

Broadband market competition report

Executive Summary

This report deals with competition in the wholesale broadband access market (market 12 in the Commission's Recommendation on relevant markets) and its relationship to broadband penetration. The work was originally started in 2003 with an analysis and comparison of broadband market data with regard to penetration and the competitive situation both on the European as well as country level. Based on 13 country studies (provided by the responsible NRAs), the impact of regulatory intervention is analyzed and explained with the theoretical concept of the "*ladder of investment*". At the end of the report conclusions with regard to regulatory strategies are drawn.

The report is structured in 4 chapters:

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|------|---|-------------|
| I. | Market data analysis (empirical evidence) | p. 2 – 5; |
| II. | Country case studies | p. 6 – 15; |
| III. | Analytical concepts (theoretical framework) | p. 16 – 21; |
| IV. | Conclusions | p. 22 – 26. |

The results will inter alia be used as input to the review of the Common Position on Remedies¹, but it will also be published as a stand-alone report. As the impact of VoIP service offers on the wholesale broadband access market could due to the lack of reliable data at this point in time not yet be tracked down, the VoIP part of the paper is separated and will be looked at in another paper.

The main findings of the report are:

Competition is pushing broadband penetration as countries with more competitive markets (measured by market share of new entrants) tend to have a higher broadband penetration as well as a faster growth. Competition is promoted by NRAs through access regulation in the DSL market, which pulls inter-modal competition. Thus inter-modal competition (mainly between DSL and cable networks) is a result of intra-modal competition on the DSL platform pushed by access regulation according to the concept of the "*ladder of investment*".

The concept of the "*ladder of investment*" is followed by all 13 NRAs of the country case studies. It explains recent developments in European broadband markets quite well and can serve as a general regulatory model. It corresponds to the ECNS framework as it encourages efficient investment while promoting competition at the same time. The more complete the chain of available access products is, the higher the competitive dynamic (e.g. France, UK, Spain). In order to make the ladder of investment operational, NRAs have to ensure that access products are consistently priced and that proper migration processes are in place allowing new entrants to move on to the next rung whenever they are ready.

¹ ERG Common Position on the approach to Appropriate remedies in the new regulatory framework (doc. ERG (03) 30rev1), available at <http://www.erg.eu.int/documents/#ergdocuments>.

I. Market data analysis (empirical evidence)

Purpose: This part provides the empirical basis. It is a stocktaking exercise acc. to past exercise and gives a static overview of the broadband market situation.

Data collected:

1. Broadband market:
 - Number of retail broadband connections;
 - broadband penetration (by technology);
 - wholesale products used (acc. to definitions of COCOM data collection, cable BSA, naked DSL/bitstream);
 - state of competition (e.g. market share of competitors);
 - other indicators.

The result of the data collection (reporting date: 1 Jan. 2005) is provided in the excel table (cf. conf. data annex). As not all NRAs provided data, and in order to get a complete picture the assessment of the market situation in quantitative terms has also been based on the data of the recent document COCOM05-12 ("Broadband access in the EU: situation at 1 January 2005", draft dated 30 March 2005).

The main results can be summarized as follows:

- broadband penetration is increasing in Europe at considerable speed;
- DSL is the technology mostly used and accounts now for nearly 4/5 of all broadband lines, the rest provided mostly via cable;
- it is remarkable that DSL lines grew in 2004 6x faster than cable, overtaking cable in a number of countries and reducing the overall share of cable;
- still in countries with high shares of cable (NL, Belgium, Austria, Estonia, Malta, Switzerland, the UK), cable increases penetration considerable.
- in terms both of absolute numbers of broadband lines added and growth rates Italy, France and the UK are among the fastest growing broadband markets, followed closely by the NL and Spain;
- in countries with a smaller potential market size, strong growth rates can also be observed as the example of Ireland (appr. 500% DSL growth in 2004) and Austria show, albeit the absolute numbers are smaller;
- at the same time, the market shares of incumbents continue to fall, more markedly in the DSL market (see below);
- countries with high growth rates tend to have more competitive markets (measured by the market shares of new entrants) than countries with average or low growth rates as shown in Table/Diagram 1.a and Table Diagram 1.b;
- this suggests that competition pushes penetration;
- the competitive dynamic is more marked for the DSL markets than for the cable markets: the loss of incumbents' market shares in the DSL market is 21.9 %points while for the total broadband market the loss is less than half of it (9.3 %points) as Diagram 2.a shows;
- while at the beginning most new entrants relied on resale, bitstream access has taken over resale as the preferred form of access (cf. Diagram 2.b) and is now the wholesale access product mostly used (with a share of more than 1/3 compared to a resale share of below 30%);

- this suggests that migration from resale to bitstream is taking place;
- the number of shared access lines has also increased (highest increase of all access forms) as has full unbundling;
- this suggests that the ladder of investment exists, new entrants are starting to climb up the ladder (cf. 10th Implementation Report, pp. 52, 56) and a move from service-based to network-based competition can be observed (p. 54);
- competition is (mainly) driven by access regulation and is access-based (intra-modal / platforms) rather than inter-modal (facility-based / alternative infrastructures), although competition from cable operators can be observed particularly in the NL, Austria, Estonia, Malta, Switzerland, Spain, and the UK; however, the existence of several infrastructures (DSL / cable) does not automatically mean they are “competing” (see country studies in the Annex);
- the more complete the chain of access products is (and the more complementary the options are a new entrant can choose from), the higher the competitive dynamic (see country studies);
- thus differences in the effectiveness of access regulation explain differences in competition and accordingly in penetration growth.

Table 1.a

Country	Market share New entrants	Broadband- penetration per 100 inhab.
Austria	64%	10.1%
Belgium	50%	15.6%
Denmark	39%	18.1%
Estonia	52%	10.3%
Finland	28%	14.1%
France	57%	10.9%
Germany	20%	8.4%
Greece	72%	0.6%
Hungary	48%	3.6%
Iceland	46%	19.7%
Ireland	33%	3.4%
Italy	27%	8.2%
Malta	74%	9.5%
Netherlands	54%	18.9%
Norway	48%	14.7%
Poland	0%	0.4%
Portugal	19%	8.5%
Romania	100%	1.4%
Slovakia	40%	1.2%
Spain	47%	8.4%
Sweden	60%	14.8%
Switzerland	61%	18.5%
United King.	75%	10.5%
TOTAL/AVE	47%	8.3%

Table 1.b

Country	Market share New entrants based on DSL	DSL- penetration per 100 inhab.
Austria	33%	5.4%
Belgium	19%	9.6%
Denmark	26%	11.9%
Estonia	1%	4.8%
Finland	25%	10.6%
France	53%	10.1%
Germany	17%	8.1%
Greece	70%	0.6%
Hungary	27%	2.4%
Iceland	45%	18.8%
Ireland	23%	2.9%
Italy	23%	7.6%
Malta	56%	5.5%
Netherlands	25%	11.6%
Norway	42%	12.1%
Poland	0%	0.4%
Portugal	10%	4.2%
Romania	100%	0.0%
Slovakia	28%	1.0%
Spain	29%	6.2%
Sweden	40%	9.8%
Switzerland	39%	11.5%
United King.	64%	7.2%
TOTAL/AVE	35%	6.6%

