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European Telecom Services
The rise of the Wholesale-Only model

Until recently it was almost unthinkable that any company would consider creating a third expensive parallel Telecom infrastructure, competing with EU incumbents and cable, given the high barrier to entry/cost of rollout, relatively stable competition plus mature nature of the industry. However, we are now seeing strategic moves across a number of European markets, with Open Fiber in Italy the highest profile case study, and others following. In this detailed report we analyse Open Fiber's prospects, its key success factors, and identify risks to other EU markets. We conclude that Italy is in many ways a "perfect storm", creating a fertile investment opportunity for alternative infrastructure. Only Germany and the UK are likely to see wholesale only on a similar scale, given low incumbent FTTH builds and high service provider interest. Today we downgraded BT to EW and upgraded TEF DE to OW, and we believe OW-rated VOD and ORA are de-risked vs. peers.

Open Fiber – Driving cost-effective rollout and high penetration. Open Fiber will double its FTTH footprint to c5m homes by end-2018, and 19m by 2023. The company sees c.50% penetration in "mature" areas, with newly built areas at c.10% and rising, per our recent meeting. Open Fiber has momentum (and financial backing) and in our view it will be very tough for TI to out-invest and compete. Key success factors are 1) no cable/incumbent FTTH, 2) Enel (utility provider) a key infrastructure partner, 3) fertile competitive retail environment with broad support for alternative infrastructure.

Beyond Italy – UK/Germany at risk. We see the UK/Germany presenting the greatest alternative infrastructure risk, with BT/DT able to mitigate through accelerated FTTH builds or lower wholesale costs, which is good for mobile-only. Other EU markets are largely de-risked due to established infrastructure competition or dominant cable. For EU cable we see some potential risk, but the majority of infrastructure investment is likely to focus on non-cable areas, given higher market share opportunities.

Stock implications. BT is negatively exposed to rising UK infrastructure and retail competition; we downgraded to EW, 280p PT (from OW, 350p PT; see our report *Wholesale-Only overhang*, 3 May 2018), reflecting lower Retail/Wholesale estimates – we do acknowledge that valuation is undemanding. We raised TEF DE to OW (€4.7 PT, was EW €4.1 PT; see our report *Inflection ahead – Upgrade to OW*, 3 May 2018) and also see 1&1 Drillisch (OW) positively exposed to German alternative build. Iliad (OW) should see FTTH margin tailwinds in France, also benefiting from Italy reseller optionality. Vodafone (OW) is also well positioned (mostly Italy and UK), in our view. TalkTalk (EW) is positively exposed to new Fibre build but not to higher retail competition. For TI (EW) the wholesale-only theme is clearly negative but we believe it is fully reflected in our estimates.

INDUSTRY UPDATE

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Executive Summary

Wholesale-Only – Lessons from Italy

Feedback from our meeting with Open Fiber

We recently met with Open Fiber - the highest profile Wholesale-Only infrastructure operator in Europe, with plans to build an extensive FTTH network in Italy. Our key takeaways are as follows.

- **Rollout on track – set to accelerate.** After initial delays on organic rollout, the company appears to be fully on track to deliver an acceleration of FTTH rollout in the next three years; we estimate it will pass c.2.5m homes per year and reach close to 10m homes by YE2020.
- **Open Fiber will rely on established third-party service providers (local broadband and mobile operators) to drive the business case**. There is no retail offering. Open Fiber has secured wholesale deals with Vodafone and Wind Tre. We see a clear path to monetize these investments as service providers are keen to migrate off the incumbent.
- **Financing secured; Double-digit IRR potential.** On 13th April 2018 Open Fiber indicated that it had secured financing for its investment plan, lifting one uncertainty about the project. We see a double-digit IRR potential for Greenfield FTTH investments, with driving on-net penetration being the critical factor. Italy and Open Fiber appear to have ticked all boxes. Continued execution is now key.
- **Identifying key success factors.**
  - **Level of Cable infrastructure and incumbent FTTH build**. This is key to assessing the size of the market opportunity and level of wholesale competition. the less competing infrastructure increases in our view the opportunity for a wholesale only provider. *In the case of Italy, there is no cable, and limited FTTH build from TI.*
  - **Having the right partners.** This is key to facilitate the new Fibre network build, manage political/regulatory relationships, and reduce unit cost of delivery. *In the case of Italy, Enel and local municipalities are key here.*
  - **Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure**. This is key for driving high on-net penetration – the greater the number of potential retail partners boosts the market opportunity. *In the case of Italy, Vodafone and WIND are all willing resellers.*

Implications for incumbents

Not all markets are equal – FTTH strategies differ materially. the UK/Germany appear most at risk

We rank each of the key EU markets by the state of current infrastructure competition, but also by the “risk” of the current situation changing/deteriorating. The UK and Germany stand out to us as markets with clear alternative infrastructure risk, unless BT/DT accelerate FTTH builds or provide lower wholesale costs. Orange does have competitive build, but the outlook seems fairly positive here, with limited headwinds. Spain/Portugal has vibrant infrastructure competition already and is unlikely to worsen, and Belgium/Netherlands risk is very low. For EU Cable, the concept of wholesale only clearly presents a potential risk. However we would anticipate the majority of infrastructure competition (incumbent and alternative) is likely to focus on non-cable areas, where the greatest market share opportunities lie.

