

# Network Operators, Content Providers, and the Open Internet

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# Network Operators, Content Providers, and the Open Internet

- A.T. Kearney (2010):

“Internet traffic is exploding in an unprecedented way due to increasing use of video. Costs for network operators are skyrocketing, even under existing technology and even without considering the huge investments needed for fibre-based Next Generation Access. Due to market defects, there is no way to make consumers shoulder the cost of the increased bandwidth; thus, it will soon become necessary for firms that provide content to pay for the network for the first time, much as content and advertising typically pay for over-the-air broadcast television.”

- Intuitive? Satisfying? Plausible?

# Network Operators, Content Providers, and the Open Internet

- I worked for GTE Internetworking (1990-2001) as Director of Capacity Planning, and later as Chief Technology Officer (CTO).
- Intuitions that motivated this study:
  - Exploding traffic is not new! Ten-fold increase in 1995.
    - About 100% YoY increase in traffic in the late nineties.
    - Absolute growth in overall traffic.
    - Steady decline in YoY percentage growth widely documented.
  - Pressure on the fixed network due to traffic growth should be *declining*, not increasing, over time.
  - In competitive markets, prices tend to respond rationally to underlying costs.
- The study was commissioned by Google, but it is an independent, objective evaluation. All views in the study – and any errors – are WIK's.

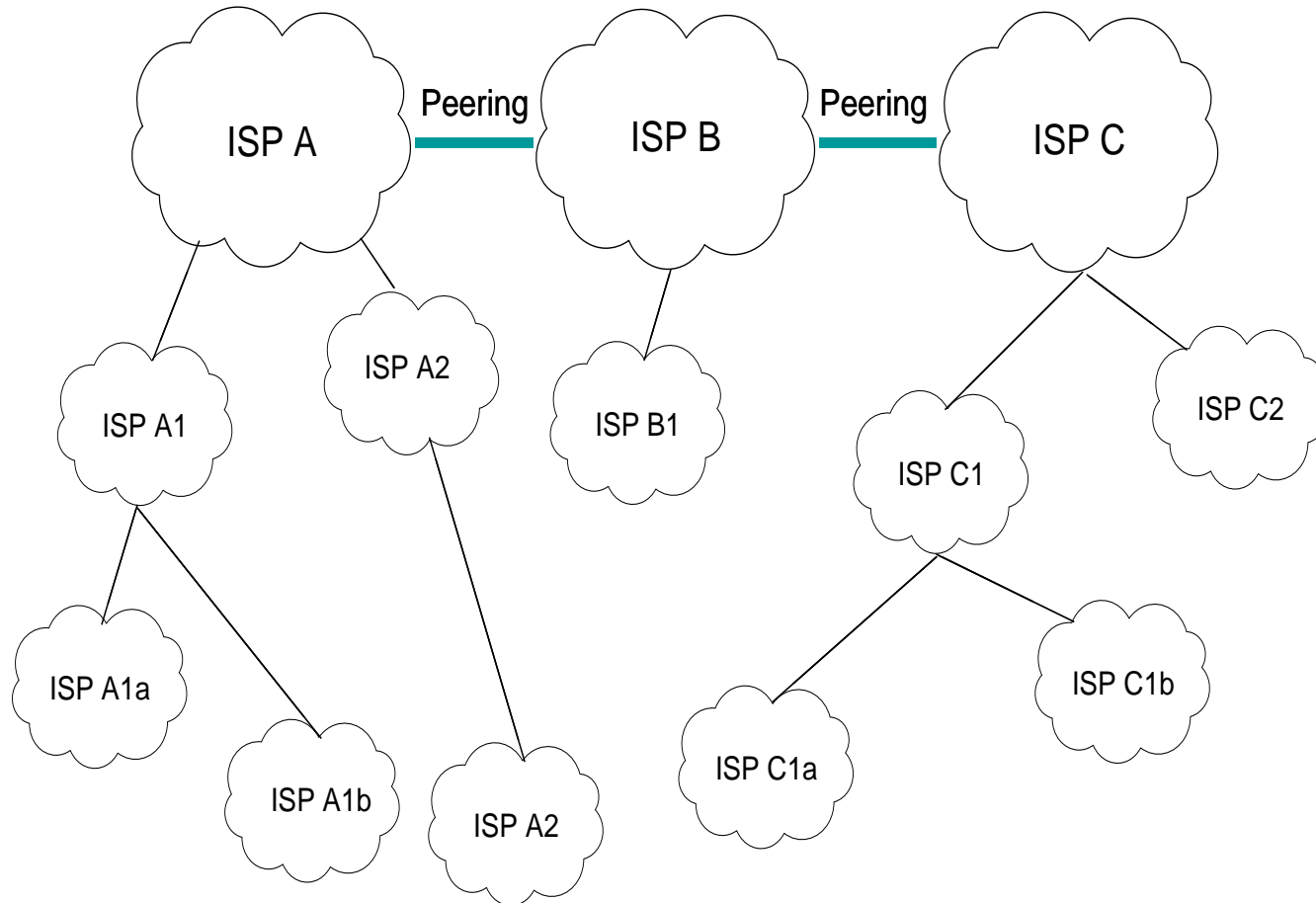
# Network Operators, Content Providers, and the Open Internet