Diagram 1.a

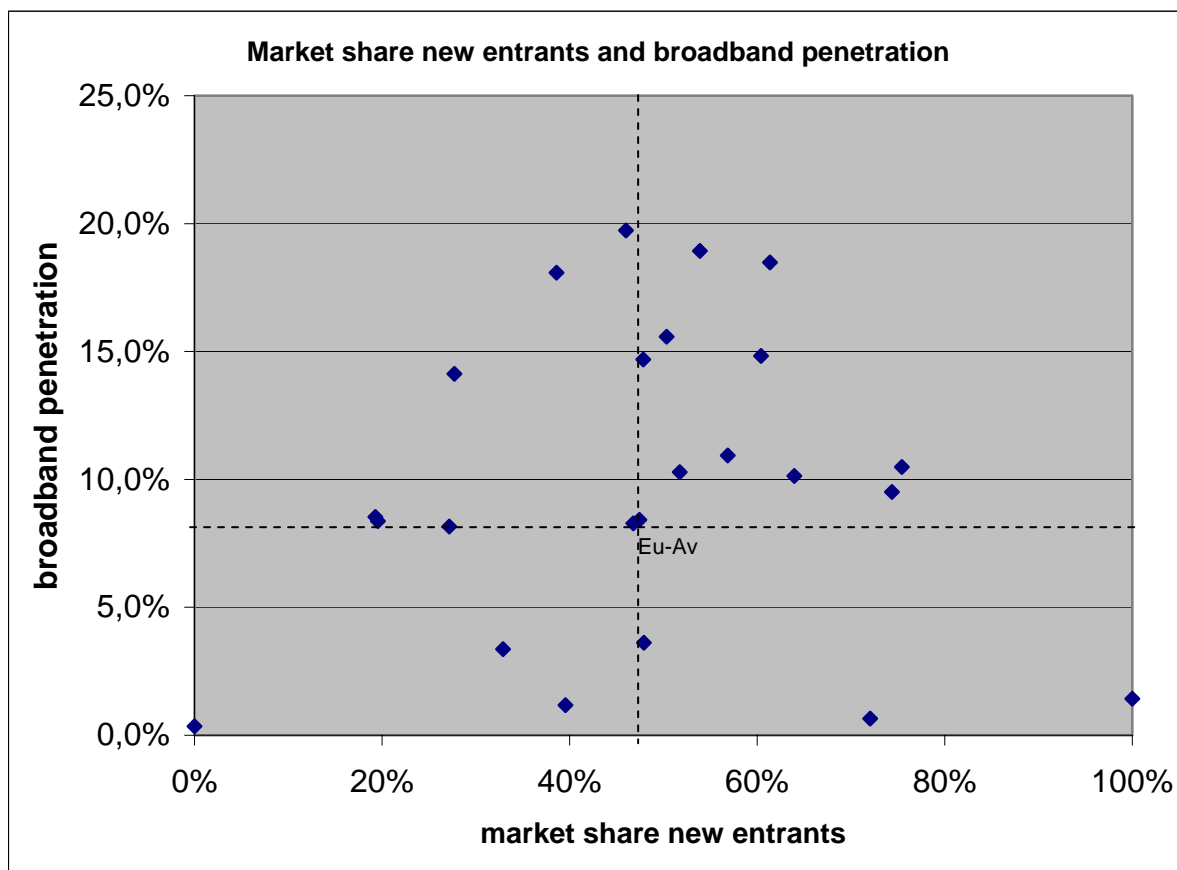


Diagram 1.b

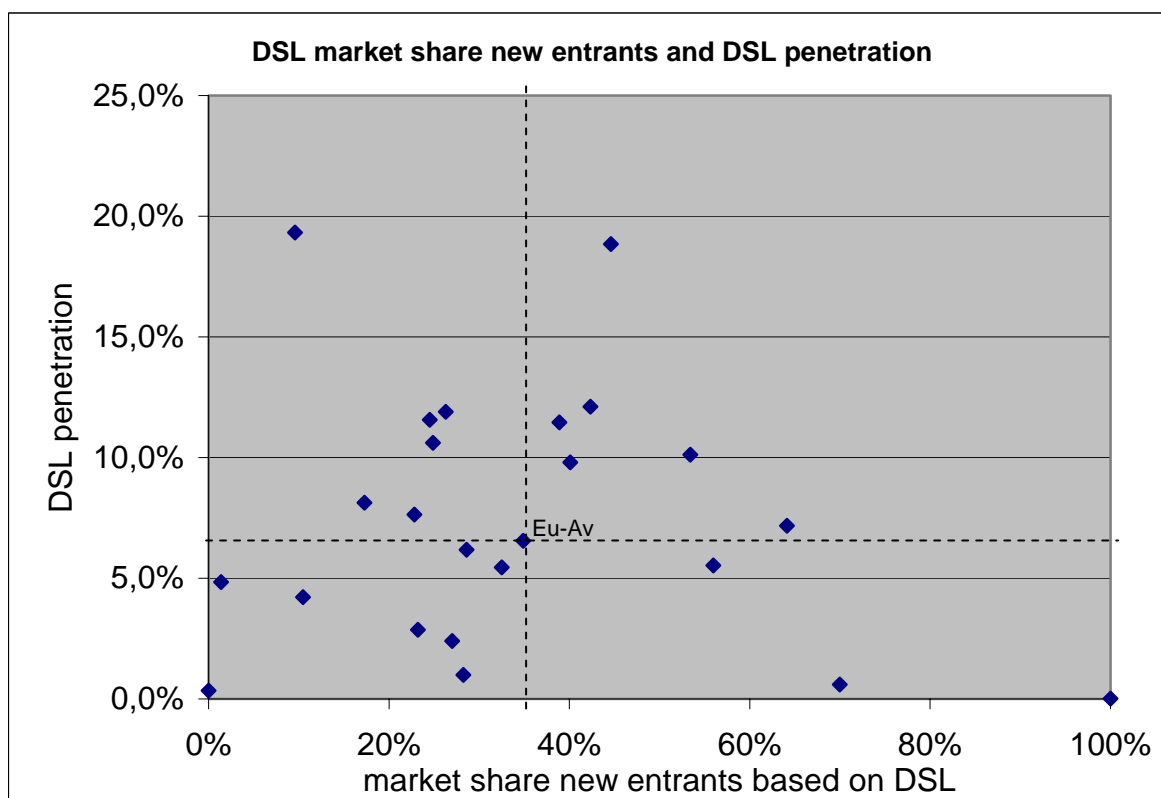
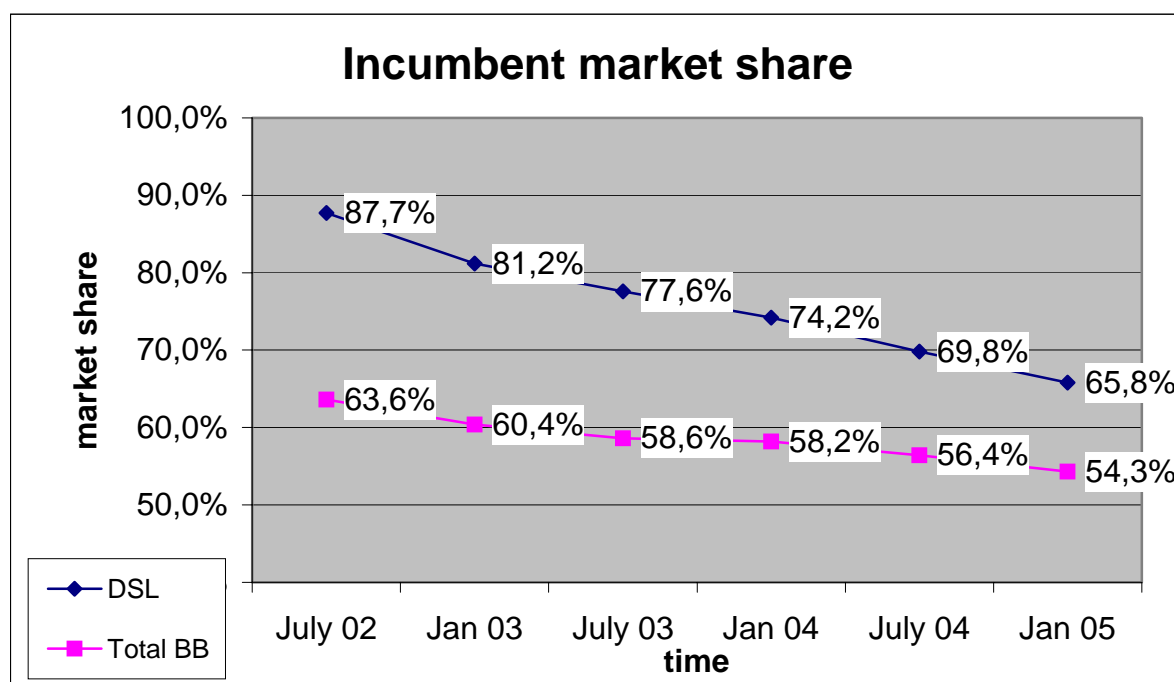
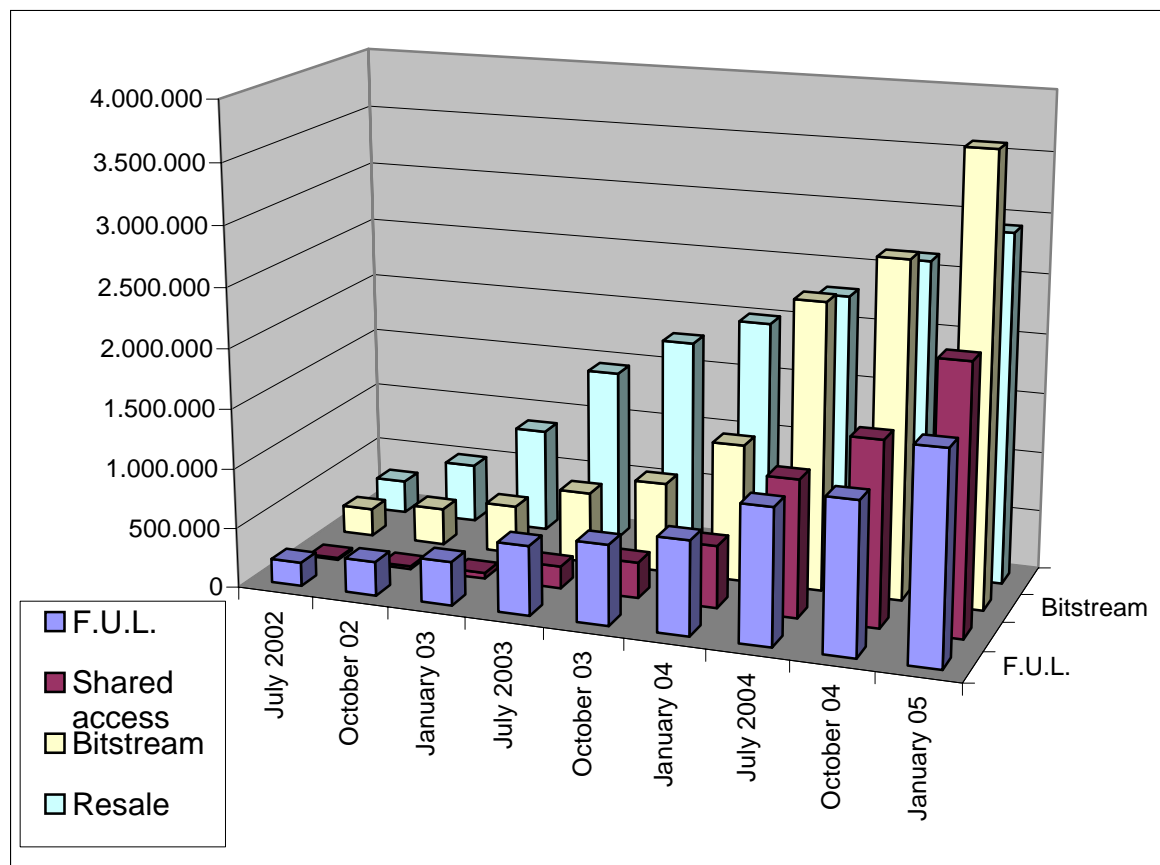


Diagram 2.a



Source: COCOM

Diagram 2.b: Use of access products



Source: COCOM data

II. Country case studies

Purpose: The intention of this part is to provide an overview of the situation in different countries. It tries to identify typical developments and thus contains a dynamic aspect. Besides exogenous factors (e.g. population density), the broadband market will be influenced by regulatory intervention. The overall aim is to link the market development to regulatory intervention/strategy of the NRA. The motivation/reasoning behind the regulatory intervention should be clear. Therefore, NRAs have described the market situation in their countries and the regulatory objectives as well as the strategy followed to achieve the objectives.