FIGURE 1

Assessing Wholesale-Only Opportunity

	Cable Infra	FTTH Fibre	Disruptive Stakeholders	Retail support	Risk
Italy	None	Low	Enel	High	High
UK	Medium	Low	-	High	High
Germany	High	Low	Local carriers	Medium	High
Switzerland	Medium	High	Utilities	Low	Medium
France	Medium	Medium	-	Medium	Low
Spain	Medium	High	-	Low	Low
Netherlands	High	Medium	-	Low	Low
Belgium	High	Low	-	Low	Low
Portugal	Medium	High	-	Low	Low

Source: Barclays

Wholesale-only risks shifting risk/reward of heavy wholesale markets

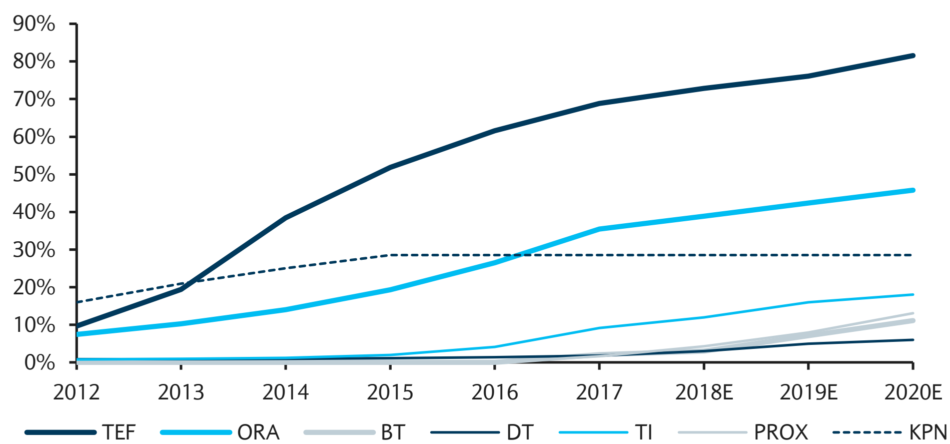
We see "Wholesale-only" providers potentially shifting the risk-reward profile for FTTH investment in Europe, principally in markets like the UK and Germany where there is a heavy reliance on the incumbent for wholesale access, and a lack of existing FTTH infrastructure. It is here where incumbents such as BT/DT have struggled to make the FTTH business case work, largely because they assess the FTTH investment against the value of the copper revenue annuity in a way that Wholesale Only does not have to. As such an acceleration of FTTH investment looks virtually inevitable in our view, but expectations of "incremental returns" for FTTH investments look unlikely to be realised. However, not investing, although having a limited impact on near-term FCF, runs the risk of ceding market share (and value). We would not expect material EU Cable overbuild, as this would clearly reduce the wholesale market opportunity.

Is there a way out (other than accelerating FTTH build)?

We look at examples of Ireland (where Incumbent lost out in government FTTH bid) and also New Zealand, where there is clear FTTH build post structural separation, although value creation is yet to occur, with unintended consequences (accelerated hard Fixed-Mobile substitution, and Chorus trading on 6x EV/EBITDA). Accelerating incumbent FTTH build is one potential route to avoid overbuild. At some point we expect the structural separation debate to increase, especially where the tension between alternative FTTH builders and willing service providers potentially undermines the incumbent's own FTTH investment.

FIGURE 2

European Telcos: Incumbent FTTH rollout (% of HHs covered)



Source: Company data, Barclays Research estimates

Stock implications

- **Telecom Italia (EW, €0.95c) – Most exposed incumbent to Wholesale-only, but we believe this is reflected in forecasts**. Telecom Italia is clearly the most exposed to the development of wholesale only competitors given Open Fiber momentum, although we do see this largely captured in our and consensus estimates. As such we expect fixed revenues to remain stable to slightly positive despite the pressure on wholesale. We also see the investment case on TI set to be dominated near term more by governance/ownership issues with Vivendi/Elliott than alternative Fibre build.