- Peering, transit, Internet access in general
- Traffic, costs, prices, and profitability
- Two-sided markets and NGA
- Concluding observations

# Peering, transit, and Internet access (1)

- Transit
  - The customer pays the transit provider to provide connectivity to substantially all of the Internet.
  - Essentially the same service is provided to consumers, enterprises, ISPs, content provider or application service providers.
- Peering
  - Two ISPs exchange traffic of their customers (and customers of their customers).
  - Often, but not always, done without charge.
- Variants of both exist.

# Peering, transit, and Internet access (2)



## Peering, transit, and Internet access (3)

- A ladder of investment for content providers.
  - **Small content providers:** commercial third party hosting services, and possibly commercial services (such as Amazon) to provide general remote computing application services.
  - **Larger content providers:** deploy own web hosting capabilities, purchase transit services, possibly purchase commercial CDN to improve performance.
  - **Still larger content providers:** substantial investments in international networks, possibly qualifying for peering with some ISPs. Peering reduces their need for transit services.
  - **Largest content providers:** Deploy their own CDNs rather than using commercial CDN services.
- With increasing scale, increasing investment and increasing vertical integration become cost-effective.

## Peering, transit, and Internet access (4)

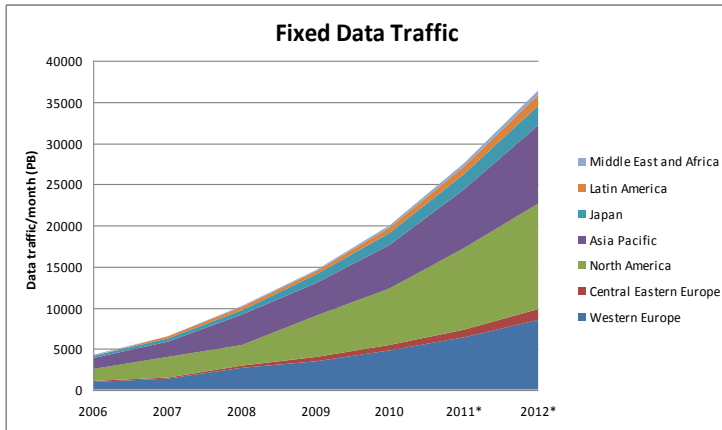
- Content providers make substantial payments for network connectivity, either through payments to Internet backbone providers, ISPs and CDNs or through investment in infrastructure.
- Content providers connect to the Internet in principle in much the same way as other business users; however, large content providers are likely to climb their own “ladder of investment”, progressively internalising more and more of the functions of a network operator and/or a Content Delivery Network (CDN).
- Content providers connect to ISPs using substantially the same arrangements as other enterprise customers or ISPs.
- We see no indications that content provider payments are out of balance with the costs that they cause.



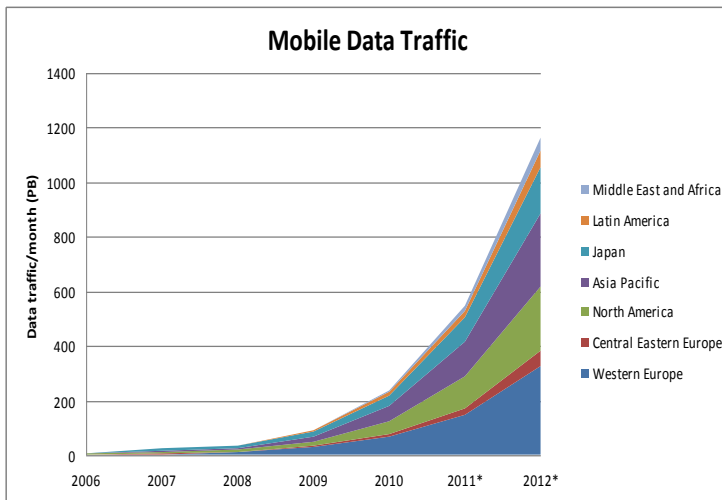
# Traffic, costs, prices, and profitability (1)

- Traffic volumes for Internet Protocol (IP) traffic are increasing, both for fixed and for mobile networks, but the percentage rate of increase is declining over time.
- The number of fixed broadband subscribers continues to increase, as does the number of mobile users who use data services.
- Traffic growth is largely a function of:
  - an increase in the number of subscribers, and
  - an increase in traffic per subscriber.
- Some costs are largely driven by the number of subscribers, and are largely independent of usage per subscriber.

