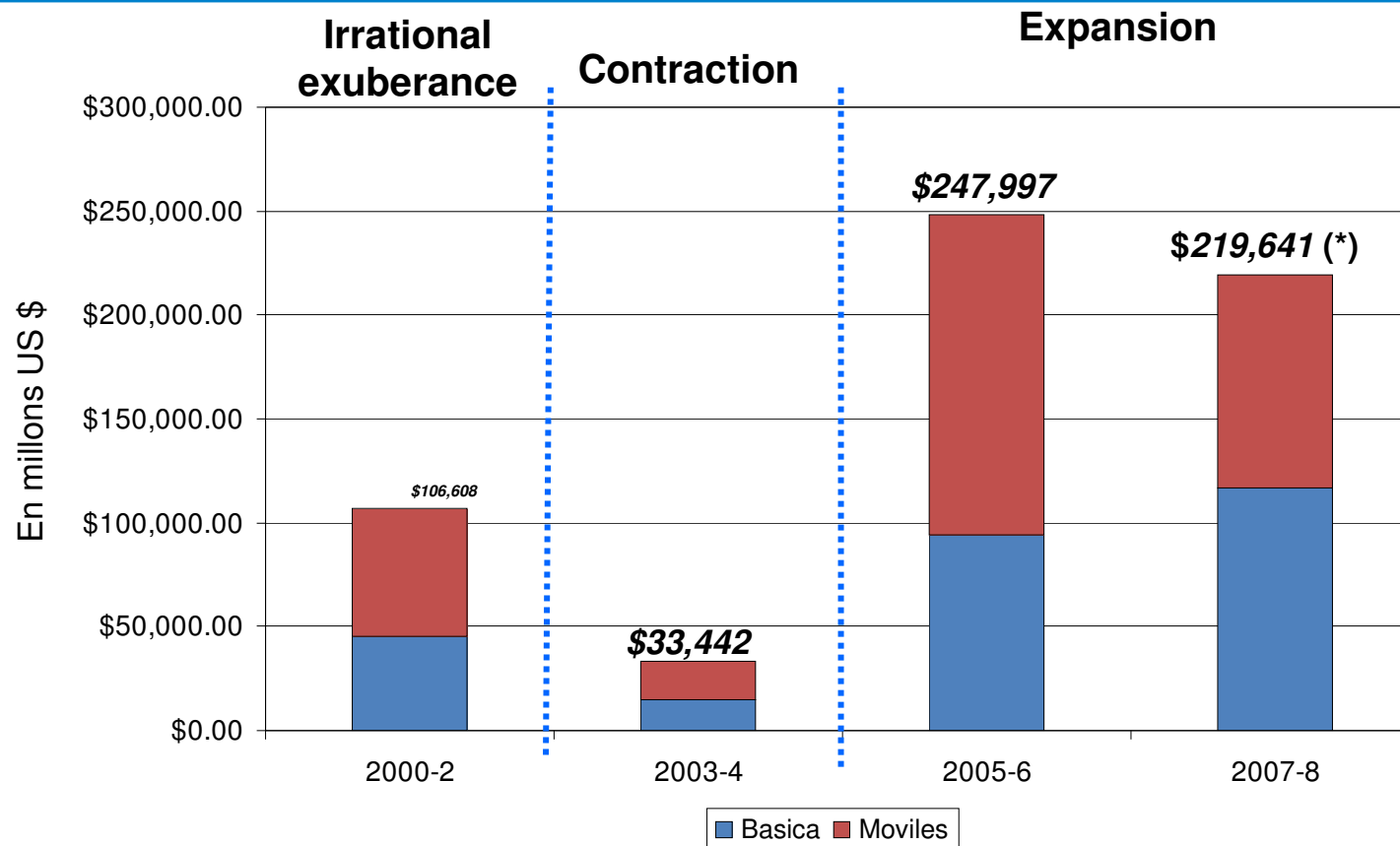
In parallel with consolidation and return to scale, the industry entered in a stage of asset overvaluation, characteristic of investment bubbles

## Industry Cycles



# After 2004, the sector entered a period of investment driven by excess liquidity

## Worldwide Private Equity Investment in Telecommunications

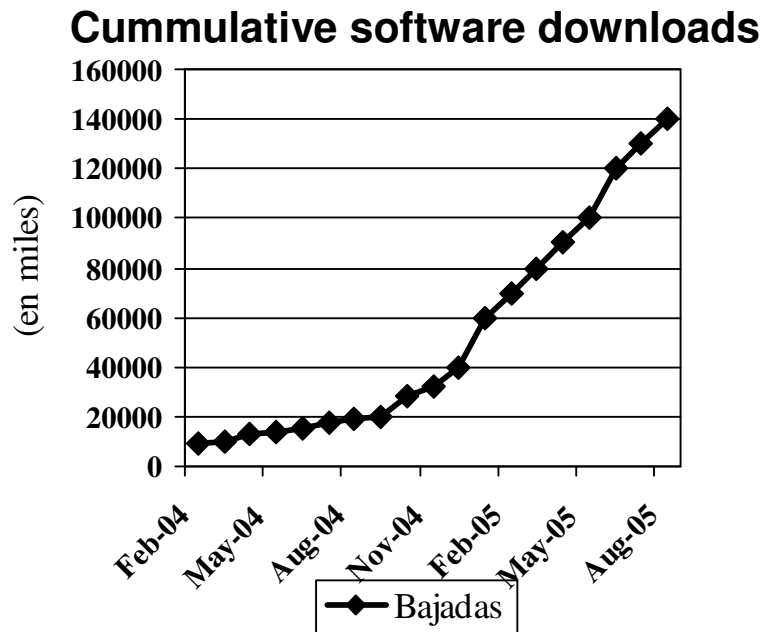


Note: Incumbents with wireless operations have been categorized as fixed telephony  
(\*) 2007-8 numbers include Bell Canada deal; numbers up to May 2008

Sources: Thomson Financial; Company and Fund reports; analysis by the author

# As a result, the telecommunications sector and primarily the Internet entered in a new period of irrational exuberance

## *Skype: An example of irrationally exuberant valuation*



↓  
"EYEBALLS"

**Number of users**

	REGISTERED	PAYING
11/2003	145,000	
1/2005	20,000,000	
3/2005	29,000,000	1,000,000
7/2005	50,000,000	
10/2005	54,000,000	2,700,000
12/2005	75,000,000	
4/2006	113,000,000	

↓  
"CLICS"

↓  
\$

eBay's valuation of Skype: \$4.285 billions

## The sector exhibits positive and negative aspects at the time of the beginning of the crisis

- Consolidation has helped solving some of the structural factors such as the returns to scale
- In some countries, platform-based competition has emerged, allowing the sector more flexibility and consequently, sustainability
- On the other hand, the reduction in fixed telephony revenues was only partially compensated with mobile telephony and broadband, both reaching saturation levels and a high price compression
- Secondly, fixed telephony has not been able to reduce its costs in proportion to the reduction in revenues (in the US, the reduction in opex between 2001 and 2007 (\$2.100 millions) did not compensate the drop in revenues (\$ 15.000 mil millions))
- Finally, cable TV competition stimulated an increase in capital investment that, combined with the funding of mergers, has started to put pressure on the carriers' balance sheets

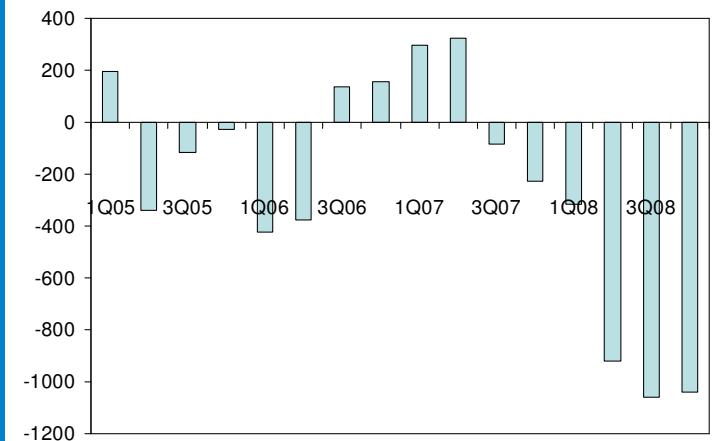
## It is in this context that the sub-prime crisis arrives in the scene

- The macroeconomic variable indicates that the economy will remain weak until the end of 2009
  - The economies of industrialized countries are expected to contract 0.3 % during 2009
  - In the US, the economy will contract 3.5% in the fourth quarter of 2008 and 0.6% in 2009, expecting to grow again (2.2%) in 2010; unemployment will reach 7.8% in the fourth quarter of 2009
  - In France, the economy will grow between 0.2% and 0.5% in 2009 (this estimate has been reduced from 1-1.15% six weeks ago)
  - In Spain, new estimations by the IMF anticipate a contraction of 1% in 2009 (reduced from a contraction of 0.2% six weeks ago)
- This macroeconomic scenario will affect the telecommunications sector at two levels
  - The reduction in demand of services: The most important difference between the current crisis and 2001 is that, in this case, final consumer spending in telecommunications will contract
  - Reduction in capital spending