- **BT (Downgraded to EW, 280p price target) – Next incumbent likely to see impact of wholesale-only, which we believe is not currently reflected in forecasts.** We note that rollouts to date have been few and far between, but new ownership of CityFibre should change this and we see key stakeholders (broadband service providers, mobile network operators and government/regulator) all keen to see the alternative FTTH build model succeed, creating infrastructure competition for BT. We reduced our estimates, price target and rating accordingly, and see a rising overhang for the shares despite valuation support – see *Wholesale-Only overhang* (3 May 2018).

- **TalkTalk (EW, 130p PT) – Alternative infrastructure cuts both ways**. The rising significance of FTTH in the UK and associated alternative build should be a clear positive for TalkTalk (or at least reduction of a negative) as it brings to bear TalkTalk's retail (and wholesale) scale, with 16% market share. TalkTalk is also investing in FTTH, with 3m homes targeted with Infracapital. The offset is potentially increased retail competition, mostly from mobile operators whose barrier to entry is falling.

- **Iliad (OW, €225 PT) – French margin tailwinds, Italy optionality**. Iliad has co-invested with Orange in FTTH build – To date we are seeing the elevated capex to achieve this, but as fibre gains momentum (50% of broadband gross adds will take Fibre in 2018), this creates a margin tailwind for Iliad that should be visible in 2H18 and beyond. In Italy, the rise of Open Fiber as alternative FTTH infrastructure creates in our view longer-term optionality for Iliad, with its imminent Italy mobile launch.

- **TEF DE (Upgraded to OW, €4.7 PT) – Increased optionality from Wholesale-only**. We see TEF DE as a potential beneficiary of renewed fixed infrastructure competition from wholesale-only as it brings more opportunities to offer a fixed line product, in addition to the current FWA (fixed wireless access) strategy as network quality improves post E-Plus integration. Please see our note published today in which we upgraded TEF DE to OW as we are more constructive on its mobile outlook – *Inflection ahead – upgrade to OW* (3 May 2018).

- **1&1 Drillisch (OW, €75 PT) - Increased optionality from Wholesale-only.** As with TEF DE above, we see Wholesale-Only creating optionality for 1&1 Drillisch, with c13% of retail broadband, 8% of mobile, and parent company 1&1 Versatel well equipped to co-invest in FTTH should the opportunity arise.

- **Vodafone (OW, 265p PT) – Creates UK and Italy Fixed opportunity, Germany less clear**. The perceived lack of convergence for Vodafone (vs corresponding incumbent strength) has been a consistent overhang for Vodafone over the past few years despite significant investments (inorganic and organic). We see Wholesale-Only in Italy/UK providing a solid platform with which to take Fixed market share. Vodafone has consistently added c240-340k fixed broadband net adds per quarter over recent periods, and we see that increasing over the coming 2-3 years. In Germany we would see limited risk of alternative overbuild in Cable areas.

Wholesale-Only - Open Fiber (Italy) in focus

Open Fiber is the highest profile Wholesale-Only infrastructure operator in Europe, with plans to build an extensive FTTH network in Italy. Open Fiber is a private company and is not under our coverage. It is 50%-owned by Enel, which is covered by Catherine Hubert-Dorel. We include analysis of Open Fiber in this report given its recent high-profile success in the area of telecom infrastructure and given the implications we see for our stock coverage. Open Fiber will rely on established third party service providers (local broadband and mobile operators) to drive the business case. On 13th April 2018 Open Fiber indicated that it had secured financing for its investment plan, lifting one uncertainty about the project. We recently met with Open Fiber management and the company appears to be fully on track to deliver an acceleration of FTTH roll-out in the next three years; we estimate it will pass c.2.5m homes per year and reach close to 10m homes by YE2020. Open Fiber has secured wholesale deals with Vodafone and Wind Tre and we see a clear path to monetize these investments.

Open Fiber - A credible business model

The plan: c. 19m homes passed by 2022-2023

Open Fiber – Utility focus, leveraging existing assets

Open Fiber is rolling out a Fiber To The Home network in Italy. Open Fiber is the result of the combination of two assets. First, Enel Open Fiber was created by Enel, the incumbent Italian electricity and gas utility in Q4 2015. The project was to roll out a FTTH network by leveraging the infrastructure of Enel, notably its ducts. Enel Open Fiber was then combined with Metroweb, a telecom network operator that had already rolled out FTTH in a limited number of Italian cities (notably Milan) and that belonged to Grupo Cassa Depositie Prestiti (CDP). CDP is a large state-owned financial institution with its mission being to support the Italian economy as a lender and investor. Today CDP and Enel are 50/50 co-owners of Open Fiber.