# Traffic, costs, prices, and profitability (2)



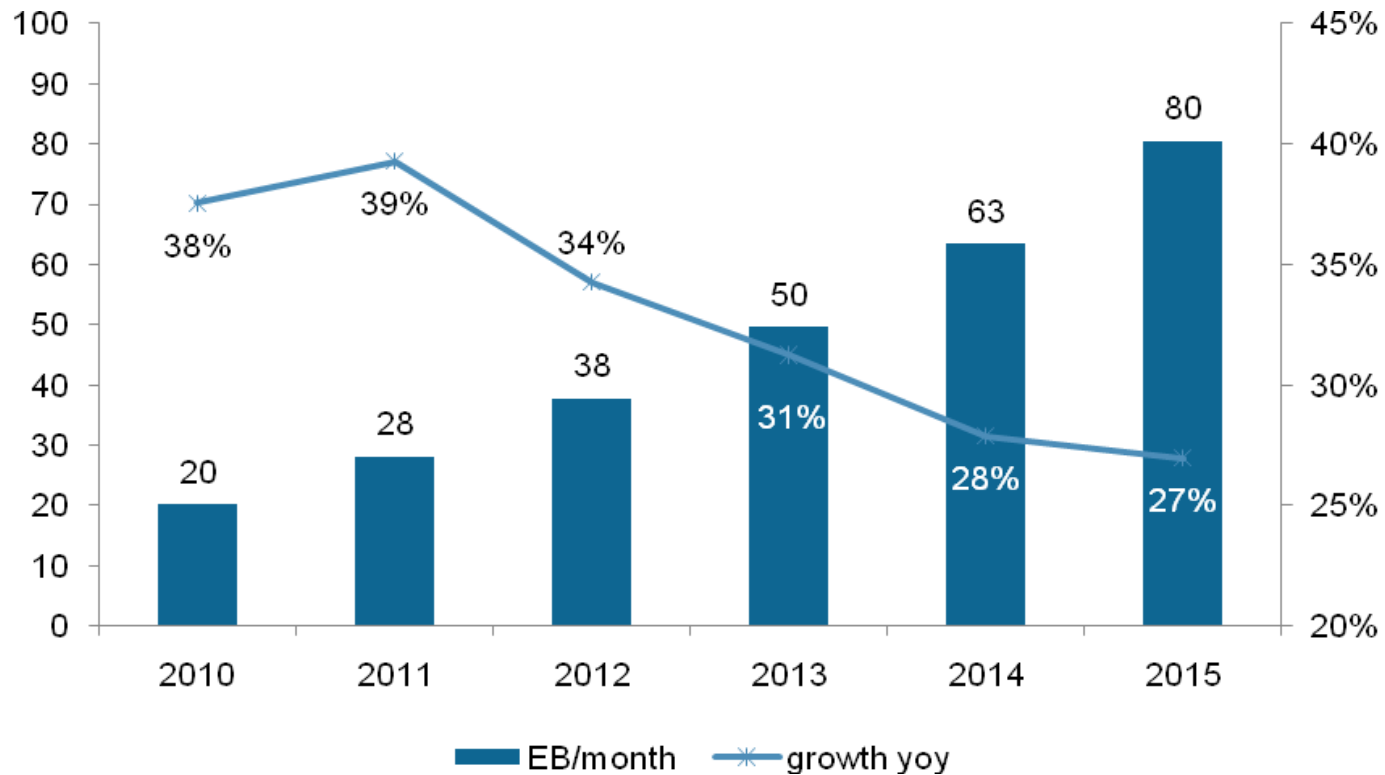
Traffic is indeed increasing in both the fixed and the mobile networks.



Source: Cisco (2011), WIK calculations.

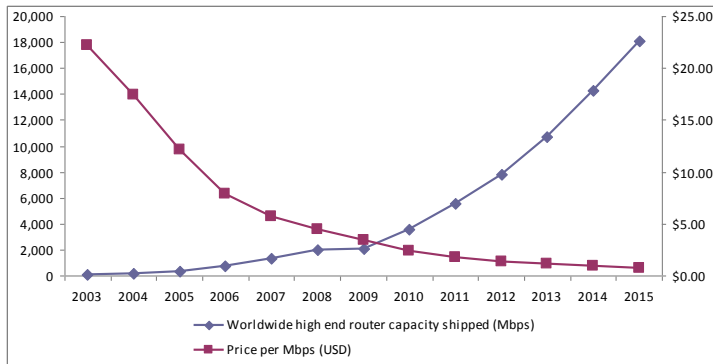
# Traffic, costs, prices, and profitability (3)

- However, the global rate of growth in percentage terms is declining over time.