# The indications of a reduction of consumer spending can already be seen at several levels

- Service consolidation by means of access line reduction, which accelerates the fixed-mobile substitution
- Alternatively, in those countries where mobile tariffs are variable and those of fixed telephony flats, substitution could happen in reverse, whereby consumers would not cancel service but would reduce the use of mobile while increasing that of wireline
  - ATT has already experienced a reduction in MOUs in the second quarter of 2% while Verizon's was of 1%, triggering a drop in ARPU from \$52.04 to \$51.77
  - Postpaid subscriber growth 26% down for Verizon
  - T-Mobile has registered an increase in MOUs of 2% in the last quarter, which the lowest growth rate in its history
  - Rural wireless operators have indicated a reduction in roaming revenues, which would indicate that Americans are traveling less
  - Extension in handset replacement cycle
- Decrease in the growth of wireless subscribers (31% reduction in the fourth quarter of 2008 (15.5 millions) compared to 2007 (22.4 millions))

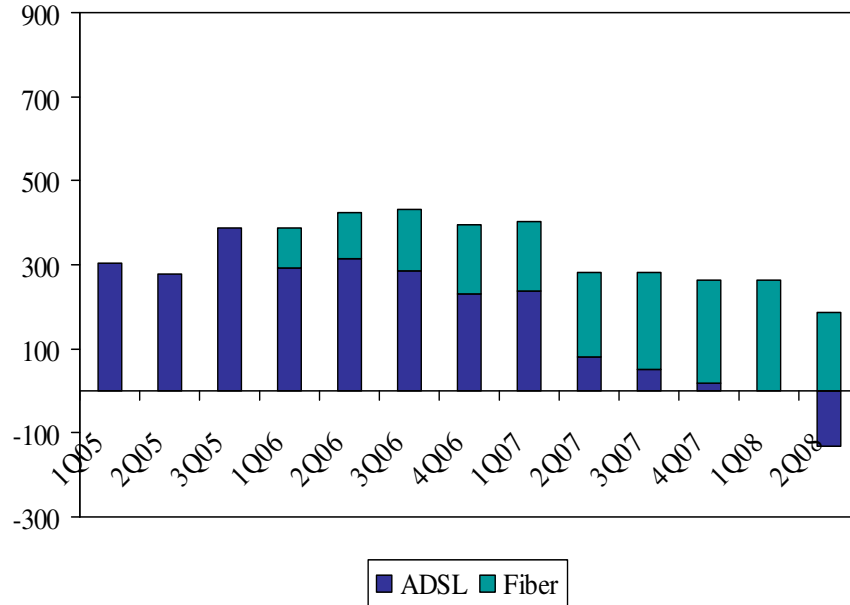
**US: Reduction in Primary Residential Lines by Quarter**



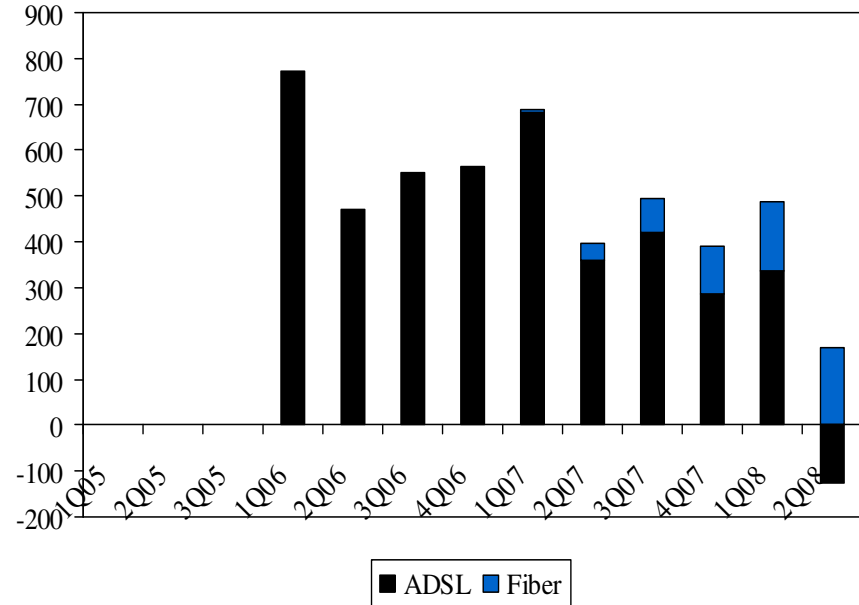
# The second effect is a reduction in the growth of broadband subscribers

## US: New Broadband Accesses by Quarter

**Verizon**  
(‘000)



**ATT**  
(‘000)

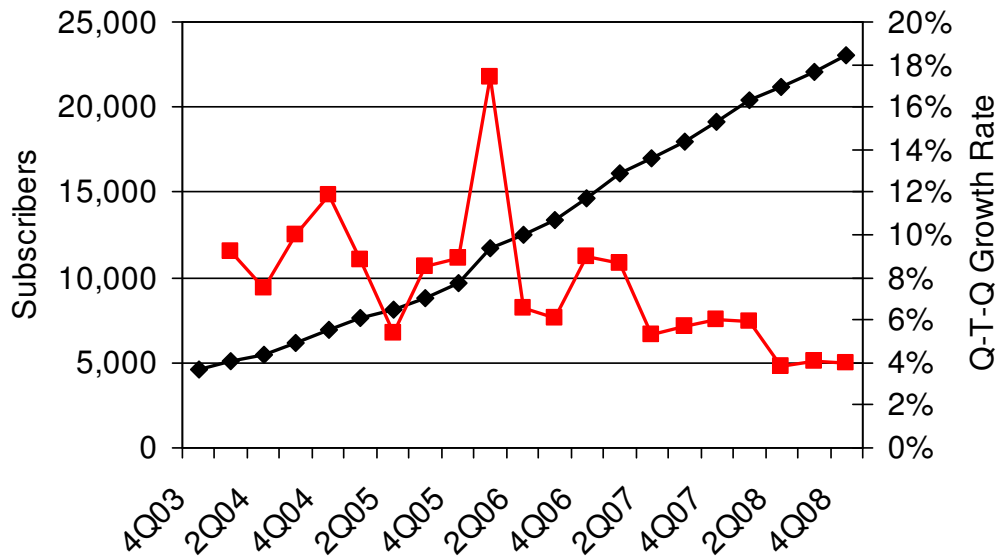


Sources: Operators

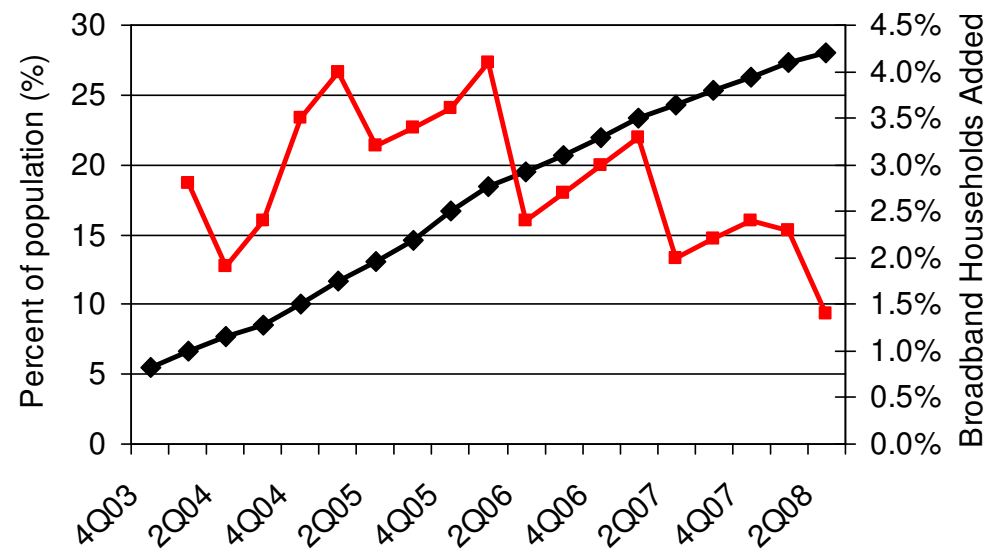
# This decrease can also be observed in other industrialized countries