The aim is to identify from the descriptions of typical market situations, that they may require different types of regulatory strategies. The situation can be characterized e.g. by the dominating technology, the dominating wholesale product, the existence of new retail product bundles such as triple play (to catch the impact of new products and marketing strategies).

NRAs have covered the following:

- the typical elements of the broadband market situation in their country (dominant technology, typical speed offered, typical tariff structure etc.);
- the development of the market;
- the reasons for regulatory intervention (e.g. commercial negotiations failed, or considered too slow, complaints of market players, requests for intervention, others, etc.);
- the objectives of the regulatory strategy (promotion of [specific type of] competition, promotion of broadband penetration, others, etc.); the particular regulatory model that has been followed;
- impact of VoIP service offers on the broadband market and on the regulatory intervention (if possible);
- the regulatory measures and the reasoning behind them on a product level (which access products/access points were mandated and why; timing [whether all products were mandated at the same time or whether there was sequential approach]; migration processes and difficulties in implementing/enforcing migration processes [how they were overcome]; price control principles [dynamic access pricing, cost-orientation, retail-minus, others]; change of strategy or the way of intervention caused by ECNS framework [advantages/disadvantages under the new regime], state of market analysis);
- new access products such as “naked DSL/bitstream” (related to VoIP offers) and whether they were mandated or voluntarily offered / commercially negotiated.

These elements allow conclusions to be drawn on the impact of regulatory interventions (see last part) on the broadband market and more specific to assess if possible the impact of VoIP service offers on the broadband market.

Country cases:

1. France	p. 7;
2. Italy	p. 8;
3. Spain	p. 8;
4. Portugal	p. 9;
5. Switzerland	p. 10;
6. Austria	p. 10;
7. UK	p. 11;
8. Germany	p. 12;
9. The Netherlands	p. 12;
10. Norway	p. 13;
11. Sweden	p. 13;
12. Ireland	p. 14;
13. Malta	p. 15.

1. France

In France like in Spain and the UK the complete set of wholesale access products is available to new entrants, shared access being the preferred option making France the country with the highest number of shared lines. ADSL Connect ATM (ACA, ATM bitstream offer) – and LLU were both available since 2000, but were not attractive enough to incite the OLOs, who only used “IP/ADSL”, (France Télécom’s IP whole-sale offer) delivered at a national level until ART intervened (on its own or upon request of SP) to modify the BSA offer and the RUO. Regarding LLU, two main decisions (2001 and 2002) made the offer especially for shared access more attractive resulting in the take-off observed in 2003. Regarding bitstream, ART had to settle several disputes in 2001 and 2003, but the offers really become attractive at the beginning of 2004, when France Télécom made the “IP/ADSL” offer available at a regional level, and the ACA tariff-structure evolved, enabling OLOs to benefit from the better origination tariffs with fewer switches connected. Today several bitstream offers are available both at the IP or ATM level, either for the professional or the residential market.

SP offer triple play (VoB, TV, Internet access) in unbundled areas, double play when using bitstream access. ART notes that Voice over Broadband (VoB) was firstly available only with shared access, as an add-on service. Thus, following the successful introduction of VoB in France, which coincides with the take-off of shared access in summer 2003, OLOs began to propose VoB based on bitstream access products, and France Télécom proposed its own VoB service in summer 2004. With shared access or bitstream, end users still have to keep their voice telephony subscription with France Télécom. ART expects a shift towards full unbundling when VoB is replacing traditional voice telephony services and notes that this migration started already (150000 fully unbundled lines). Besides, France Télécom announced that it would offer a naked DSL product; however ART remains reserved, stating that this product must complement, but preserve, full unbundling.

ART like OFCOM considers LLU as the keystone to promote broadband competition and pursues the extension of infrastructure-based competition via LLU. ART considers it essential that bitstream offers are available which can be used to complement

unbundling in order to address the retail market at a national scale. ART regulates bitstream prices in such a way as to guarantee a sufficient margin to LLU providers. Besides determining access prices, ART also looks closely at the improvement of the quality of service trying to speed up delivery and facilitating migration (proposed remedies for market no. 12). ART considers that VoIP technology will have a significant impact as it reduces costs considerably and has a potential for increasing competition. The French retail broadband market is characterized by a high level of competition (53% new entrants' market share in DSL, 57% overall broadband market).

2. Italy

When TI announced at the end of 1999 its ADSL retail offer, AGCOM deemed it necessary to intervene to avoid pre-emption of the retail market before full implementation of LLU. TI was mandated to provide wholesale broadband access services on a non-discrimination basis, already at this stage, AGCOM also imposed on TI the obligation to provide detailed SLAs for the wholesale offer. As pricing principle AGCOM uses retail minus: OLOs must be able to replicate the retail offer of TI. AGCOM established a strong link: TI is only allowed to launch a retail service when the corresponding wholesale access product is available. In January 2001, in order to speed up competition at retail level, as well as to ensure non discrimination between operators, AGCOM extended the availability to all authorized operators. Although AGCOM originally considered LLU the main form of access, it soon realized that the market dynamics advanced the implementation of LLU too much and thus also mandated a bitstream offer, which is also deemed the necessary complement for LLU providers in areas with less population density. In 2003 AGCOM issued general regulatory guidelines that aimed at introducing more flexibility of wholesale offers in order to allow greater differentiation of end user services. TI must give a 90 days notice before launching a new wholesale offer or modifying an existing wholesale offer. When the changes pertain only to the price of the offer the notice period reduces to 30 days.

AGCOM points out some disadvantages of the retail minus principle especially for product bundles increasing the complexity of the system and also causing possible inconsistencies with LLU prices (distorting the "make or buy" decision. AGCOM therefore proposed in its national consultation document of market n. 12 a revision of the bitstream pricing model moving from retail minus to cost orientation in order to ensure price consistency along the ladder of investment. The market share of new entrants in the broadband retail market is 23%.

3. Spain

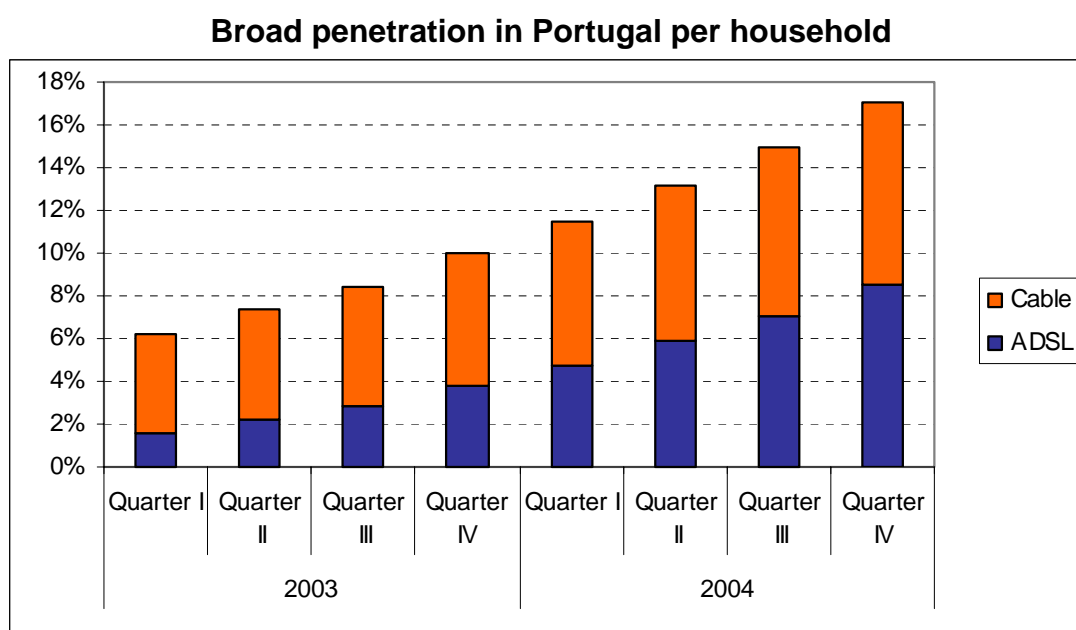
The first broadband offers in Spain were made by cable operators in 1998 (but only in some regions), while Telefonica (its ISP) launched its first ADSL offer in 1999. Cable operators offer triple play services, however the presence varies considerably. Cable has a share of 25% of the Spanish broadband lines. From the beginning onwards, Telefonica was obliged to offer ATM bitstream, the price being set by CMT since 2001 on a retail-minus margin of appr. 40% of the retail price for the per user connection charge and on cost-oriented level for the charge per ATM port. The margin covers the additional costs of providing the retail services like network costs (charge per ATM port, backhaul to PoP, IP network, external internet connectivity) and the retail activities (customer care etc, discounts/promotions), the latter considered to make up roughly half of the margin. The bitstream offer was incorporated in the RUO in 2001.