Source: Cisco (2011), WIK calculations.

# Traffic, costs, prices, and profitability (4)

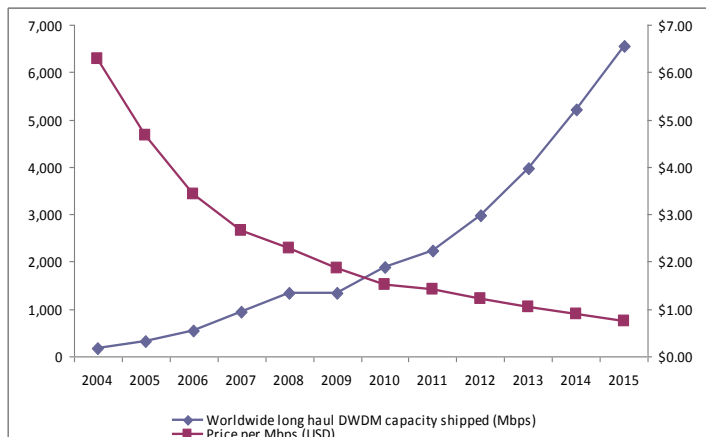


Here we have the shipment quantities in Mbps and the price per Mbps (USD) for high end routers and for long haul DWDM optoelectronic equipment.

These are among the key cost drivers for Internet core and aggregation networks.

The growth in shipments generally tracks the Cisco projections.

The growth in *shipment volume* does not equate to a growth in *costs*, because the decline in unit costs is nearly in balance with it.

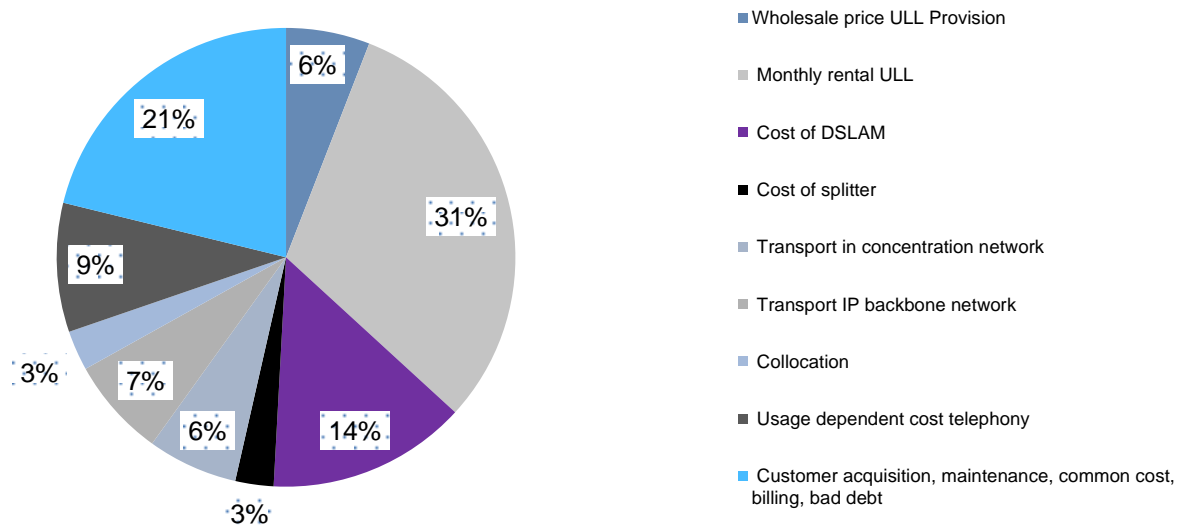


Source: Dell'Oro (2011), WIK calculations.

# Traffic, costs, prices, and profitability (5)

- The core network is about 7% of total cost, the concentration network about 6%.
- Both benefit from these technological enhancements.