## Decrease in broadband growth

Germany: Broadband market



United Kingdom: Broadband Market



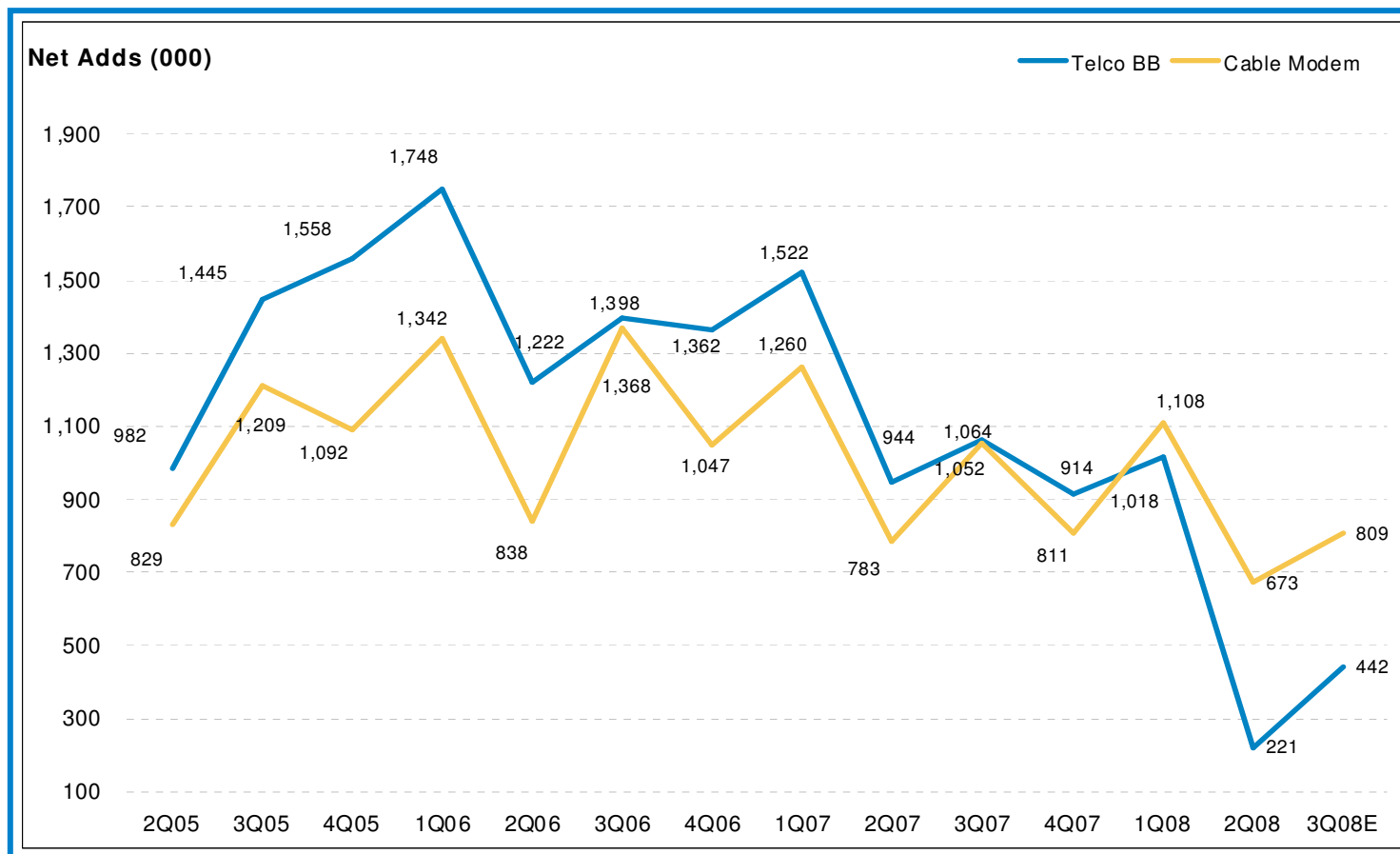
Sources: Merrill Lynch; analysis by the author

## The reduction in broadband growth is due to several simultaneous effects

- Substitution of fixed broadband for mobile broadband: in certain European markets, the mobile internet via 3G is replacing fixed broadband
  - Certain market segments (such as students) which are impacted more by the economic situation tend to cancel its home fixed broadband access and consolidate its Internet access through mobile devices, complemented with fixed access at work or at the university
- With the decrease in consumer confidence, they tend to postpone the purchasing of products and services: ATT and Verizon have announced that the number of new subscribers to their broadband services have declined over 80%
- Certain market segments which have purchased broadband access through promotional discounts, have started to disconnect when the period of introductory discounts ends
- Finally, the reduction in the rate of residential construction has resulted in a net decline of new accesses

At any rate, it important to indicate that the reduction of telco broadband in the US is also partly due to successful cable competition

## US: New Broadband Accesses



Sources: Company data, Morgan Stanley Research

# The macroeconomic climate is also affecting the levels of capital investment

## *Variables that impact the capex rate*

<b>Key Variables</b>	<ul style="list-style-type: none"> <li>•Expected return rate</li> <li>•Risk associated with the rate of return</li> </ul>		
<b>Secondary Variables</b>	<b>Macro-economy</b>	<b>ICT idnustry</b>	<b>Firm level</b>
	<ul style="list-style-type: none"> <li>○Acceleration effect (Roller y Waverman, 2001)</li> <li>○Demographic and geographic characteristics</li> <li>○Economic cycle (Katz, 2003)</li> <li>○Generic regulatory framework I</li> </ul>	<ul style="list-style-type: none"> <li>○Industry regulation</li> <li>○Competitive intensity</li> <li>○Technological progress</li> <li>○Evolution of demand</li> </ul>	<ul style="list-style-type: none"> <li>○Cost of capital</li> <li>○Debt leverage</li> <li>○Firm profitability</li> </ul>



A reduction of the GDP growth rate of 1% leads to a decline of 0.7% in the investment rate

# Verizon has already begun to reduce its capital investment, especially in fixed telephony – forward looking (6%)

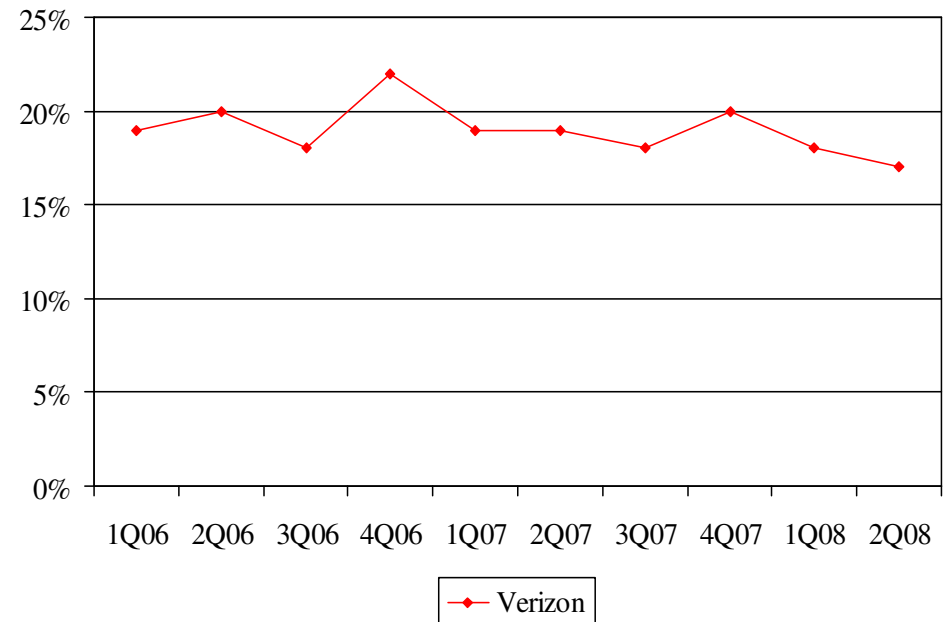
## Verizon: Evolution of Capital Expenditures

Investment (in billion USD)

Sector	1H06	2H06	1H07	2H07	1H08
Fixed	5.010	5.249	5.210	5.839	4.835
Mobile	3.178	3.440	3.388	3.115	3.250
Total	8.188	8.689	8.598	8.954	8.085

Source: Operator

Investment (Capex/revenues)



## At the same time, we are witnessing a marked decline in IT spending

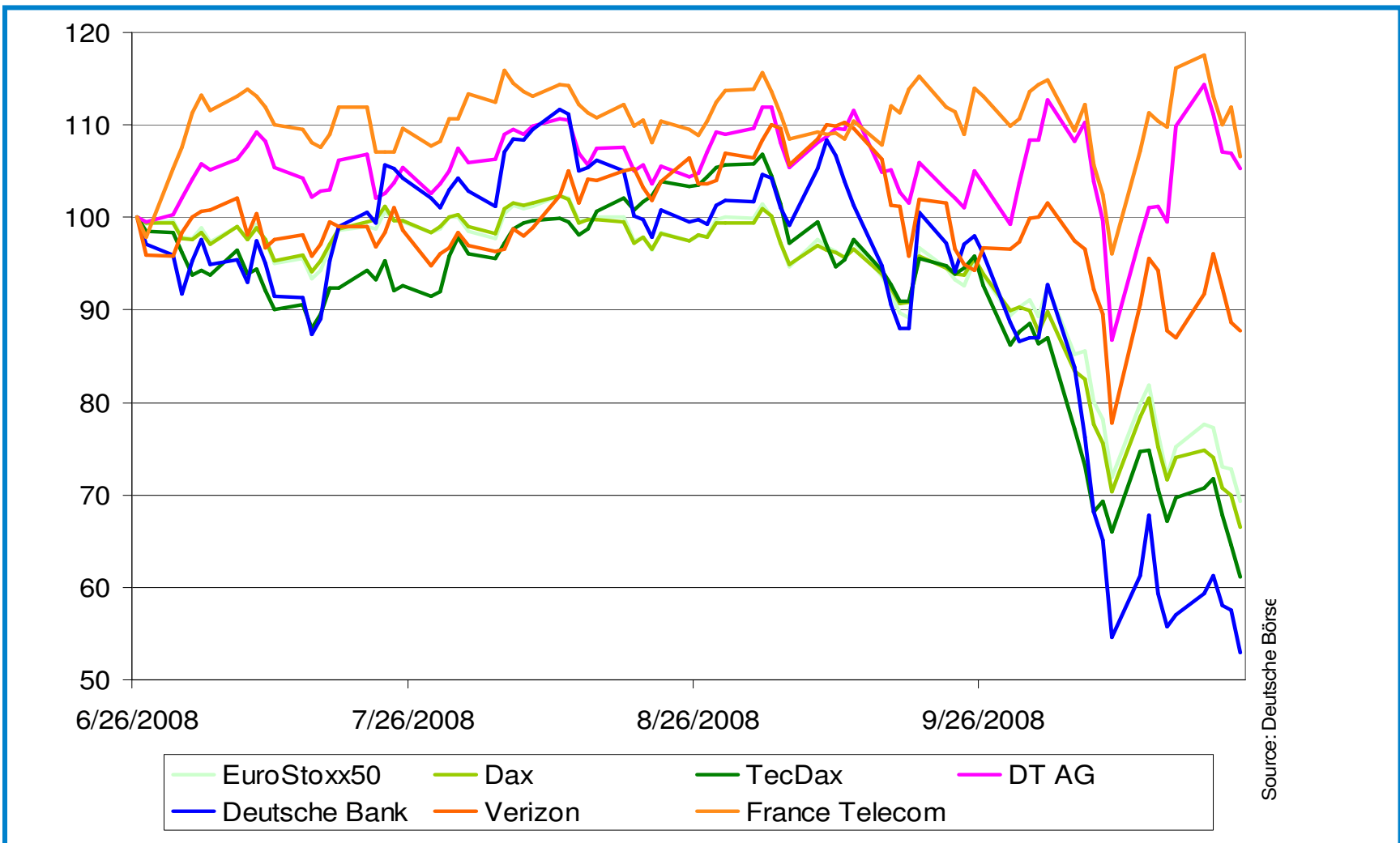
- Operators are reducing their IT investments in terms of postponing the launch of big systems projects and displaying considerable prudence in the conversion of pilot trials to big projects
- For example, Sprint has decided to postpone all modifications to its billing system, and any future migration in its systems architecture
- Simultaneously, having generated enough synergies as a result of its BellSouth acquisition, ATT has reduced its IT budget at the same time that it has outsourced a large portion of systems maintenance to an offshore Indian provider
- Finally, the migration costs of a new billing system at Comcast has obliged this cable TV operator to postpone its acquisition at least temporarily
- This tendency is confirmed by the fact that IBM Global Services and Infosys have had their revenues grow only 2% this quarter