New entrants rely mainly on bitstream access, followed by resale. Due to difficulties with the size and dimensioning of collocation rooms, LLU had a slow uptake (starting in October 2001). Only with the 2nd revision of the RUO in July 2004 and subsequent decisions where CMT set conditions for block migration of bitstream connections to full or shared unbundled loops, the use of LLU increased and gained speed.

CMT intends to find a balance between service and infrastructure competition by setting incentives to move on to LLU use through cost-oriented prices by at the same time use a less aggressive retail minus pricing for bitstream access (margin squeeze issues are a concern with the introduction of metered offers by Telefonica).

4. Portugal

The first broadband offer was via cable modem in 1999, ADSL followed 2 years later in 2001. Currently Portugal has a broadband market structure characterized by a nearly 50:50 share of cable and DSL:



Its characteristic feature being that the PSTN incumbent - PT - also owns the biggest cable network. This limits inter-modal competition. Hence ANACOM in its market no. 12 analysis found PT dominant on both the PSTN network as well as the cable network. After interventions from ANACOM, PT is obliged to offer bitstream access (at IP backbone as well as ATM parent and distant switches). IP aggregation access is still the preferred option. However recently there is an important uptake on full unbundling, following ANACOM recent interventions on RUO: a) on prices; b) processes; c) SLAs specially delivery times and; d) ordering the inclusion of ADSL2 and ADSL2+.

New operators started promoting higher downstream bit rates through LLU and have announced triple play offers, PT recently followed quadruplicating the DSL downstream rate offer maintaining the wholesale price: ANACOM expects the recent uptake of LLU to continue. While adjusting incentives for infrastructure investments, ANACOM tries to ensure price consistency between access prices: LLU and ATM bitstream, which are set at cost-oriented levels and IP access which has been regu-

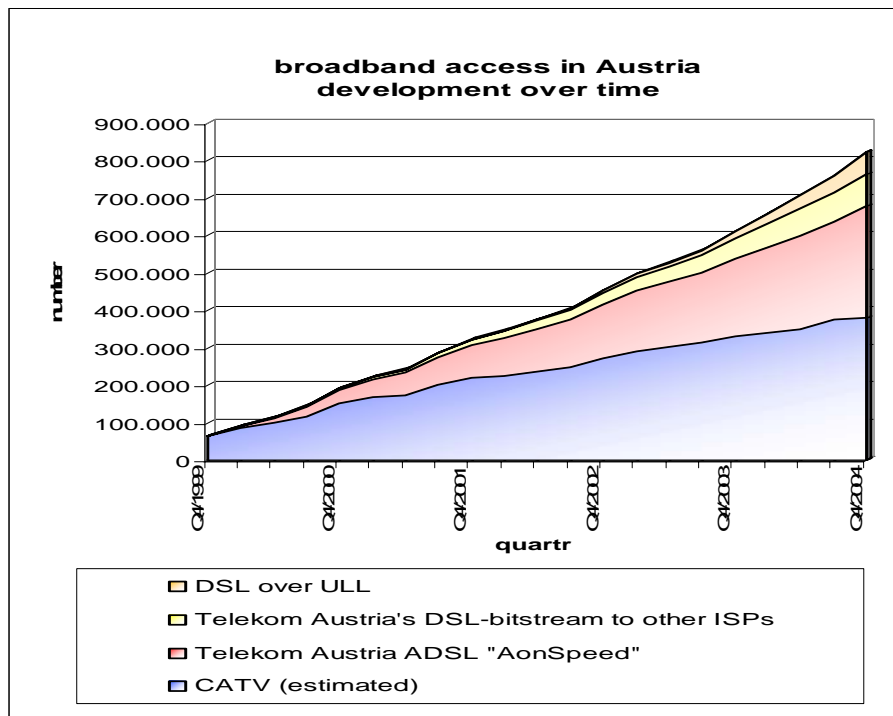
lated according to retail minus to ensure replicability of PT's retail offer in order to promote competition as the market share of PT in the DSL market is nearly 90%, overall 80%.

5. Switzerland

Switzerland provides an interesting case study as it relies on ex-post regulation only and has no LLU or bitstream access obligation in place, the only possibility to compete on the DSL market being a resale offer. As in Spain and Austria, the cable operators were the first to launch a broadband offer in 1998, followed by an ADSL offer of Swisscom in 2001. However, DSL has now taken over as the predominant technology in the Swiss market (substantial increase in 2004), but only the biggest Cable operator Cablecom currently offers triple play services, Swisscom plans to launch a triple play offer by the end of 2005. After cable operators took the lead in increasing the bandwidth, Swisscom followed, both without increasing retail prices. Though Swisscom has made a resale product available for alternative operators, an intervention of the Swiss NCA ensured the non-discriminatory basis of the resale offer. Thus besides the service competition coming from the resale offer, competition in Switzerland is obviously driven from competing infrastructures, the only example where inter-modal competition emerges on its own, not driven by access-based intra-model competition (e.g. ULL and regulated bitstream access). However, the overall dynamic in the Swiss broadband market has slowed down recently and therefore the introduction of ULL and bitstream access are currently discussed by the Swiss parliament. Also, VoIP is still only an add-on service as DSL customers have to keep their voice telephony subscription. Only when switching to a cable operator, VoIP can be used as a substitute.

6. Austria

As in a number of other countries, cable operators launched the first broadband offer in 1996 followed 3 years later (Nov. 1999) by the first ADSL offer of TA. Also as in all countries where cable was launched first except Portugal, DSL has meanwhile taken over showing the greater dynamic of the DSL market. Also, cable operators are often present only in regional areas (exclusively serving their individual areas, CATV operators are often owned by or linked to local communities) and cannot compete with TA on a national scale. After launching its ADSL offer, the association of ISP in Austria (ISPA) succeeded together with informal pressure of RTR to force TA to make a bitstream offer. BSA is still the option mostly used by new entrants, but the number of fully unbundled lines has increased considerably and is growing faster than bitstream access which seems to suggest that migration is starting, although both products are used complementarily as in France, Spain and Italy to complete the retail offer. ISPs also offer BSA to other ISPs based on LLU. There are also cable wholesale products offered by cable operators to ISPs.



As the number of households that can be served by more than one LLU beneficiary shows, competition between LLU based ISPs is going on. RTR is following the ladder of investment and considers the right pricing on all stages of the value chain to be critical and continues to regulate LLU on cost-oriented prices, but will also test for margin squeezes between LLU and bitstream access in order not to cannibalise LLU. RTR expects a stimulus from triple play offers over DSL, which would give a push to inter-modal competition. VoIP has not had a visible impact yet. The DSL market share of new entrants reached 33% and nearly double including cable (64%).

7. UK

The UK has lately seen strong growth of its broadband market. Currently, BT has a 25% share of the retail broadband market and cable a 35% share. OFCOM does not expect inter-modal competition between DSL and cable operators to be effective between now and the end of the decade and thus sees a need to promote access-based competition. Originally the UK started with promoting competition in the DSL market mainly through resale products (IPStream), which are still mainly used by ISPs. However, with its strategic review, OFCOM is now reshaping its regulatory strategy focusing on promoting competition at the deepest level of infrastructure. As in France, this is likely to mean promoting LLU and bitstream access (DataStream), which are seen as complementary to each other, as bitstream access will be used in less densely populated areas while LLU is used in the major cities (so-called 2-tier-strategy). LLU prices are set at cost-oriented levels (LRIC+), while bitstream prices are set on a retail minus basis (with a regulated margin between IPStream and DataStream). Since OFCOM regulated this margin, the number of broadband services based on DataStream has doubled. Ofcom has mandated migration processes at the retail level (without interruption by means of an "authorisation code") and has an on-going project to improve migration processes at the wholesale level. Ofcom has also appointed a Telecommunications Adjudicator to accelerate the implementation of fit for purpose and appropriately industrialised LLU products and processes (including LLU migrations). OFCOM (as ComReg) has received a number of complaints regard-

ing poor processes and has intervened on this several times. The reduction of LLU charges and improvement of LLU products and processes has had a significant impact on the take of LLU and operators plans to invest.

8. Germany

In Germany DSL is the predominant technology with an overwhelming share of 97%. Germany was one of the first countries to introduce full unbundling, which was available since the beginning of 1998. The number of fully unbundled lines continues to grow at a steady rate and has meanwhile passed the 2mio threshold (of which only ½ are used for DSL provision), and is expected to reach 3mio until the end of 2005. Shared access is not much used in Germany as the 53 operators (so-called city carriers) that use LLU also offer voice telephony services via full unbundling (probably the only country where this plays a role). Bitstream access is not available, only since the 2nd half of 2004, DT made voluntarily a resale offer of T-DSL (not regulated), which is already used for 246,000 lines, giving to ISPs for the first time the possibility to offer customers the access plus the internet connectivity instead of the usual 2 contracts that the customer has to sign, which impeded on competition as it gave DT and its ISP subsidiary T-Online an advantage in marketing. Bitstream access is not available so far in Germany, some internet backbone operators (like Telefonica) using T-ZISP (74 handover points, regulated), other ISPs using T-Gate (1 handover point, not regulated), both broadband originating services without direct customer access. The DSL (and accordingly the broadband) retail market is dominated by DT, who holds a market share of 80%.