Open Fiber plans to cover 18.8m households (i.e. c. 66% of total Italian households) with FTTH (1Gbps speeds, <1.5ms latency) spread around 7,000 municipalities, deploying 150,000 km of fiber. The plan is expected to be achieved by 2022-2023. Open Fiber is deploying its network in two areas:

- 271 cities located in dense areas that represent around 10m households and 60% of the Italian population. These areas are called the A and B areas.
- Around 6,700 cities in non-dense areas that represent around 9.3m households in the so-called C and D areas. In these areas Open Fiber will benefit from c. €3bn of public subsidies and has a concession granted by Infratel until 2037.

Open Fiber has communicated on a regular basis when it started to roll out its network in a number of cities. This illustrates well its gradual ramp-up, and we note the large announcement for Rome that was made at the end of 2017.

Low capex per homes passed

Open Fiber is targeting a cost of €250 per home passed

Open Fiber has indicated that the cost per home passed is around €300 for the horizontal part and could come down to €250 over time. This is low in a European context where the cost of the horizontal part can be multiples of the cost of Open Fiber. Open Fiber leverages the existing electricity distribution network of Enel, which covers c.85% of Italy's population as some of this existing infrastructure can be re-utilised. Enel has 1m street cabinet's vs 150k for TI. This is particularly relevant in C & D areas.

- **In large cities, Open Fiber uses municipalities' public lighting infrastructure, which are obliged to give access**. Municipalities can charge, or give access for free and typically do as they try to facilitate the roll-out of FTTH. Telecom Italia also provides access to ducts and pools, which are regulated. Finally, OF has also signed a deal with a

Roman electricity company (ACEA) to access its ducts in exchange for providing fibre to the company.

- **In areas such as Milan where there are a number of buildings with multiple floors (more than 12), Open Fiber builds the verticals**. Where there are fewer than 12 floors, OF wait for the first customer order before building vertical.

- **Open Fiber highlights that Metroweb brings valuable know-how** developed over many years as it deployed fibre in Milan and some other cities. In 2017 Open Fiber had 6,000 active workers and it had 7,000 in April 2017. Open Fiber expects this to increase to 15k in 2018.

- **Open Fiber expects total capex to be €6.5bn**, of which €1.4bn is from Infratel, so net capex for Open Fiber is €5.1bn, of which €4.4bn by 2022. We note that there is €3.0bn of public funding (€0.35bn from the regions), which could be already included in the Infratel capex figure.

Solid retail partners deliver good take-up rate

Open Fiber has a solid list of retail partners – Mobile operators and broadband providers

Open Fiber's business model is to wholesale its infrastructure to retail partners. The main partners are Vodafone and Wind Tre. At YE 2017, Vodafone had a broadband customer base of 2.4m, Wind Tre of 2.4m.

In Milan there are 800k homes passed and the take-up rate has been 50%, which Open Fiber believes is a reasonable target for the project. Roll-out in the new areas is going well, with some cities reaching a 10% take-up rate in one year. Specifically Perugia/Calgari/Palermo are progressing very well. In Calgiari, Open Fiber notes that Tiscali has been very active with a street-by-street marketing approach. This has enabled Tiscali to migrate its own ADSL-based customers but also to gain market share. Open Fiber also notes that WIND is willing to start commercialising its product at lower levels of penetration than Vodafone, so take-up is progressing faster in the areas where it is stronger.

Uptake is accelerating. Back in September Open Fiber indicated it had reached 320k subs. In Q3 2017 there was an average of 6k orders/week, of which 50% were activated (rest is backlog - can do 50% inside a 20-day Service Level Agreement). The target is to reach 80% order activation - hence 12k/week connections. Open Fiber expects to more than double the current run rate of additions once there is a higher level of completion. It is only convenient for operators to push the product once you have c. 50-60% completion. The company claims provisioning is quicker than TI, with 80% done inside 18 days.

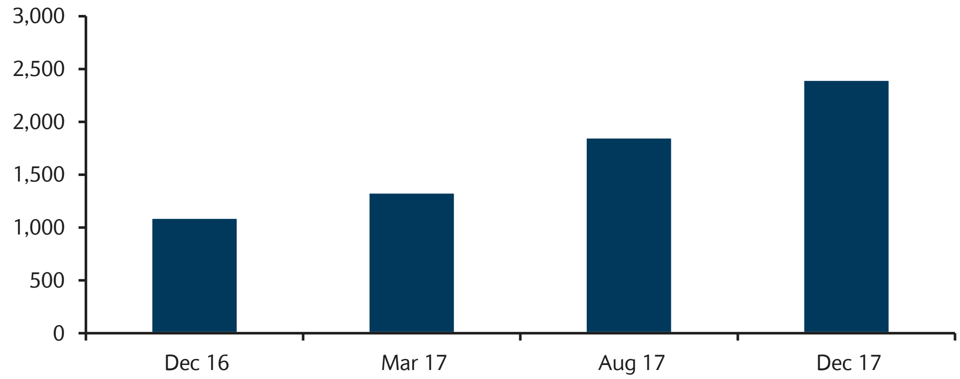
Financing and retail partners secured

- **On April 13, Open Fiber announced it had secured €3.5bn of project financing from Societe General, BNP Paribas and Unicredit for a 7-year duration**. This financing matches the peak funding need that the company had guided to at a presentation to investors in September. This lifts one uncertainty over the project and in our view validates the business plan. This financing will be made available once the EIB has given its authorisation.