## Theoretically, the telecommunications sector should be less affected by the financial crisis

- The telecommunications sector should be less affected impacted by the financial crisis for two reasons:
  - The industry has had some experience on how to survive contraction cycles (see 2001)
  - The telecommunications business comprises a continuous flow of revenues, which is not the case with car manufacturing
- In moments of high volatility, industries with stable monthly revenues and constant demand become the most attractive investment targets
- Finally, public infrastructure services represent a less risky option for institutional investors

In principle, the markets have confirmed this hypothesis

### Stock Market Trend



## Nevertheless, the cost of capital for telcos is increasing in parallel with the other sectors of the economy

- Sprint is paying LIBOR + 2.5-3.0%
- Verizon is paying 200 “basis points” more than what they paid historically (8.95% on notes issued in 10/30)
- There is a net increase in WACC to 8.5%

## The information available until now indicates that the sector has entered in a contraction cycle

- The degree with which the decline in consumption and capex is not as sharp as in the 2001-2 crisis is a function of the experience gathered by the sector in the prior cycle
- Platform-based competition provides operators with greater financial and operational flexibility to adapt to the new circumstances
- This cycle could accelerate the pace of consolidation, such as the acquisition of Embarq by Citizens in the US, although a lot of M&A opportunities remain in Europe (for example, broadband in Germany and other fixed telephony operators)
- Operational flexibility to adapt to new market conditions, product innovation and the possibility of managing the fixed and mobile product portfolio are probably the best options to face the challenge of the new cycle

# Agenda

1. **The impact of the financial crisis and the economic recession in the telecommunications sector**
2. **The challenge in deploying Next Generation Access Networks**
3. **A return to Keynes?**

## Current NGAN situation in key industrialized countries

Country	Broadband subscribers (% households)	Incumbent Telco retail share of Broadband	FTTx 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%)	41%	0%	17%		42%
Belgium	2,671,826 (57%)	48%	0%	36%		16%
Canada	8,675,197 (87%)	44% (**)	0.5%	52%	Deploying	17%
Denmark	1,157,907 (76%)	58%	7%	13%	Testing	29%
Finland	1,615,270 (61%)	57%	0%	13%		29%
France	16,258,000 (54%)	48%	4%	4%		48%
Germany	21,185,000 (55%)	47%	1%	6%	Planning	46%
Italy	10,686,625 (41%)	61%	3%	0%		39%
Japan	29,342,000 (57%)	56%	45%	13%	Launched	29%
Korea	14,800,000 (91%)	81% (***)	34%	19%		0%
Netherlands	5,289,000 (78%)	43%	4%	38%	Launched	12%
Singapore	932,900 (88%)	55%	0%	45%		0%
Sweden	2,756,000 (62%)	38%	18%	19%		43%
Switzerland	2,407,400 (65%)	51%	6%	31%	Postponed	18%
United Kingdom	16,154,000 (55%)	27%	0%	23%	Launch 09	50%
United States	71,125,000 (60%)	46% (****)	6%	51%	Launch 09	3%

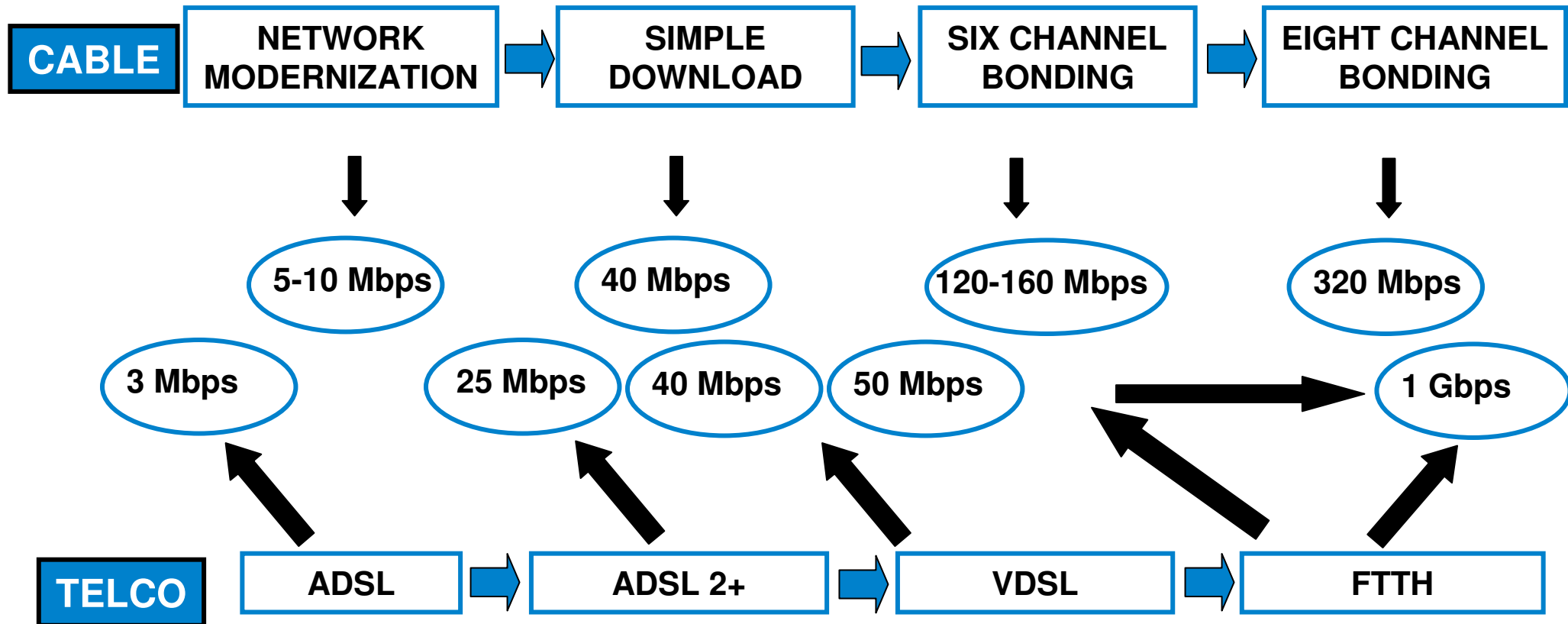
(\*) Fixed wireless (Wimax, WLL), Power Line Carrier, ULL  
 (\*\*) Two telcos  
 (\*\*\*) Three telcos  
 (\*\*\*\*) Multiple telcos