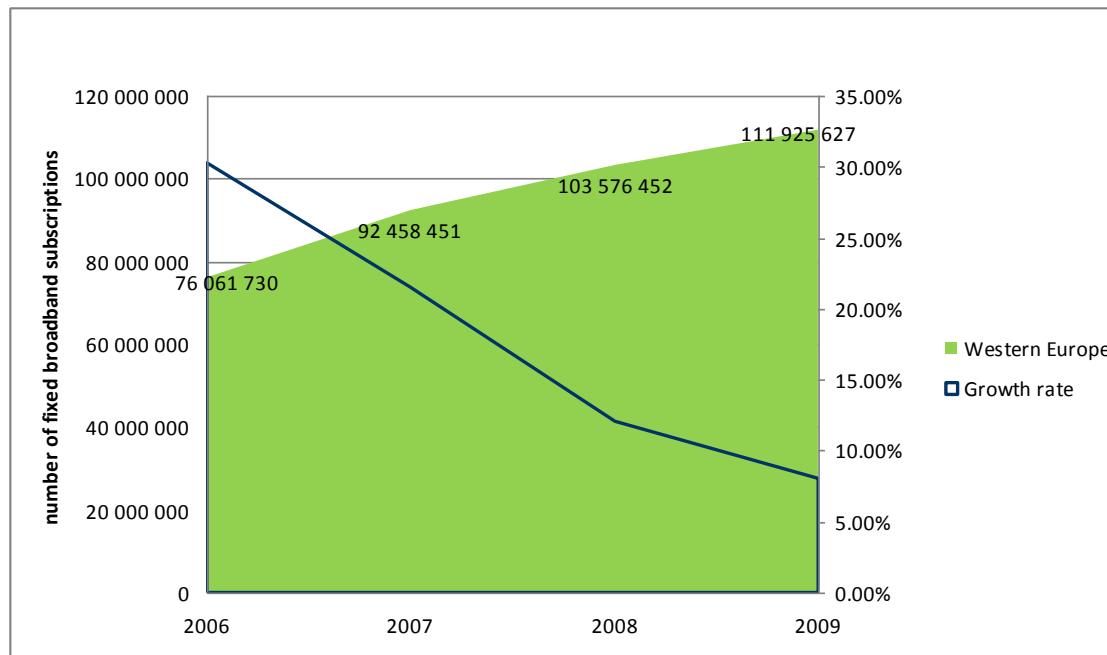
## Monthly cost of a bundled DSL broadband/voice service (BNetzA 2009)



Source: German BNetzA (2009).

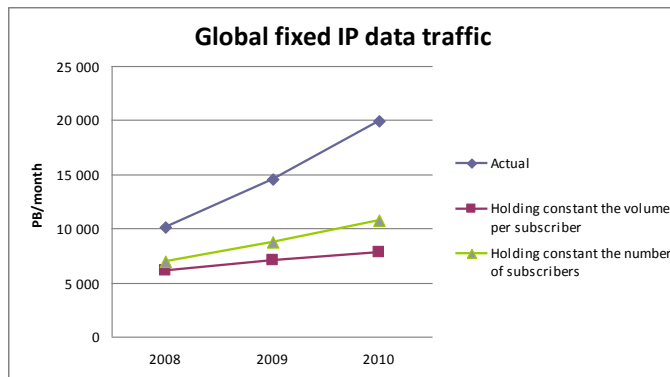
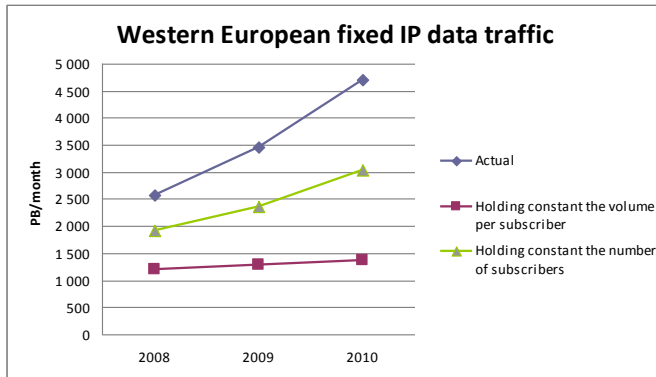
# Traffic, costs, prices, and profitability (6)

- Meanwhile, the number of fixed subscribers is growing, both globally and in Western Europe.
- This rate of growth in percentage terms is also declining over time.



Source: OECD (2011), WIK calculations.

# Traffic, costs, prices, and profitability (7)



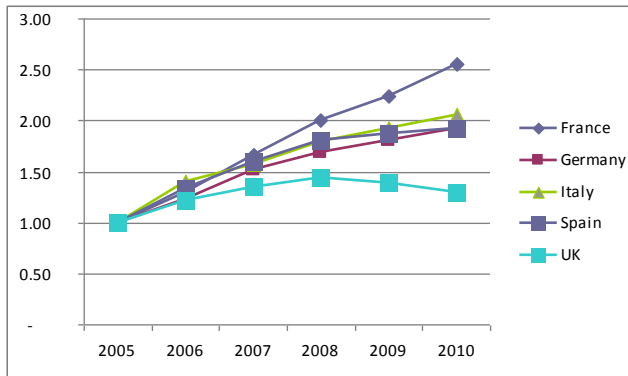
Internet traffic growth is partly a response to increased use of Internet applications and content, and partly a result of increase in the number of subscribers.

It is possible to distinguish between these two effects.