- **Since the beginning of the year Open Fiber has extended its commercial agreement with Vodafone to 271 cities, in line with the deal it signed with Wind Tre in September 2017.** This basically covers 10m households in the dense areas (so called A and B areas) and c. 60% of the Italian population.

- **At YE 2017, Open Fiber had 2.4m homes passed, up from 1.9m at end of August 2017, suggesting a rollout rate of c. 30k per week**. Vodafone indicated that around 1.9m of these homes were marketable: i.e. they were in areas where the rollout rate was above 50%, making it attractive to start commercialising the service.

FIGURE 3
Open Fiber coverage (k, households)



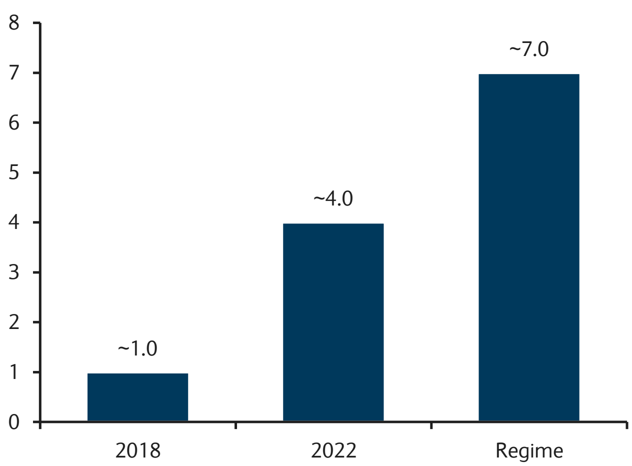
Source: Open Fiber

Financial targets

Open Fiber targets 7m customers longer term

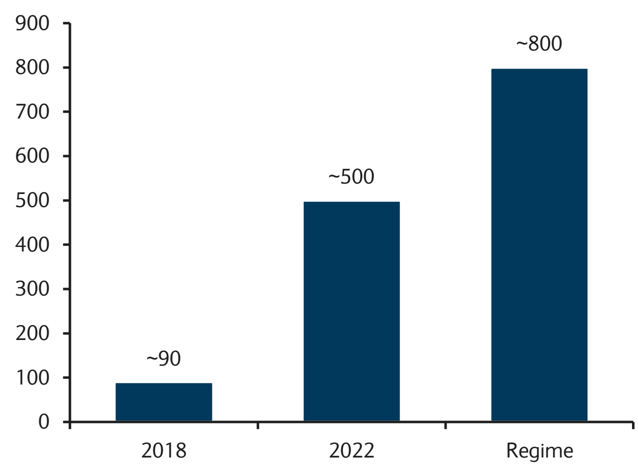
Back in September 2017 Open Fiber indicated that it expects 1m users by YE 2018, 4m subscribers by YE 2022 and 7m long term. Open Fiber assumes no loss of customers from TI to Open Fiber - hence it sees its plan as conservative. Combination of Passive and Active: End price of €12/mth for a passive service declines to €9/mth with volume discounts and €15/mth to €13/mth for active. There is also an activation fee. There is a revenue share model with the Italian government – the government spends €2.7bn and at the end of 20 years, the government will take ownership of the Infratel areas. Open Fiber expects €90m EBITDA by 2018, €500m by 2022 (75% EBITDA margin), and €800m eventually. Peak funding needs are estimated at €3.5bn and capex of €5.1bn for the whole project.

FIGURE 4
Open Fiber: Users expected (m)



Source: Company presentation, Barclays Research

FIGURE 5
Open Fiber: EBITDA projections (€m)



Source: Company presentation, Barclays Research

Infratel explained: Half of the households to be covered by Open Fiber

Open Fiber – Urban and Rural model: Infratel in focus in rural areas where Open Fiber is winning contracts

Infratel is the telecoms' in-house division of the Ministry of Economic Development. Infratel is focussed on areas where other operators will not roll out fibre and will not do so for the next three years (the so-called market failure areas, or areas/clusters C and D). Currently, Italy has 22% coverage of over 30Mbps broadband internet whereas the EU average is 64% coverage. For speeds of over 100Mbps, Italy has 2% coverage vs. the EU average of 6%. In the October 2015 *public consultation*, Infratel presented the regions in which there was a gap to reach the EU 2020 objective of 100% population internet coverage with a 30Mbps speed. The focus is on the so-called clusters/areas C and D that represent more than 10m households spread over c. 7,000 cities.