As a result of the market analysis of market n. 12 published for national consultation on 6 April, DT will be designated as SMP operator opening the way to impose a BSA obligation. With the missing steps of the ladder, Germany has a less competitive market and is thus falling behind in terms of penetration (even though in absolute terms it still has the highest number of broadband lines). Also, in a way Germany made life hard for itself as it started at the highest point (LLU) of the ladder requiring a substantial initial investment to reach the MDFs/DSLAM locations (which meant that most of the 53 city carriers with the exception of Arcor and a few others are only present in their local area). On the other hand the high upfront investment for LLU to get to the MDFs and in collocation infrastructure etc. has also an advantage as it allows city carriers a multiple use enabling them to make bundled offers of voice and broadband services, which pays off in the medium term. Recently (2nd half 2004) the incumbent started offering an unregulated DSL-resale product, but the intermediate step – BSA – is still missing.

9. NL

The NL are – besides Belgium and Austria - the country with the highest share of cable modem connections. Like in Austria, Spain, Switzerland and Malta, cable operators were the first to offer broadband connections in 1998 (followed by an ADSL offer of KPN in 2001), but in all those countries DSL has meanwhile taken over (in 2004) confirming the trend that competition that pushes penetration is coming from intra-modal competition based on regulated access rather than inter-modal competition between alternative infrastructures. In the NL most new entrants' lines are based on shared access, fully unbundling increasing and having a 10% of all unbundled lines. Cable operators start to offer VoIP services, but VoIP is not working as it should be,

thus its impact is limited for the moment. So far no regulatory decision has been taken, but OPTA does not rule out that it will be included in the fixed telephony retail market, up to then a light touch regulation is followed as no regulation is possible until the market reviews will have been concluded. BSA was topped by a court ruling, only an offer for business customers on a non-discrimination basis is available (considered more a retail product by some observers). To give new entrants enough incentives to invest in own infrastructure the LLU price for fully unbundled lines was partially based on dynamic access pricing, which will be reviewed depending on the broadband market analysis. Following complaints, OPTA is closely monitoring migration processes from shared to fully unbundled lines (including NP at the same time), which might impede on new entrants using the incentives provided for by dynamic access pricing and stop moving on. The DSL retail market share of new entrants is 25%, the broadband market share 54%.

10. Norway

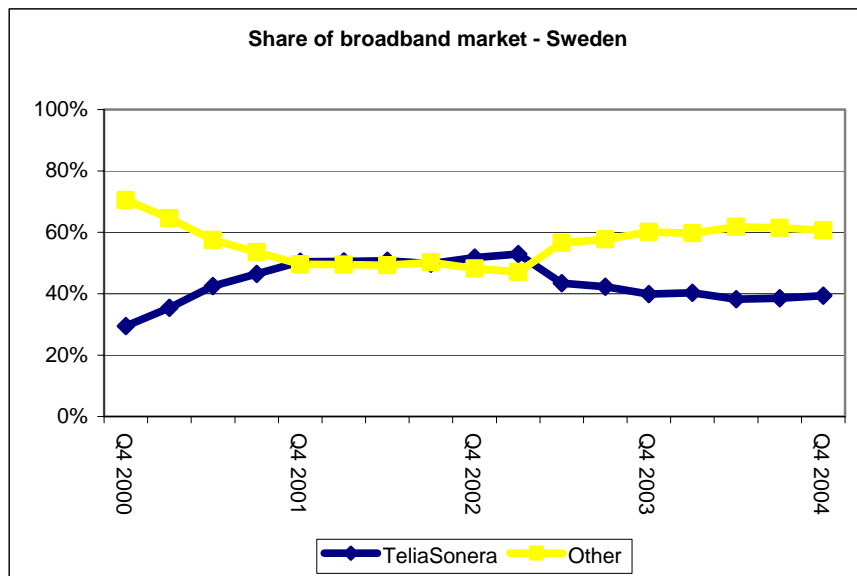
In Norway most broadband connections are provided via DSL technology, however there are also cable modem connections account for nearly 1/5. Telenor has a retail market share of 52%, so the Norwegian retail market is quite competitive. In Norway a so-called naked DSL service (without a voice telephony subscription) is available to customers. However in this case the broadband provider has to compensate Telenor with 7.5 € (excl. VAT) for maintenance of the local loop. VoIP has seen a dramatic increase in subscribers during the last year (50,000 compared to 700,000 broadband users). However the impact on broadband roll-out is unclear at this point in time as still the majority of new broadband users do not install VoIP, but data is unreliable, because usage of services such as MSN messenger, SKYPE etc. is mostly unknown.

NPT intervened several times to improve the RUO (requiring cost-orientation of the voluntarily LLU offer Telenor made in spring 2000), in particular decisions were made by NPT in July 2003 with regard to fault handling and SLAs, also for collocation NPT intervened imposing report obligations on Telenor for all cases where requests were turned down. NPT inspected several times collocation space (in 3 exchanges). The price of shared access foresees a 50/50 split of costs between telephony and broadband services. A bitstream access offer is available since 2001 on a non-discrimination basis (reasonable requests, no price regulation). Except for resale, the ladder stands and since last year a migration process is set up and one provider migrates from bitstream to LLU with "bulk pricing". The objective of the interventions on LLU was to ensure the availability of functioning wholesale products. As ART and OFCOM, NPT considers market no. 11 as the cornerstone for sustainable infrastructure competition and is committed to a strategy of supporting possible investments according to the ladder of investment.

11. Sweden

The Swedish market is characterized by a mix of technology, DSL being the predominant technology with a share of > 60%, but cable and fibre technology are also widely spread. New entrants have a DSL market share of 40%, the market share in the broadband market is 60% (see diagram for the evolution over time). PTS tried at several occasions to introduce a bitstream access product, but did not succeed so far. Most new entrants therefore rely on shared access, followed by resale, fully unbundled lines making up 10% of all unbundled lines. LLU is available since March

2000 and regulated at cost-orientated prices since the beginning of 2001, however not until recently with LRIC while earlier on a FDC calculation was used. The uptake was very slow, among other things due to slow delivery times, which forced PTS to intervene on a non-discrimination basis also for collocation space. The proposed bit-stream pricing principle would be retail-minus. PTS also proposed a naked DSL product. VoIP has no significant impact so far. One interesting aspect of the Swedish market is that 3 operators compete with the incumbent with a resale product based on the LLU wholesale products of the incumbent.



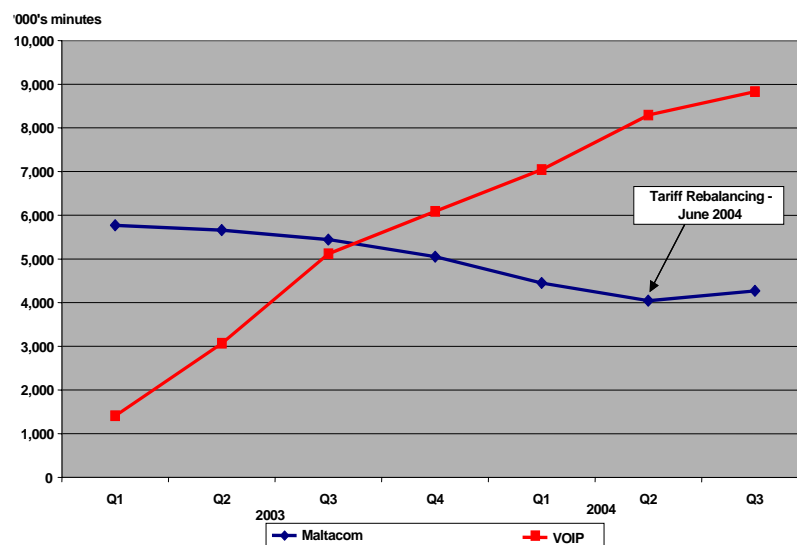
12. Ireland

The Irish broadband market is characterized by an 84% share of DSL as the predominant technology, cable following with 7%, but being restricted by historic low levels of investment in the network. Local authorities construct fibre-optic metropolitan area networks with the financial assistance of the Irish government. In 2004 Ireland experienced rapid DSL growth of approximately 500% which was accompanied by a substantial reduction in retail prices. ComReg has mandated bitstream access as well as LLU (both full and shared access). Bitstream access is the option mostly used by new entrants, full unbundling and shared access having developed at a much slower pace. At the end of 2004 two new operators entered the LLU market and commenced the unbundling process. ComReg also enforced important improvements in processing: bitstream port transfer allows customers with an existing DSL service to migrate to an alternative operator without significant break in service (already in place); integrated LLU and GNP ordering, which means that an access seeker is capable of ordering the 2 services together on a single order is being explored as is the ability to migrate retail customers (single or in bulk) whose services are based on a particular wholesale products (e.g. bitstream, wholesale line rental etc) to a retail product(s) based on LLU offerings. This simplifying of migration processes is extremely important for stimulating competition in the provision of broadband services. So far, the impact of VoIP is negligible, but ComReg expects infrastructure-based service providers to use IP technologies that will allow them to offer innovative premium services generating incremental revenue. Therefore ComReg expects VoIP triple plays, which are closely tied to the long-term development of the broadband

market. New entrants have a DSL market share of 23% and a broadband market share of 33%.