Sources: ECTA; OECD; Regulatory Authorities;  
 Analysis by the author

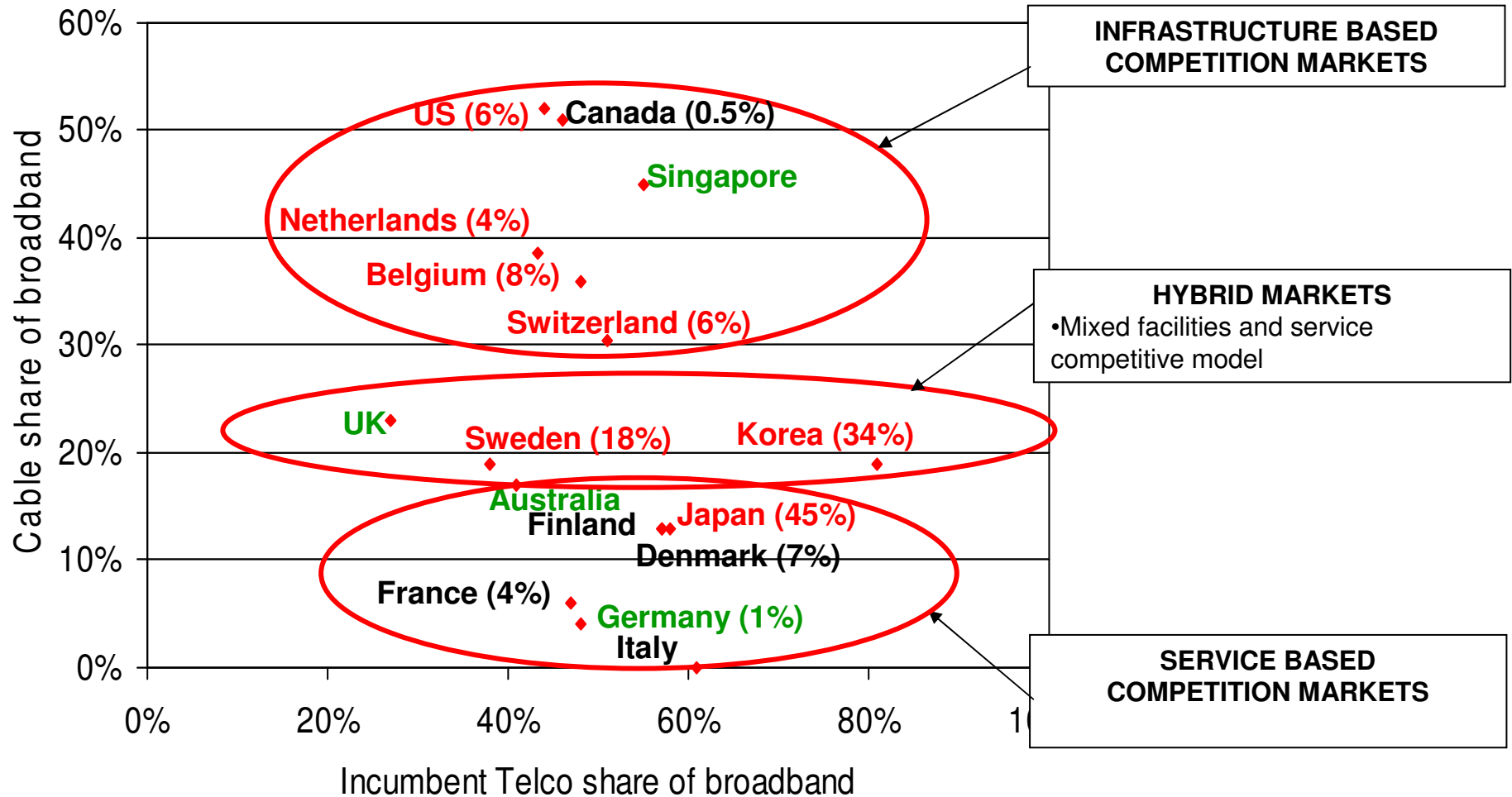
## Our study indicates that there are four factors driving the pace of fiber deployment

- Market structure: facilities-based competition conducted between one (or more) telco and/or cable player within a “2.5-3.0 players” industry structure
- Active government policy: subsidies to underserved areas, demand-side incentives, co-investment in NGAN
- Monopoly of NGAN access; assuming natural monopoly characteristic of the access market (or recognizing the need to provide additional investment incentives), the government enacts a monopoly of access rule
- Density: high urban concentration

# Competition between cable and telco operators is partially driven by download speeds



# Infrastructure-based competition and hybrid markets are at the forefront of fiber deployment



Notes: Data labels in red indicate fiber deployed; data labels in black no fiber program; data labels in green indicate upcoming fiber program; numbers between brackets FTTx as % broadband accesses

# Platform-based competition is positively affecting the deployment of FTTH/FTTC

- Most countries with important presence of cable are engaged in fiber deployment programs (US, Netherlands, Belgium)
- Exceptions (Singapore and Canada) are in the process of accelerating deployment
  - Singaporean government recently assigned to a Singtel-led consortium the responsibility to deploy a national fiber network
  - Bell Canada and Alliant are engaged in limited FTTN deployment programs, slowed down by BCE “privatization” problems
- Fiber deployment in hybrid competition countries (platform-based and service-based) responds to specific features
  - Korea was a latecomer to unbundling broadband (2002), after facilities were deployed
  - In Sweden, the government originally assigned a key role in fiber deployment to municipalities; after TeliaSonera’s merger, Sweden migrated to an infrastructure-based player model

## Conversely, service-based competition markets tend to lag regarding FTTH/FTTC deployment

- There is substantial evidence indicating that service-based competition models (e.g. under wholesale unbundling requirements) reduces investment in telecommunications platforms
  - Low LLU rates improve broadband penetration in the short run but reduce platform investment (Wallsten, 2006; Flamm, 2005; Distaso et al., 2004)
  - Incumbent telecom capex data indicates that the EU (service-based competition) lags North American markets (platform-based competition) (Waverman et al., 2004; Crandall, 2007)
- As a result, service-based markets tend to lag in fiber deployment
  - All service-based countries in our sample have either deployment restricted to high-density markets or no fiber at all
  - Similarly, in those environments, cable operators are somewhat reluctant to deploy DOCSIS 3.0 (Australia)
  - The Japanese exception is explained by a shift in the past five years from service-based competition to infrastructure-based

## In countries with functionally separated incumbent, it is the competitive incentive that promotes NGAN deployment

- In the UK, there is consensus that Ofcom's undertakings represent a disincentive to fiber deployment
  - In that regard, BT's announced fiber program for 1 Billion GBP incremental investment in July 20 was triggered by Virgin's DOCSIS 3.0 announcement and to meet shareholder criticism for lagging in investment
  - As a result, the plan addresses only a portion of Britain's needs, and given the way investment is scaled up, it will not have material impact before 2010
  - Finally, the proposed FTTC platform does not provide a step-function change regarding ADSL2+, available to a large portion of the UK population
- In Sweden, while TeliSonera's network unit, Skanova, is functionally separated, the incentive to invest in fiber was primarily driven by Telenor's FTTN deployment in urban areas

## There is not clear consistency among countries studied regarding the regulation of fiber access

- In the US, a series of regulatory and judicial decisions have led to a complete deregulation of broadband access, including fiber
- The Canadian broadband regulatory regime (including copper and fiber), has been significantly reduced in scope
- In Germany, fiber is not included in the broadband market definition, although there is unbundling of fiber if there is no duct space (and the regulator might be inclined to compel DTAG to offer bitstream access at the MDF)
- In Japan, fiber unbundling rules are stipulated in a differentiated manner from copper, rates being determined by the LRIC model (subject to ongoing revisions)
- In the Netherlands, KPN has access obligations to all of its fiber and street cabinets, including migration rules for phasing out MDF access services (excluding bitstream access)
- Concerned by potential bottlenecks in fiber networks, Ofcom in the UK is considering both regulation of passive and active line access

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## Before the ongoing crisis, some governments had already been very proactive in developing a broadband/NGAN agenda

- The Swedish government enacted in 2000 a policy aimed at universalizing broadband service
- In 2008, Australia called for bids to build a National Broadband Network, based on FTTN
- In 2007, Singapore also assigned, through a bidding process, a Singtel-led consortium to build a National Gbit FTTH network
- In 2000, the Canadian government set the goal to ensure universal broadband access by 2005
- The US enacted a national broadband policy in 2005

# The future role of government needs to be considered in the context of the current macro-economic situation

- The NGAN investment is quite considerable

	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)

*Sources: Operator announcements*

- Furthermore, total deployment in Europe is estimated to require 250 billion Euros

## Government intervention acts as a good incentive to deploy fiber in service competition environments

- Japan is the preeminent example of industrial policy as an incentive
  - Loan systems with interest rates lower than market are made available to any carrier with a fiber installation plan
  - Tax deductions assigned to carriers engaged in fiber deployment
- Korea has also been active in this domain, primarily intervening in the process of industry consolidation leading to the creation of strong broadband players
- Sweden has put in place a series of demand (tax deductions) and supply incentives to promote fiber deployment