FIGURE 6
Italian regions

Cluster/Area	Cities	Households - 000s
A	15	4,048
B1	480	7,338
B2	638	3,542
C	2,666	6,326
D	4,289	4,048
Total	**8,092**	**25,302**

Source: Infratel, Istat, Barclays estimates

To ensure that these regions are covered, Infratel set up a concession model whereby it gives to private operators the right to operate and invest in these regions for 20 years, i.e. until 31/12/2037. State and regional subsidies are also granted as detailed below in Figure 7.

FIGURE 7
Infratel auctions

Auction	Close Date	Winner	Regions	Population (000s)	Households & SMEs (000s)	Cities	Subsidies (EURm)
1st	18/07/2016	Open Fiber	6 *	6,500	4,600	3,000	1,752
2nd	30/09/2016	Open Fiber	11 **	6,700	4,700	3,710	1,250
3rd	2018		3 ***	378	296	882	103
Total OF				**13,578**	**9,596**	**7,552**	

Notes: *Abruzzo, Molise, Emilia Romagna, Lombardia, Toscana, Veneto. **Piemonte, Valle D'Aosta, Liguria, Friuli Venezia Guilia, Trento, Marche, Umbria, Lazio, Campagna, Basilicata, Sicilia. ***Sardegna, Calabria, Puglia ****EUR1.4bn of State funds + €0.35bn of regional funds. Source: Infratel, Open Fiber, Telecom Paper, Barclays Research

Open Fiber has won the first two auctions for an undisclosed amount. A third auction for 3 regions has been announced in April 2018 and Open Fiber will be looking at whether or not it considers the conditions to be attractive.

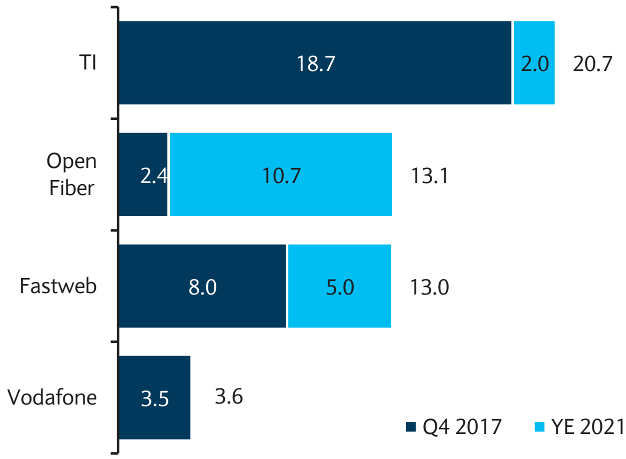
Italy's Fixed NGN landscape: A three-player market

TI is the leader in terms of FTTx networks with c.75% coverage of households at end-2017. The second-largest player is Fastweb with 32% coverage, followed by Vodafone at 14%.

We expect TI to remain the largest FTTx operator with c. 80% coverage planned for 2020. Fastweb had indicated plans to reach c.50% by 2020 but seems to be more focused on upgrading its FTTC network to FTTH in the short term. Open Fiber has indicated plans for 18.8m, i.e. for 2022e including the Infratel concession areas in areas C and D.

FIGURE 8

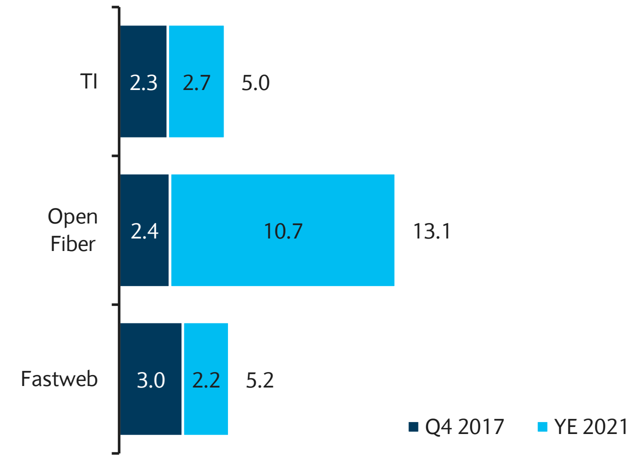
Number of households covered by FTTx, own build (m)



Source: Barclays Research estimates, company data

FIGURE 9

Number of households covered by FTTH, own build (m)



Source: Barclays Research estimates, company data

Open Fiber to become the largest FTTH player in Italy?