13. Malta

Malta has seen the first broadband offer from cable operators, meanwhile DSL has taken over with a stable 60:40 relation. ISPs can retail DSL services based on a re-sale offer only (no other access forms available so far, MCA is envisaging introduction of bitstream access and LLU as a result of the market analysis), while cable is retailed by the cable operators' ISP subsidiary only. MCA mandated third party access (= cable BSA), but this has not been implemented. Broadband take-up (both DSL and Cable) was boosted in the last quarter of 2004 when providers doubled the connection speed without price increase. Comparable to the UK, the DSL market share of new entrants based on resale is 56% (UK: 64%, but with other wholesale access products available) and the overall broadband market share of new entrants is 74% (UK: 75%). With regard to VoIP, it has developed since its start in January 2003 as a cheap alternative for international calls, where it is used as a substitute to fixed telephony international calls, Maltacom is offering VoIP services. The take-up of VoIP services in terms of international calls was phenomenal (see diagram), but the impact on the broadband market is not significant so far (2 SP offering VoBB), probably the critical mass in terms of broadband subscriptions has not yet been reached.



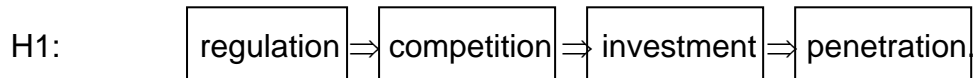
III. Analytical concepts (theoretical framework)

Purpose: The purpose of this part is to apply theoretical concepts (such as Cave's ladder of infrastructure investment) to the developments / regulatory strategies followed by the NRAs in order to analyse which concepts can explain the situations/results best and why. In other words theoretical concepts are confronted with empirical evidence/practical experiences of implementation.

Key questions:

- Linking regulatory interventions to market development:
 - effects of regulatory interventions on the market and competition development and the reasons;
- Generalization of causes (regulation implemented) and effects (market evolution, competitive situation, evolution of broadband penetration);
- Role of structural parameters such as population density;
- Role of timing of regulatory intervention;
- Ladder of infrastructure investment (Cave), consistency of pricing: does it work in practice? What are the conditions to make the ladder concept operational?.

The market data analysis and the country studies both lead to the conclusion that the following hypothesis can explain the market development both in terms of competition and penetration / growth of penetration:



Regulation leads to competition, which then incites investment, which in turn pushes penetration. The underlying process can be explained with the concept of the “***ladder of investment***” or “*ladder of infrastructure construction*” describing a coherent and comprehensive approach to access regulation.

This regulatory model which was developed among others by Prof. Martin Cave² assumes that investments are made in a step by step way by new entrants. In order to allow new entrants to gradually (incrementally) invest in own infrastructure they need a chain of (complementary) access products to acquire a customer base by offering their own services to end users based on (mandated) wholesale access. Once they have gained a critical mass generating revenues to finance the investment, they will deploy their own infrastructure³ taking them “progressively closer to the customer and increasingly able to differentiate their service from that of the incumbent”⁴, also making them less dependent of the incumbent's infrastructure. This involves migration from one access product (or access point) to another (moving to the next rung). Thus

² E.g. Cave, The Economics of Wholesale Broadband Access, Proceedings of the RegTP Workshop on Bitstream Access – Bonn – 30 June 2003, MMR-Beilage 10/2003. Recently Cave expressed himself more critically in

2 papers prepared for KPN and DT.

³ Cf. ERG Common Position on Remedies, p. 68.

⁴ Cave, Remedies for Broadband Services, Study for the Commission, Sept. 2003, available at http://europa.eu.int/information_society/topics/ecom/useful_information/library/studies_ext_consult/index_en.htm#2003, p. 20.

“the entrant passes progressively through several stages of infrastructure competition, as it ascends a “ladder of infrastructure”⁵, the initial phase being service competition, which can therefore be seen as a *vehicle* to infrastructure competition^{6,7}, which is the ultimate aim as it ensures sustainable competition in the long run. Once the process gets started and provided the right regulatory measures are taken (see next paragraph), the process will get its own dynamic and with the different elements reinforcing each other will become self-propelling⁸.

In order to kick-off the process as well as to ensure that it does not stop and new entrants keep on moving to the next rung, proper migration processes must be in place and prices must give the right incentives. Therefore pricing of access products must be consistent, i.e. the relative prices must reflect the difference in cost between the products. In other words: the price difference or margin must satisfy the margin squeeze test of covering the incremental costs of providing the “wider” product.⁹ When rungs are too far away, the move to the next rung becomes too risky, when rungs are too close, it would not pay to move to the next rung. In both cases due to wrong pricing, the new entrant remains sitting on “his” rung without moving on.

When looking at the broadband market, mostly the following wholesale access products are included in the chain, forming the rungs of the ladder starting with the lowest rung:

- resale;
- bitstream;
- shared / fully unbundled access.

Also certain backhaul services (ATM backhaul, ATM broadband conveyance, other backbone transport) may be provided.

Following the logic of the process lower rung access products should be made available first as this allows easy market entry. Thus a sequential approach should start with making the resale option available. In general, all access products must be fit-for-purpose. Also, the process will work the more smoothly the more products are available as moving on becomes easier when no rung is missing. The more complete the ladder is, the more competitive are the DSL markets (see particularly France, Iceland, Norway, Sweden, Austria, Spain Denmark, Finland, the NL, Italy). Countries like Germany where not all access products are available (yet) and which started in reverse order (with the unbundled local loop) have less competitive DSL markets and a lower penetration as market entry required more initial investment by new entrants.

However, in order to be able to migrate to the next rung, it is fundamental that migration is possible without complications, especially without interruption of service for customers. Thus to make the ladder operational in practice, NRAs must ensure frictionless switchover from one access product to the next. In reality incumbents are often reluctant to provide proper handling of migration thus being the cause when new entrants (have to) remain on the same rung. This is surprising as incumbents constantly point out the advantages of infrastructure competition, which means they

⁵ Ibid. p.10.

⁶ Cf. ERG Common Position on Remedies, p. 68.

⁷ This does not imply a complete duplication of the access network, thus only *efficient* investment shall be encouraged to promote infrastructure competition.

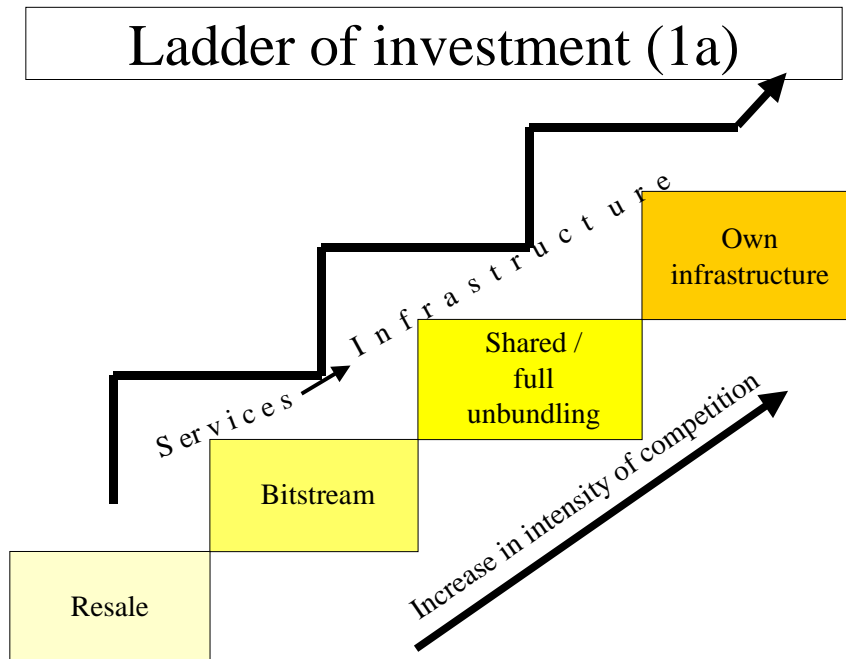
⁸ Allowing ultimately to remove regulation.

⁹ Cf. Cave, op. cit., p. 22; ERG Common Position on Remedies, p. 88/89.

should have an incentive to comply. As this seems not to be the case in practice, NRAs have to enforce compliance in this fundamental area and monitor closely the design of the processes as well as the handling. OFCOM and ComReg are on the forefront in monitoring migration processes.