## Government funding appears to be gaining ground across all countries studied

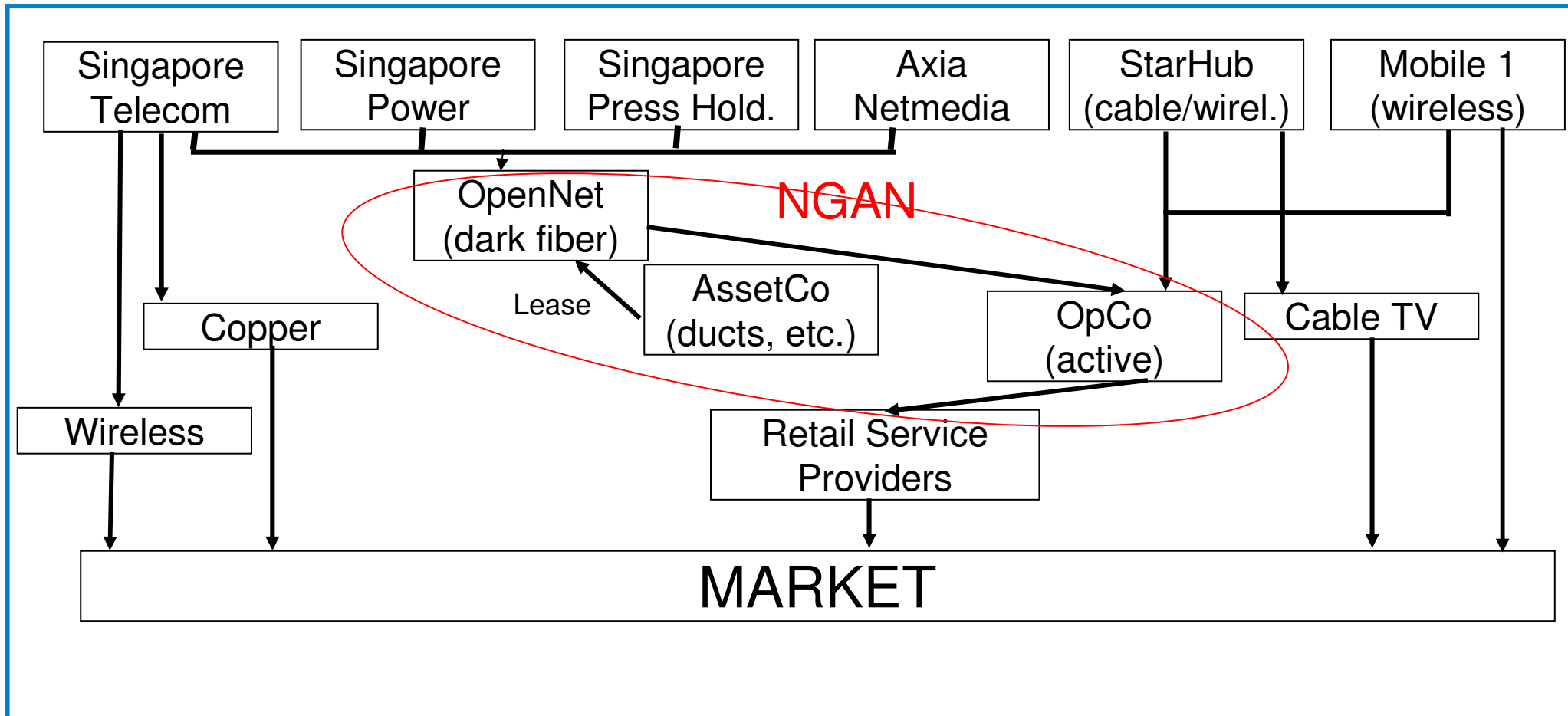
- The US lacks a coordinated set financial incentives for fiber deployment although a somewhat haphazard approach to direct (rural broadband projects, state driven public-private partnerships) and indirect subsidies exists at the Federal, State and Municipal level
- In Australia, the government is planning to spend A\$ 4.7 billion of total A\$ 9 billion required for construction of the National Broadband Network
- In Singapore, the government will provide a grant of S\$ 750 million of S\$ 2.2 billion to support the roll-out of the fiber network
- In Sweden, broadband government promotion comprised financial incentives to municipalities for fiber deployment (E1.3 billion will have been invested between 2000 and 2010 to fund 2/3 of total investment)
- In Canada, has relied on four programs to promote broadband development (Broadband for Rural and Northern development, Canada Strategic Infrastructure Fund, and others) resulting in an overall investment of C\$ 300 million

## Some countries opt to allow the player deploying fiber to retain a monopoly position

- Australia would allow the National Broadband Network to retain a monopoly position, although some industry players mention that this should be allowed in exchange for structural separation
- In Singapore, the network company is expected to be a monopoly in exchange of which it has to be structurally separated from the Retail Service Providers

# Infrastructure sharing models are gaining in popularity as a return to scale enabling approach

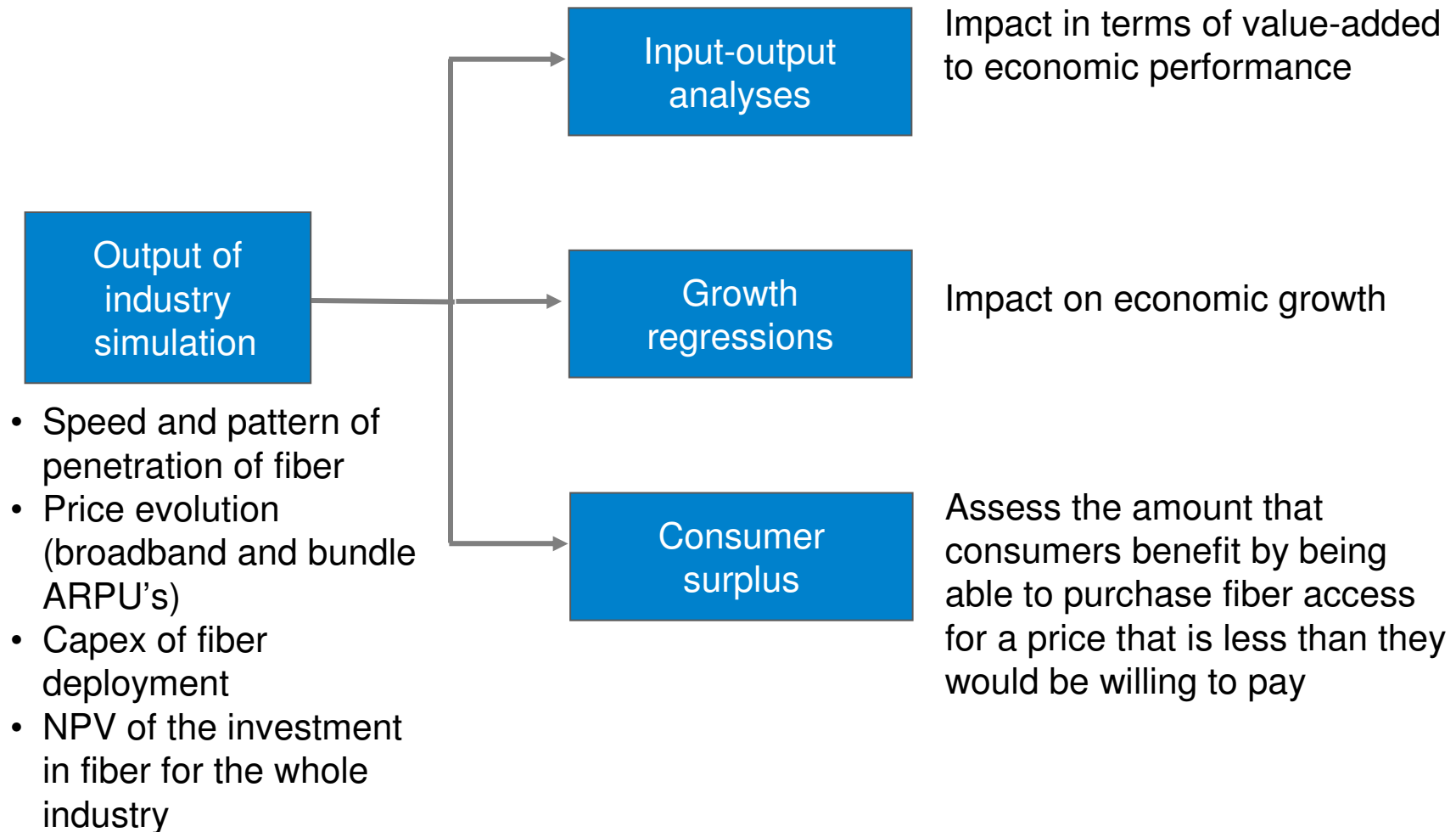
## Singapore: Industry structure



## Fiber deployment incentives focus both on the supply and demand sides

- In Japan, two types of incentives for deployment are provided: loans with low interest rates, and tax deductions
- In Sweden, provide subsidies at the access level for development of neighborhood, and household fiber
  - Tax incentives given to businesses and residential tax- payers who sign up for broadband services (key stimulus in a country where the marginal tax rate for the average taxpayer is 20%)
  - 50% of the costs are deductible up to a maximum of 5000 SEK
- Similarly, in the Netherlands, the government considers that the best way to stimulate the supply of broadband infrastructure without artificially favoring any technology is to “bundle demand” around schools, communities, etc in order to make a project attractive