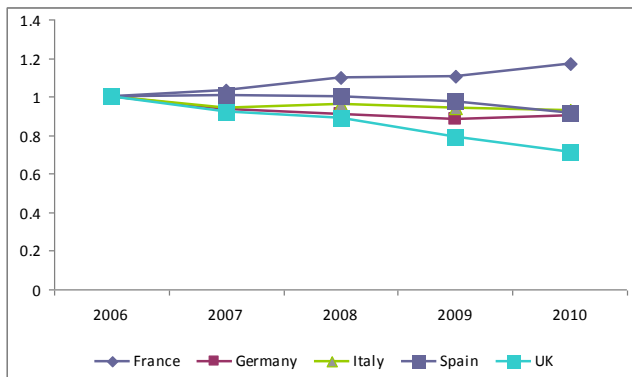
The effects on network operator profitability can be quite different. Increases in the number of subscribers equate to increased revenues.

Source: Cisco (2011), OECD (2011) WIK calculations.

# Traffic, costs, prices, and profitability (8)



Fixed broadband subscriber revenue per subscriber (ARPU) is fairly steady, but total fixed broadband subscriber revenue is increasing at a rate that reflects the growth in subscribership.



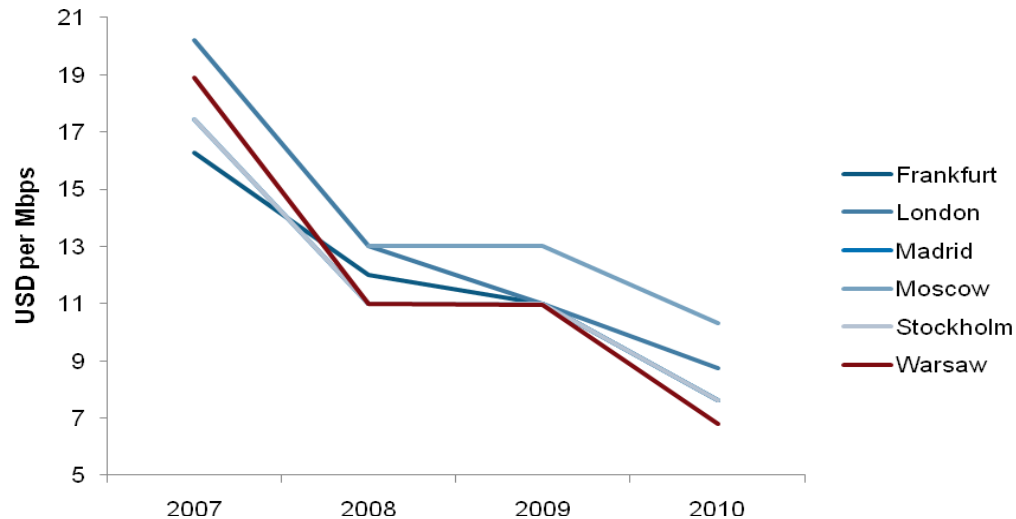
This is as it should be. The retail unit price is stable because underlying costs are stable.

Source: IDATE data (2011), WIK calculations.



# Traffic, costs, prices, and profitability (9)

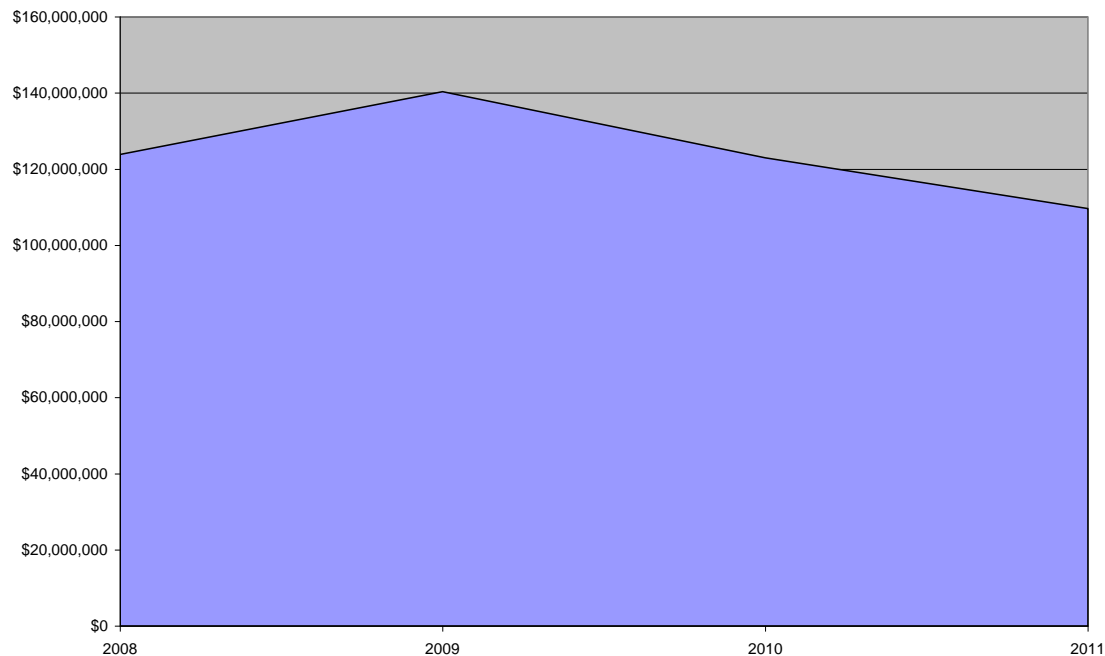
- Meanwhile, unit prices for global transit are declining rapidly.
- This decline reflects not only equipment costs but also circuits (over land and under water).
- Labour and other OPEX elements play only a small role, since they depend mostly on the number of subscribers.