With regards to FTTH coverage, Open Fiber should be the largest player in Italy since all its deployment is planned to be on FTTH, unlike peers. TI would be a distant third – the company has guided for 4.0m households in 2019 (in the figures below, we assume it grows coverage to 5.0m households by 2021). Fastweb is targeting 5.0m households in 2020 (we assume 5.2m in 2021). TI and Fastweb have set up a joint venture named 'Flash Fiber' that is 80% owned by TI and 20% by Fastweb and that will invest in FTTH together in 3m households The plan is to develop the secondary and vertical segments of the FTTH network in 29 cities (excludes Milan and areas already covered by the two parties before the deal). The target is 3m households for a capex of €1.2bn (i.e. €400 per home). As part of the deal, TI bought 650k FTTH connections from Fastweb, for €200 per unit.

Wholesale-Only – Making the business model work

The above section laid out what Open Fiber is rolling out, how it is financed, and the business model on which it is based. But is the Wholesale Only model a viable standalone business? After all, most EU incumbents attest that having the retail customer base as well as the network creates an "anchor tenant" advantage, as they can bring 30-40% of market broadband customers "on-net" immediately. Cable operators have also shown limited enthusiasm for engaging with service providers, therefore limiting the potential market opportunity. The early evidence from Open Fiber above would indicate clear momentum with positive proof points. In this section we dive into the critical factors needed to make Wholesale-Only work, and we look at which EU markets we believe could foster this approach.

What are the critical success factors?

We see a number of critical success factors for making "Wholesale Only" work.

- **Level of Cable infrastructure and incumbent FTTH build.** This is key to assessing the size of the market opportunity, and level of wholesale competition. In our view, the less competing infrastructure increases the opportunity for a Wholesale Only provider.
- **Having the right partners.** This is key to facilitating the new Fibre network build, managing political/regulatory relationships, and reducing unit cost of delivery.
- **Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure.** This is key for driving high on-net penetration – The greater the number of potential retail partners, the greater the market opportunity.

Open Fiber – A perfect storm?

In this case, we believe Open Fiber has a "perfect storm" in which to operate.

- First of all in Italy there is no cable infrastructure, which increases the wholesale opportunity for Open Fiber compared to other markets. *Italy here is in stark contrast to, say, the Netherlands, which has c50% of broadband customers on Cable networks – this would limit penetration of a wholesale-only model to 50%, and even lower if the incumbent did not migrate its customers).* In addition, Telecom Italia has only rolled out FTTH to 2.3m households, with FTTC at 18.7m.
- Secondly, Open Fiber has Enel as a key partner and stakeholder. Enel has: 1) the duct infrastructure with which to facilitate FTTH build, 2) clear political know-how, and also 3) potentially a retail customer base with which to be a potential eventual customer.
- Thirdly, Vodafone and WIND (plus others) have been heavily reliant on Telecom Italia for wholesale access for years. Vodafone has stated that churn/service delivery is higher on Telecom Italia infrastructure than on its own. Both companies have been clear supporters of the Open Fiber build, and have the potential to add material numbers of customers.

The above clearly demonstrates that having limited infrastructure competition, and delivering cost-effective execution on the network plus having the right partners to drive penetration are key to success.

Below we lay out a generic model for a wholesale-only provider for 1m homes.

- We assume capex per home of €500 (excluding vertical build).
- We assume €15/month wholesale ARPU, assume that the €100/home vertical capex is offset by one-off customer connection fee.
- We assume 50% penetration rate within 5 years for each element of the rollout.

This provides long-term FCF of €77m/year (pre tax), and c€500m peak funding.

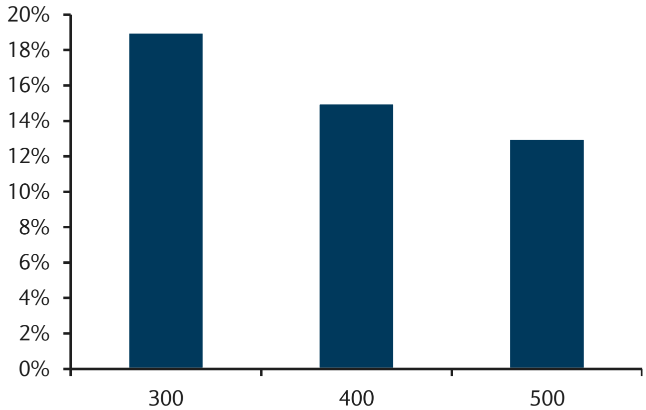
FIGURE 10
Wholesale –Only – Generic Business Model (€m)