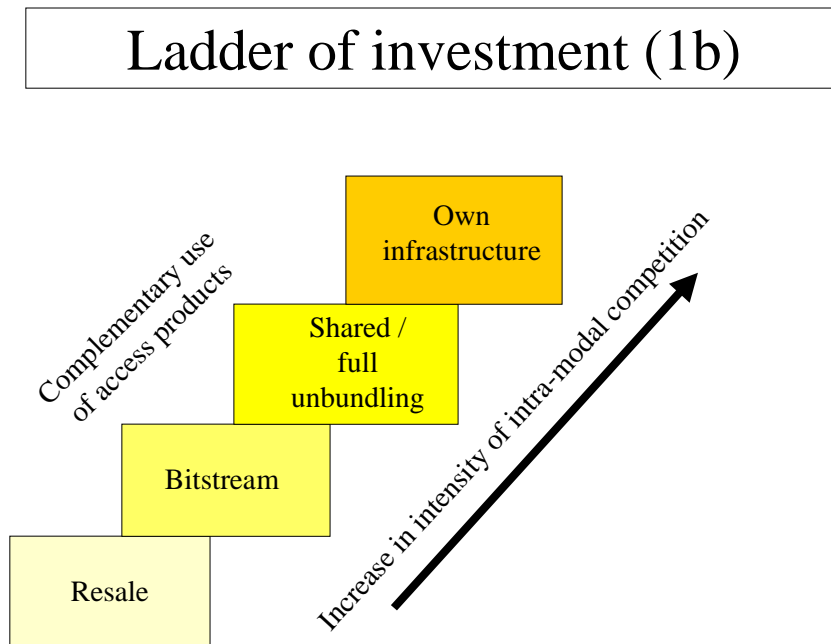
The ladder of investment can be presented as follows:

Diagram 3.a



As stated above, the migration from resale to bitstream is taking place, the increase in shared access especially in France, Sweden and Ireland indicates that new entrants are moving on, but it is also important to note that e.g. in France, Italy, and Spain where BSA was available very early, bitstream access is used complementary to unbundling in areas with less density to get national coverage and complete the offer. Thus the passage is based on the use of 2 access products, but the rational behind the business model might still be the same: acquiring a sufficiently large customer base first before making the next step in investment (gradually rolling-out further). NRAs should therefore encourage this strategy bearing in mind that both steps may have to exist over a long period. The parallel use of 2 (or more) access products can be presented as a partial overlap of the rungs of the ladder as shown in Diagram 3.b:

Diagram 3.b



When the process works successfully and investments are made by both the incumbent and new entrants, because competition forces them to invest, penetration increases faster as the investment is born “by several shoulders”. This effect can be seen in Diagram 1.a and 1.b. This is not contradicted by the example of Malta and the UK where market shares of new entrants are high, but penetration relatively low, which can be explained by the fact that competition in the DSL market is based primarily on resale and thus investment is made only by the incumbent, which results in a lower penetration rate. Further, the recent development in France, Italy, and the UK seems to suggest that the process gains additional momentum once a certain threshold is passed.

While countries with high shares of alternative infrastructures – mainly cable – tend to have more competitive broadband markets (market shares of new entrants are twice or nearly twice as high as the new entrants’ DSL market shares in Austria, the NL and Spain, countries like Malta, Switzerland and the UK that based DSL competition solely or to a large extent on resale, still see an increase of 10 to 20%points), the broadband market as a whole is driven by the DSL part based on access regulation, which causes an increase in DSL which then pulls the cable part of the broadband market. Thus inter-modal competition is a result of the dynamic of the intra-modal competition in the DSL part based on regulated access rather than the cause of a competitive broadband market.

H1 can therefore be specified in the following way:

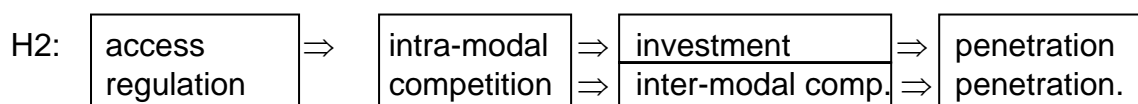
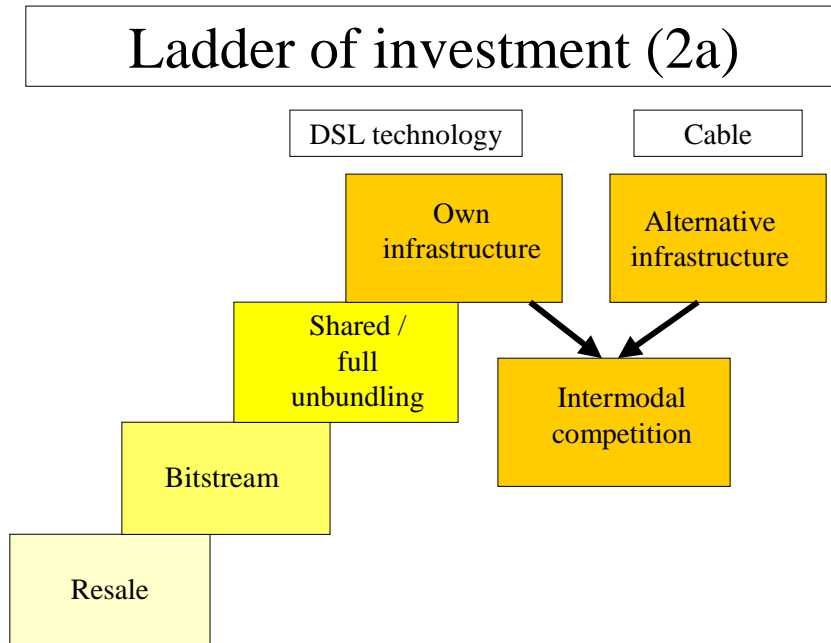


Diagram 4.a shows the ladder of investment including its effect on inter-modal competition:

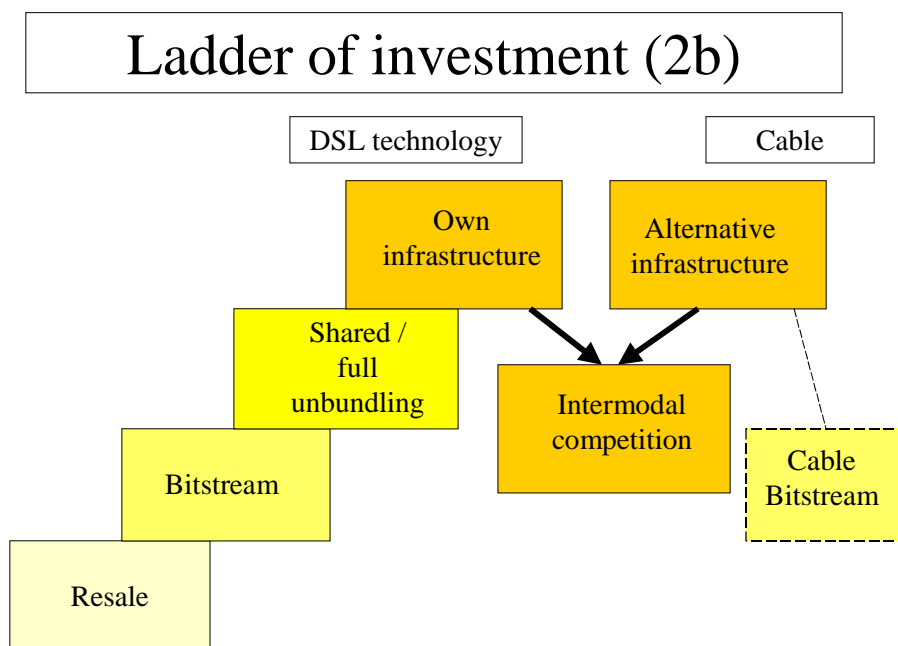
Diagram 4.a



The finding regarding the interaction between DSL and cable in the broadband market seems to suggest that the alternative regulatory model that assumes the mere existence of alternative infrastructures will lead – more or less – automatically to competition and thus considers regulation not decisive or where regulation does not take account of all technologies, which risks distorting the technology mix, is not a real option. The latter approach can be observed in the USA today and might therefore be called the “American model” while the “ladder of investment” explains the recent European development in broadband markets. It corresponds to the ECNS regulatory framework, which requires NRAs to encourage efficient investment in infrastructure, and to promote innovation (Art. 8.2 FD).

Given the recent fall-back of the share of cable modem connections, the requirement for technological neutrality and the fact that the limited regional extent of cable networks might also limit their ability to compete, NRAs may apply appropriate measures to cable operators¹⁰ in order to promote (inter-modal) competition further. The widening of the scope of the regulatory framework and the possibility of technological neutral regulation now provided for by the ECNS framework can stir broadband market dynamics when used adequately by NRAs. This scenario is shown in Diagram 4.b:

¹⁰ If found dominant on the relevant market.

Diagram 4.b

IV. Conclusions

Purpose: The purpose of this part is to draw conclusions from the empirical description, the description and analysis of the market in the country studies and the regulatory interventions. Is it possible to identify key factors for success/failure? Do certain strategies only work in certain environments? Are they country specific or universal? If a successful strategy is country specific, why do certain strategies work in some cases and not in others? Are there certain conditions to be fulfilled for a successful regulatory intervention (influence of timing etc.)? Is it possible to identify typical market situations and to link them to certain regulatory strategies? What role do VoIP service offers play for the broadband market? What is the impact of certain VOIP regulatory strategies on the development of these innovative services?

Key factors/areas of conclusion:

1. Broadband market competition

The analysis of the empirical data has shown that broadband competition in Europe is emerging (decline of incumbents' market share both in the DSL as well as in the broadband market). Competition is positively correlated with penetration as countries with more competitive markets tend to have a higher broadband penetration as well as a faster growth. The finding that competition is the main driver of broadband penetration is supported by an article recently published by Distaso/Lupi/Manenti¹¹.