Source: Telegeography (2011), WIK calculations.

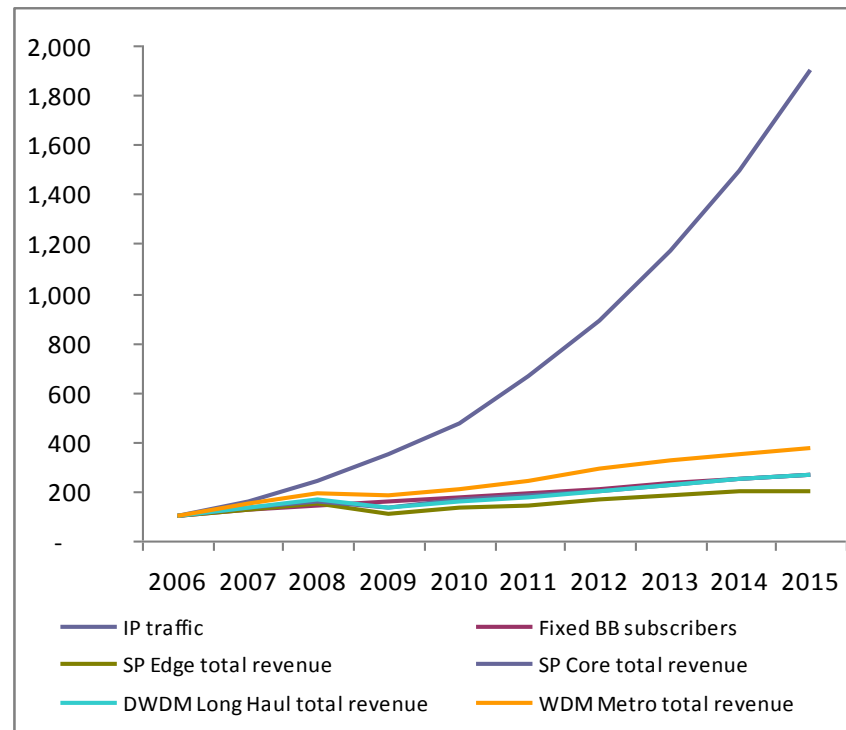
# Traffic, costs, prices, and profitability (10)

- The monthly cost of carrying every bit of Western European Internet traffic, including growth, is declining (and small in any case).
- Any self-supply is presumably cheaper than buying transit.



# Traffic, costs, prices, and profitability (11)

- This is consistent with the trend in underlying equipment costs, which tracks with subscribership and revenue, not with the volume of traffic.



# Traffic, costs, prices, and profitability (12)

- We also find no support for the A.T. Kearney claim that prices for broadband are stuck at any particular level.
- Andrew Odlyzko claimed in a 2003 paper that the consumer preference for flat rate would win out if underlying costs were low enough.
- Prices in the fixed network have been stable, apparently because usage-based costs have been small, and in decline.
- Data from multiple sources show that prices move in both directions.
- Mobile network operators in the United States (including the largest, AT&T and Verizon) have just recently announced their intention to implement capacity caps on their services. There are many ways in which to implement a price increase.