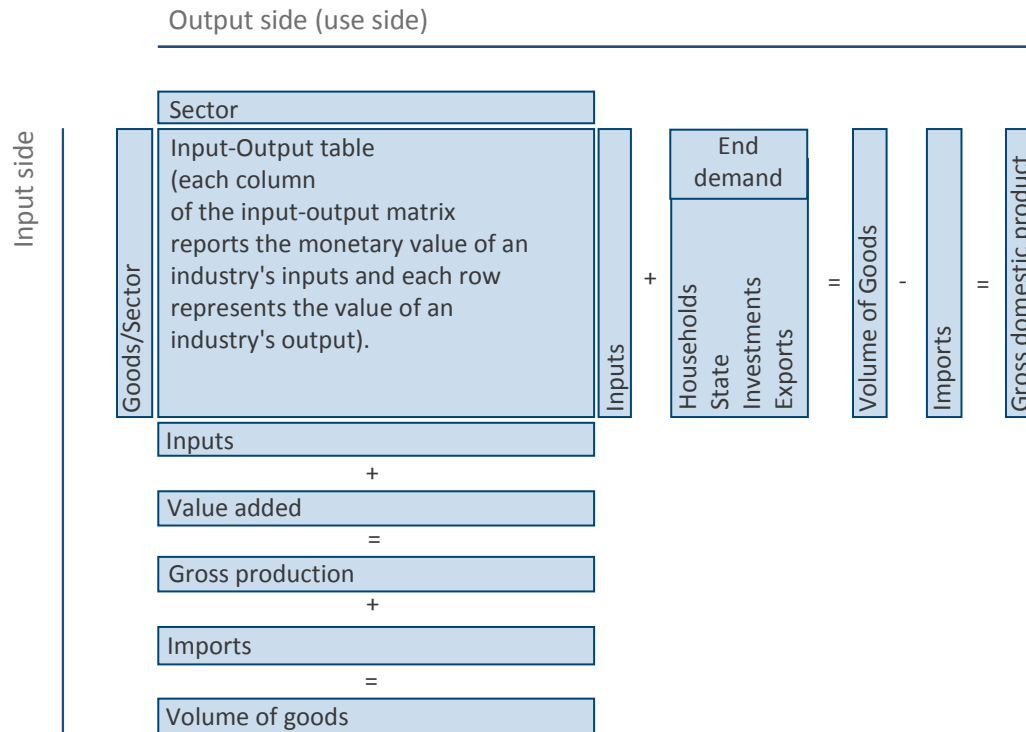
# Why should governments invest in NGAN in the current environment?



# Input-output model in general terms

- The input-output model of economics uses a matrix representation of a nation's economy. It is designed to predict the effect of additional demand in one industry (e. g. telecommunications) on others.
- The input-output analysis considers inter-industry relations in an economy
  - It depicts how the output of one industry goes to another industry where it serves as an input, and thereby makes one industry dependent on another both as customer of output and as supplier of inputs
  - An input-output model is a specific formulation of input-output analysis
- The mathematics of input-output economics is straightforward, but the data requirements are enormous because the expenditures and revenues of each branch of economic activity has to be represented.

# The input/output-matrix assesses the value added of additional demand based on a multiplier



With input-output tables it is possible to calculate the effect of additional investment in telecommunications

The result is a multiplier indicating how much additional value added will be generated due to the fiber deployment.

What do Multipliers measure? Multipliers measure the total additional production in the economy due to a unit increase in demand in a specific sector (e.g. construction).

## Conclusion from the input/output-model

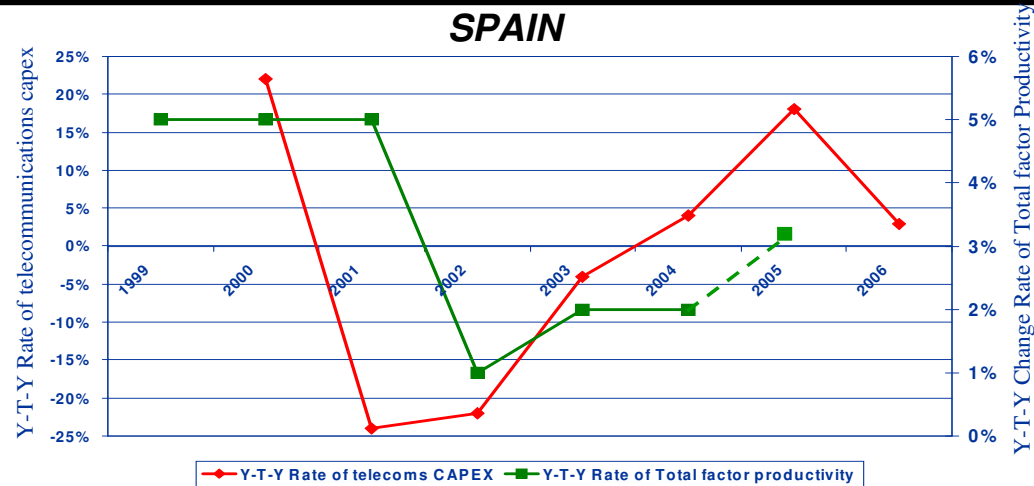
- The input/output-model leads to the following multipliers
  - Value added-multiplier            1.5
  - Employment-multiplier            1.4
  - Work volume multiplier            1.4
- The multipliers for the fiber rollout are rather low, compared to other industries with higher value added (e. g. pharmaceuticals). This is due to the fact, that most of the investment is spent in construction, a sector with low productivity and low use of intermediate goods from other sectors.

## Model results might be underestimating the total impact of the fiber network

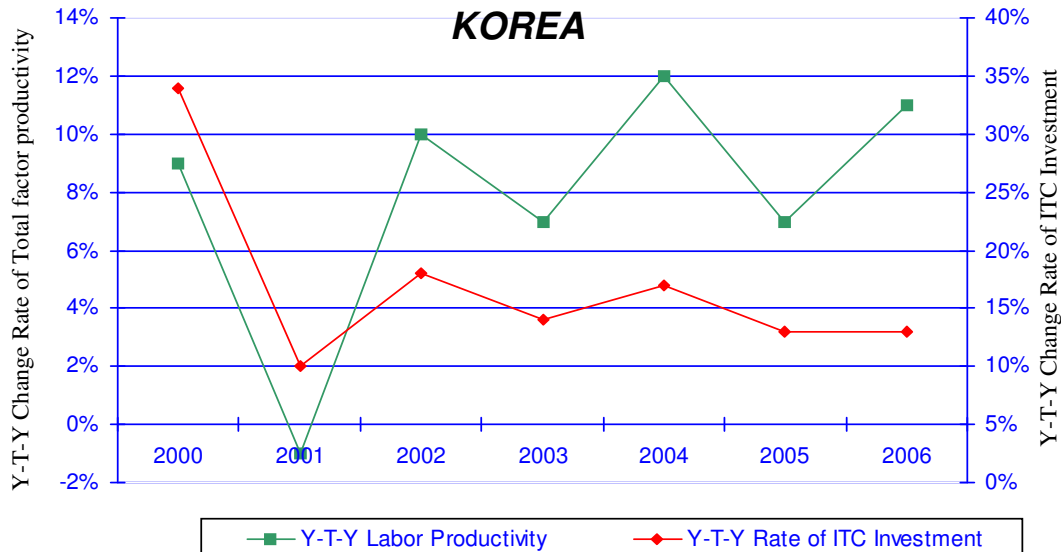
- The static nature of input-output analysis allows us to estimate the inter-industry impacts as a result of value added multipliers.
- As such it needs to be complemented with analysis that estimate the whole set of network externalities likely to have an impact on economic performance (e. g. labor productivity, industrial efficiency, export volumes etc.).

# The relationship pattern between telecom capex and TFP

## SPAIN



## KOREA

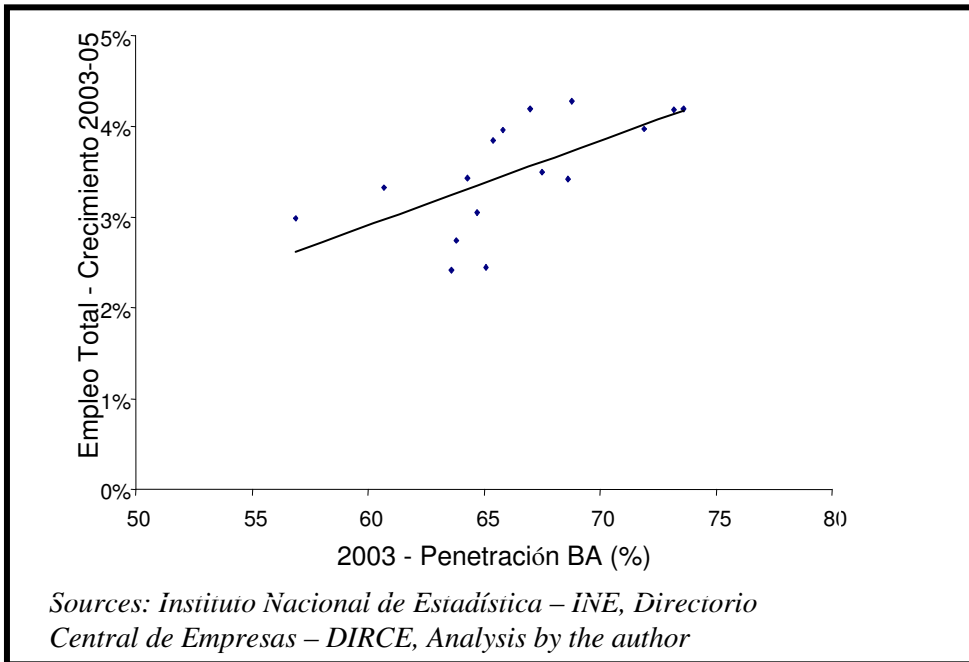


- The rate of change of ITC investment has been found to be directly linked to Total Factor Productivity change
- Impact can be achieved almost simultaneously or with a time lag
- Time lag has been found to be driven by an economy's ability to immediately assimilate the investment in ITC as a result of high level of human resource training and flexible production processes ("intangible capital")