2. VoIP services competition and how it effects broadband and fixed network markets

The quantitative impact of VoIP services on the broadband market is so far considered too small to be analyzed. The only exception is France, where the uptake of shared access coincided with the advent of the first VoIP offer. However, most NRAs expect an impact on business plans of the incumbent and other market players, but are not yet in a position to specify the consequences. Naked DSL is available only in Norway (and Belgium as well as Denmark)¹², but here too the impact is yet to be seen.

3. Role of regulatory intervention in promoting infrastructure competition: Path-dependence (due to national circumstances) vs. one (harmonised) regulatory model (guidance if possible)

The concept of the ladder of investment explains – at least a posteriori – the recent development of broadband market competition in Europe very well and can serve as a regulatory model for NRAs, as markets with the complete set of access products made available to new entrants tend to be more competitive than those where ele-

¹¹ Walter Distaso, Paolo Lupi, Fabio M. Manenti (2005), "Platform Competition and Broadband Uptake: Theory and Empirical Evidence from the European Union". University of Padua Working Paper. Downloadable at <http://ideas.repec.org/p/wpa/wuwpio/0504019.html>.

¹² PTS has proposed it, but the decision is blocked by a court ruling.

ments are missing or migration does not work, i.e. the distance to the next rung becomes too big (missing access products) or too tedious (poor or no migration processes). Based on the results of the country studies it can therefore be concluded that the more access products are available ("the more rungs the ladder has"), the smoother the process of climbing the ladder runs. The exact implementation of the ladder in terms of timing, pricing and product design needs to be adjusted ("customized") to national circumstances as e.g. the level of resistance of the incumbents differ (e.g. in some countries incumbents made voluntary BSA offers [Austria], in others incumbents appeal decisions which may be blocked by court decisions [BSA in Sweden] delaying the process) and other structural/exogenous factors need to be taken into account as well.

Bitstream access is now the access product mostly used taking over from resale. It seems this option was the missing element for easy market entry not requiring as much upfront investment as LLU while allowing providers to differentiate the services offered to end-users more than with resale. Since it got a better legal base with the ECNS framework (Art. 12 AD), NRAs could enforce this option more easily and thus its usage increased tremendously.

In some countries migration from bitstream to shared access can be observed where migration processes are running smoothly and costs are reduced through bulk migrations (Norway, Iceland). In other countries (France, Italy, Spain) bitstream access and shared access are used complementarily, but e.g. in Spain the CMT set the conditions for block migration from BSA to shared/full unbundled access, which is expected to be used in the near future.¹³ However, the complementary use of several access products may mean that both forms of access should be made available over a longer period. Also, pushed by VoB becoming a substitute for traditional voice telephony services migration from shared to full unbundled access has started already (e.g. France). Again, it has to be stressed that in order to make the ladder operational, NRAs must put the highest emphasis on the design and monitoring of migration processes. The importance of migration processes is mentioned by all NRAs, some already starting concrete action (e.g. OFCOM and ComReg). Also it should not be forgotten that migration needs time to work out.

Most countries looked at in the country studies apply the retail-minus principle for setting the BSA price, but with the advent of bundled retail offers, its application gets more complicated as AGCOM and CMT point out. Also, it might create inconsistencies with LLU prices set at cost-oriented levels. In order to solve these problems and to ensure price consistency AGCOM has proposed, in its national consultation on market 12, to change the pricing model of bitstream interconnection from retail-minus to cost orientation (at least for DSLAM and parent switch interconnection). In order to provide enough incentives CMT applies a less aggressive (than strict cost-orientation) retail minus rule in the future. In general to make the ladder work, access prices must be consistent.

¹³ Lately also more direct forms of migration could be observed: e.g. in Ireland a provider whose principal focus has been on voice (carrier pre-selection) recently entered the LLU market and by-passed the earlier infrastructure phases of resale and bitstream; in Portugal a move from resale to full unbundling was seen, in other countries providers moved from BSA to full unbundling leaving out shared access (to save on migration costs). NRAs should not prevent these direct migrations "leaping over" one or several rungs in case these business models are considered viable by providers.

In case suitable (fit-for-purpose) access products are made available at consistent prices and smooth migration processes are in place, a sudden increase (“jump”) in demand e.g. resulting of VoIP services uptake, will lead to a move up the ladder and to a faster growth rate, otherwise the process will be slowed down and demand pushed back as new entrants are not able to get suitable access in a timely manner. Access products can be introduced sequentially, but they should be introduced in logical order (starting with the lower rungs) and NRAs should announce their strategy and a timetable to provide a stable planning horizon for all market players to make sound business plans. Once the ladder is established and continued monitoring preserves the availability of consistently priced access products, the process will propel to a higher dynamic as it gathers momentum (e.g. France, UK). This may be linked to passing a certain threshold level.

According to the theoretical model of the ladder of investment, the regulator should not only encourage access, but may actively support the upward move by signalling either through dynamic pricing or sunset clauses that regulation will be removed (thus new entrants should not establish themselves forever on a particular rung, i.e. business models should not be built on the unlimited availability of specific mandated access products). However, at this moment in time while most NRAs are still in the process of erecting the ladder, it is too early to anticipate when and how these elements can be introduced by NRAs in practice¹⁴ without risking disruption.¹⁵

Countries with a high share of cable modem connections also promote access-based competition according to the ladder concept and do not rely on inter-modal competition, notably this can be seen in the NL and the UK. The only exception is Switzerland, where the legal basis for the introduction of other forms of access (BSA, LLU) is missing. Given the limited regional extension of cable networks, cable operators are not able to compete on a national scale, which limits the possibilities of inter-modal competition.

All NRAs of the country studies follow the ladder concept as a regulatory model, albeit with different success so far. Thus the differences in effectiveness of regulation can explain the differences in competition (and accordingly in penetration) between countries. The differences are shown in the table below.

¹⁴ Until now only OPTA introduced dynamic access pricing (cf. above p. 12/13).

¹⁵ Speeding up the process too much may create the opposite effect of new entrants “falling down the ladder” (i.e. exiting the market).

Table 2: Availability of wholesale access products

Country	Resale	BSA	Shared access	Full un-bundl.	Cable ¹⁶	New entrant DSL market share	New entrant BB market share	BB penetr.
France	1999 ¹⁷	ATM 03 IP 4Q/03	2002	2001	-	53%	57%	10.9%
Italy	-	1Q/00	1Q/01 ¹⁸	1Q/00	-	23%	27%	8.2%
Spain	2Q/99	2Q/99	1Q/01	1Q/01	X	29%	47%	8.4%
Portugal	-	4Q/00	4Q/01	1Q/01	X	10%	19%	8.5%
Switzerl.	2001	-	-	-	X	39%	61%	18.5%
Austria	-	1Q/00	4Q/04	2Q/99	X	33%	64%	10.1%
UK	2Q/00	2Q/02	4Q/00	2Q/00	X	64%	75%	10.5
Germa.	2Q/04	-	2Q/01	1998	-	17%	20%	8.4%
NL	-	-	4Q/01	3Q/00	X	25%	54%	18.9%
Norway	-	1Q/01	2Q/00	2Q/00	-	42%	48%	14.7%
Sweden	2Q/00	n/a ¹⁹	Q2/01	Q2/00	X	40%	60%	14.8%
Ireland	-	2Q/02	1H/02	1H/02	-	23%	33%	3.4%
Malta	2000	-	1Q/05	1Q/05	X	56%	74%	9.5%

4. How to balance the promotion of infrastructure and service competition?

Following the concept of the ladder of investment and especially setting the right access price signals to set incentives for efficient investments is the best way to balance service and infrastructure competition. Emphasis must be put on consistent pricing. The difficulties that arise when using different pricing principles (e.g. cost-orientation for LLU prices, retail-minus for BSA) are mentioned by several NRAs, who try to combine the 2 principles, but this is likely to require a more detailed analysis.

The emphasis on the encouragement of efficient investment in the ECNS framework can be seen as a new paradigm compared to the focus at the beginning of liberalisation to open up the incumbent's network focusing more on – short term/static – service competition under the 1998-ONP framework. Now as the market is further developed, naturally NRAs must look on long term/dynamic issues to ensure that the process of emerging competitive market structures continues to evolve in the right direction with a stable level of competition, while preventing a “swing-back” (re-monopolisation) through leveraging of market power.

In spite of the advent of “new” technologies re-monopolisation is a danger as the example of ADSL2+ and VDSL2 and the difficulties encountered with non-discriminatory implementation show (e.g. Belgium). On the other hand, these new

¹⁶ This column signals whether cable networks play a significant role (X) or are not/less important (-). The data of the 3 last columns (new entrant DSL market share, new entrant BB market share, and broadband penetration) is taken from Tables 1.a / 1.b.

¹⁷ IP offer at national level.

¹⁸ On December 2001, AGCOM issued further detailed technical regulation in order to speed up shared access uptake.

¹⁹ BSA is available for business but not for residential customers.

technologies open the chance to (more) inter-modal competition (e.g. video-on-demand and triple play offers of both DSL providers and cable operators providing the whole package to the customer) if NRAs ensure their pro-competitive introduction through appropriate regulatory measures such as availability of suitable wholesale access products. Wholesale offers should enable new technologies in order to promote innovation and competition.

The concept of the ladder of investment corresponds to the ECNS framework and for the moment NRAs should continue to follow it as an approach with a sound theoretical basis working in practice as the examples of France, the UK, Spain and others show.

Annexes:

Annex A: 13 Country studies

Annex B: Definitions

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