# Traffic, costs, prices, and profitability (13)

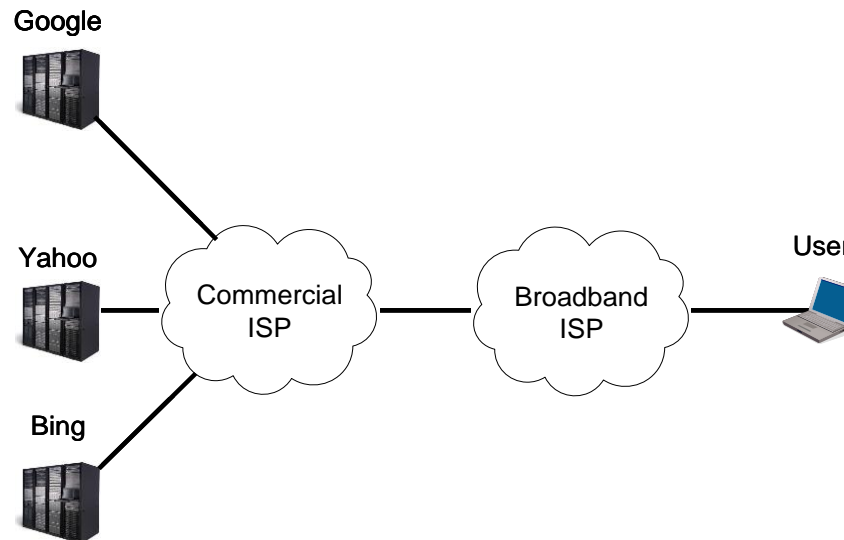
- Financial indicators do not suggest major mismatches between costs, prices, and profitability of fixed network operators.
- In their recent analyst call, AT&T said: “... IP data now makes up half of our consumer revenue. U-verse has transformed our Consumer business. We have done an outstanding job of scaling this business from scratch just a few years ago to an annualized \$6.5 billion business today. And it's growing at a 57% clip year-over-year. This has helped stabilize Wireline Consumer revenues, which grew for the fourth consecutive quarter. And as we scale U-verse, margins will continue to improve, contributing to profitability.”
- If profitability goes up with volume, there does not appear to be a problem with exploding costs.

# Traffic, costs, prices, and profitability (14)

- Total fixed network costs increase at a rate that is in balance with the increase in subscribers. This means that the cost per user is relatively stable.
- Total retail revenue for fixed broadband has increased in proportion to the number of subscribers. Traffic growth driven by an increase in the number of subscribers should raise no concerns.
- If costs had increased, prices would have increased. Retail prices tend to move up or down in response to underlying costs, in this market as in most healthy competitive markets.
- The growth in mobile Internet traffic is quite stunning.
- All indications are that mobile network operators can and will find ways to adjust their retail prices to keep them in balance with their costs, provided that regulators do not prevent them from doing so.

# Two-sided markets and NGA (1)

- A fairly new body of economic theory deals with two-sided markets (broadcast television, singles bars).
- The objective is to enhance societal welfare by maximizing participation and usage externalities.



## Two-sided markets and NGA (2)

- Through the EU 2020 strategy, Europe seeks to achieve availability of 30 Mbps broadband to all Europeans by 2020, with half of all broadband consumers served at speeds of 100 Mbps or more.
- Consumers have only limited interest in NGA at present – incremental willingness to pay for ultra-fast broadband is only about € 5 per month, which is nowhere near enough to fund the initial investment needed in most parts of the national territory.
- Most estimates of the investment needed are in the neighbourhood of € 200 – 300 billion.

Network Type	Cost per home accessed [in €]					
	DE	FR	SE	PT	ES	IT
VDSL	457	n.v.	352	218	254	<b>433</b>
PON	2,039	1,580	1,238	1,411	1,771	<b>1,110</b>
P2P	<b>2,111</b>	<b>2,025</b>	<b>1,333</b>	<b>1,548</b>	<b>1,882</b>	<b>1,160</b>

Source: WIK (2008).



## Two-sided markets and NGA (3)

- Determining the right balance of payments in a two-sided market is complex. Many factors would need to be considered, including externalities and demand elasticities.
- The focus for NGA deployment and adoption to date has been on the *supply* side, not on the *demand* side.
- If one were going to take a two-sided market approach to NGA deployment, the optimal flow of payments could just as well be from network operators to content providers (i.e. in the opposite direction from that which has been suggested).
- If consumers are not convinced that ultra-fast connectivity is worth what it would cost, there is a clear need for more high value high bandwidth content.
- Without rigorous analysis, the answer is indeterminate.

# Concluding observations

- If costs were truly increasing for all market players (as may be the case for mobile networks), network operators should have no difficulty in raising their prices.
- If network operators find that retail prices are constrained by competition to levels that are insufficient to cover their costs, they might be well advised to:
  - consider how their costs compare to those of their competitors;
  - reconsider their retail pricing arrangements.

# Concluding observations

- There is no market failure to “correct”.
- The normal European preference is to rely on wholesale regulation where needed, but to avoid intervention in retail pricing arrangements other than in exceptional cases.
- Non-intervention in retail prices is generally the right approach here: Network operators need the flexibility to evolve their pricing plans.
- It is possible that Internet pricing plans will move away from pure flat rate arrangements over the next few years, especially for mobile network operators. This should be viewed in general as a normal, healthy market adjustment, not as an aberration.



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