# The relationship between broadband and employment appears to be stronger in Spain than in South Korea

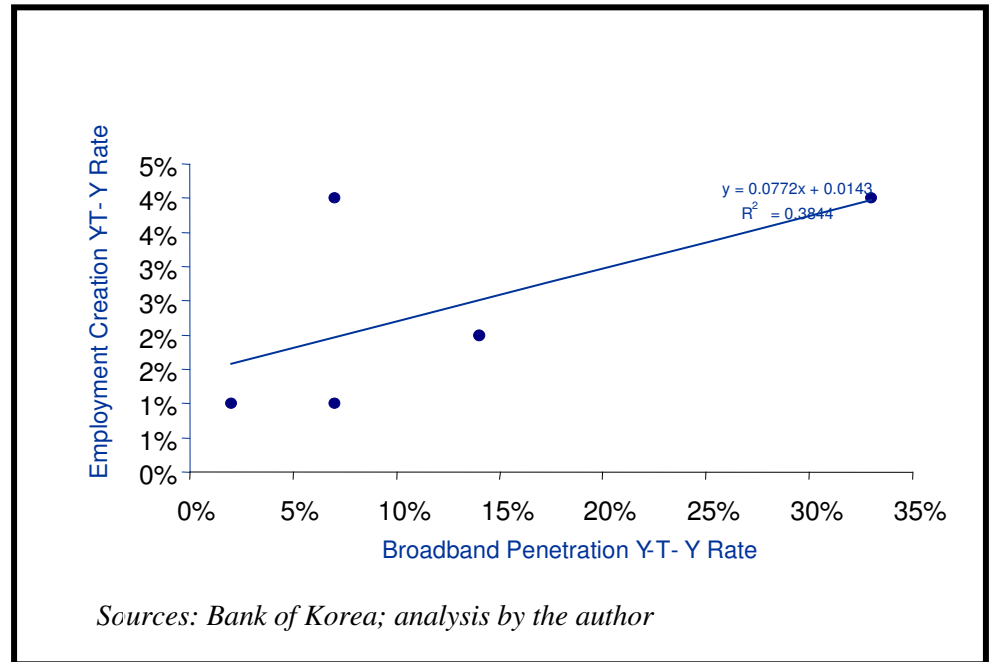
## BROADBAND PENETRATION AND CREATION OF EMPLOYMENT

### SPAIN



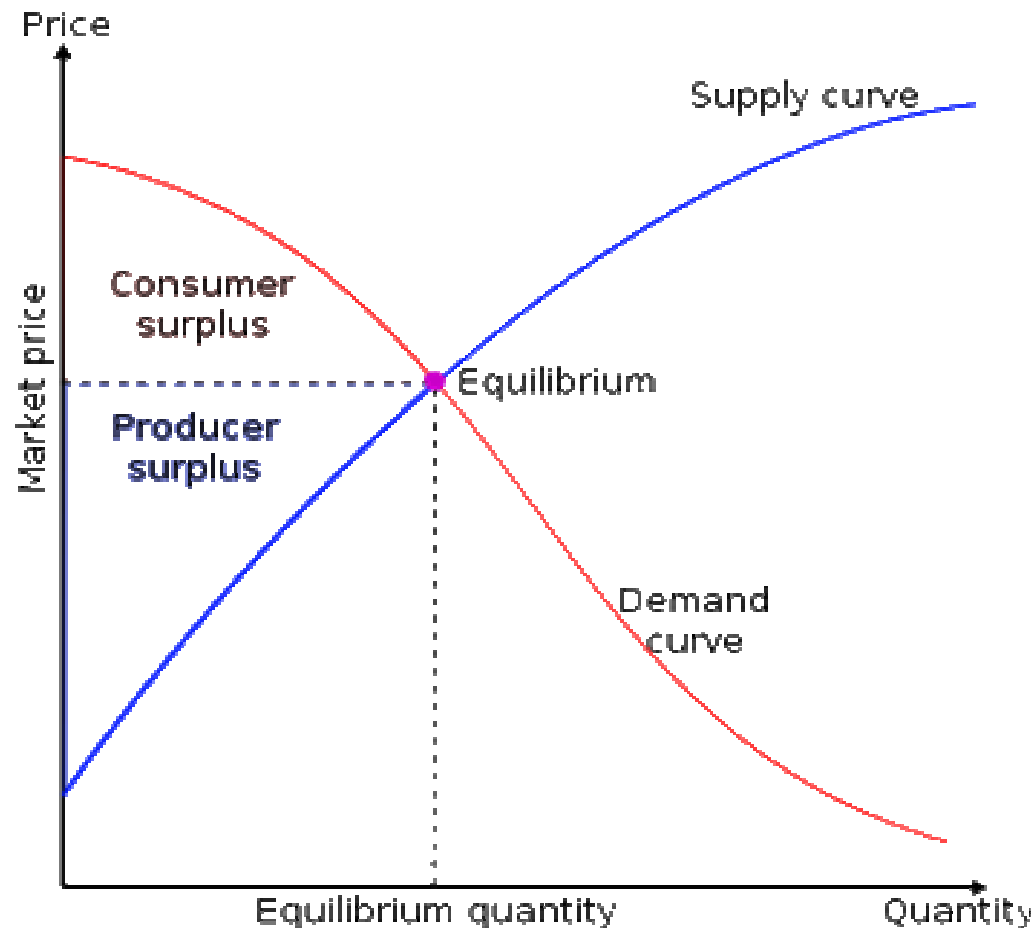
A 5% increase in broadband adoption by enterprises (SMEs included) results in a .6% of percentage point improvement in job creation

### KOREA



A 5% increase in broadband adoption by enterprises (SMEs included) results in a 0.4% improvement in job creation

# The concept of consumer surplus

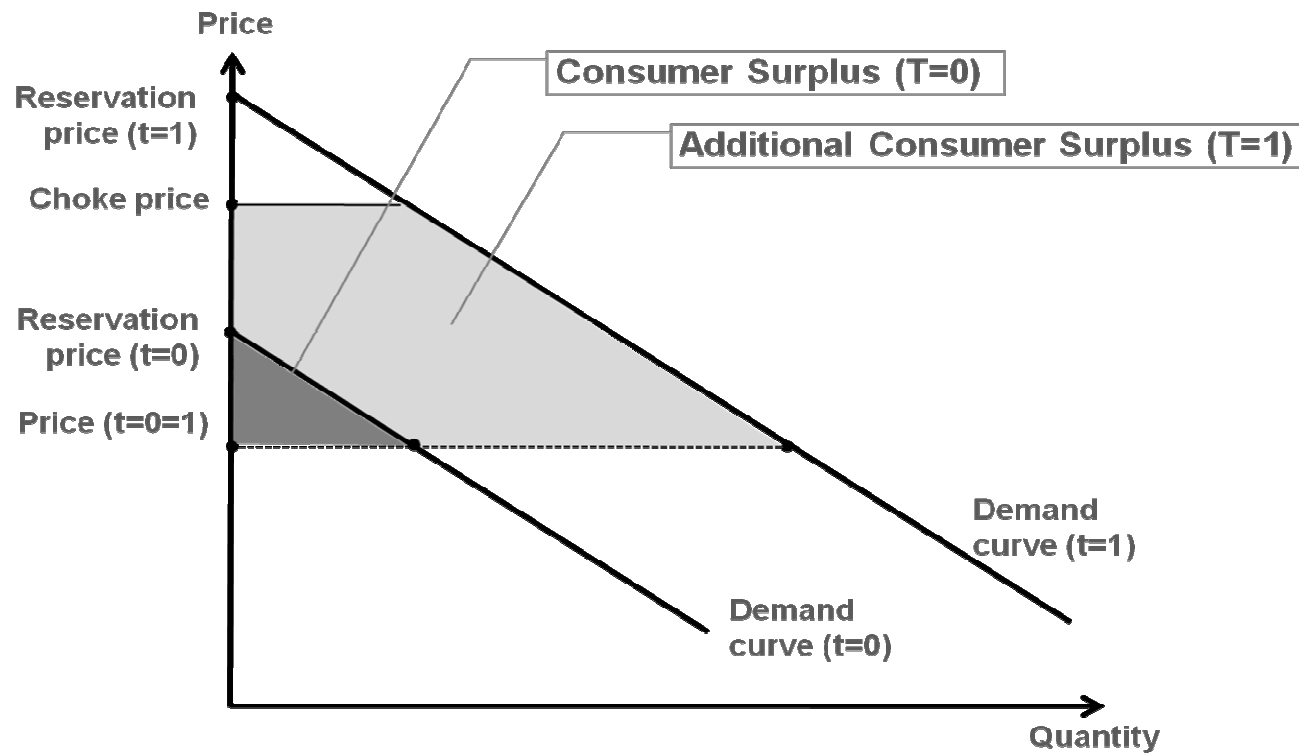


In economics, the term «surplus» is used mainly for two related quantities.

- The consumer surplus is the amount that consumers benefit by being able to purchase a product for a price that is less than they would be willing to pay.
- The producer surplus is the amount that producers benefit by selling at a market price that is higher than they would be willing to sell for.

The analysis focus on consumer surplus, as it is not possible to estimate an accurate supply curve.

# To measure consumer surplus, information on penetration (quantity) and prices are used



# Conclusions

- Current economic crisis is leading to a reduction in capex
- This reduction might have a negative impact on NGAN deployment
- However, NGAN has some positive economic impacts (multiplier effect, growth, productivity, consumer surplus)
- Therefore, governments should play a role in stimulating NGAN investments
- Setting the appropriate regulatory framework might not be enough; co-investment through subsidies might be needed