FTTH	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Homes passed	**200**	**400**	**600**	**800**	**1,000**	**1,000**	**1,000**	**1000**	**1000**	**1000**	**1000**
Net Adds	200	200	200	200	200	-	-	-	-	-	-
Capex/Home Passed	500	500	500	500	500	500	500	500	500	500	500
Connection Capex/Home	100	100	100	100	100	100	100	100	100	100	100
Horizontal Capex	100	100	100	100	100	0	0	0	0	0	0
Vertical Capex	0	2	4	6	8	10	8	6	4	2	0
Capex	**100**	**102**	**104**	**106**	**108**	**10**	**8**	**6**	**4**	**2**	**-**
Uptake - Percentage											
Year 1 Build		10%	20%	30%	40%	50%	50%	50%	50%	50%	50%
Year 2 Build			10%	20%	30%	40%	50%	50%	50%	50%	50%
Year 3 Build				10%	20%	30%	40%	50%	50%	50%	50%
Year 4 Build					10%	20%	30%	40%	50%	50%	50%
Year 5 Build						10%	20%	30%	40%	50%	50%
Uptake - Homes											
Year 1 Build		20	40	60	80	100	100	100	100	100	100
Year 2 Build			20	40	60	80	100	100	100	100	100
Year 3 Build				20	40	60	80	100	100	100	100
Year 4 Build					20	40	60	80	100	100	100
Year 5 Build						20	40	60	80	100	100
Total		**20**	**60**	**120**	**200**	**300**	**380**	**440**	**480**	**500**	**500**
Penetration		5%	10%	15%	20%	30%	38%	44%	48%	50%	50%
ARPU		**15.0**	**15.0**	**15.0**	**15.0**	**15.0**	**15.0**	**15.0**	**15.0**	**15.0**	**15.0**
ARPU Revs		4	7	16	29	45	61	74	83	88	90
Connection Revenues		2	4	6	8	10	8	6	4	2	-
Revenues		**6**	**11**	**22**	**37**	**55**	**69**	**80**	**87**	**90**	**90**
Gross Profit		-	4	15	26	41	55	66	75	79	81
Margin (%)		0.0%	50.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
EBITDA	**(40)**	**(40)**	**-**	**20**	**32**	**48**	**60**	**69**	**74**	**77**	**77**
Margin on ARPU Revs (%)		N/M	N/M	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
FCF	**(140)**	**(142)**	**(104)**	**(86)**	**(76)**	**38**	**52**	**63**	**70**	**75**	**77**

Source: Barclays Research estimates

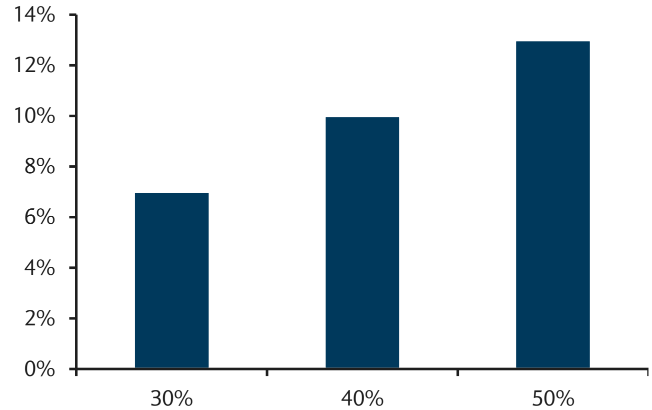
In our base case we estimate an IRR of 13% (assuming a 25% tax rate). For €400/home capex the IRR rises to 15%, and 19% for €300. If we assume 40% take-up the IRR falls to 10%, and 7% for 30% take-up.

FIGURE 11
Wholesale-Only: IRR - Flexing Cost Per Home (€)



Source: Barclays Research estimates

FIGURE 12
Wholesale-Only: IRR - Flexing Penetration (%)



Source: Barclays Research estimates

Modelling Open Fiber

Based on the information disclosed by Open Fiber, in the figure below we provide an operating model of the company in order to assess the attractiveness of the Wholesale-Only model. What we show below is in line with the company's stated targets in terms of network rollout, subscribers, ARPU, EBITDA and Capex.

FIGURE 13

Open Fiber modeling assumptions, based on company information

	2016	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e	....	2037e
KPIs											
Total households - 000s	28,600	28,657	28,715	28,772	28,829	28,887	28,945	29,003	29,061		29,826
Households covered/Completed - 000s	1,095	2,400	4,800	7,550	10,300	13,050	15,800	18,350	18,450		19,750
Net adds - 000s		1,305	2,400	2,750	2,750	2,750	2,750	2,550	100		100
Total penetration - %	3.8%	8.4%	16.7%	26.2%	35.7%	45.2%	54.6%	63.3%	63.5%		66.2%
Take out rate - %		20.8%	20.8%	23.2%	24.3%	24.9%	25.3%	25.9%	29.8%		40.5%
Customers - 000s	180	500	1,000	1,750	2,500	3,250	4,000	4,750	5,500		8,000
Customers average - 000s		340	750	1,375	2,125	2,875	3,625	4,375	5,125		7,950
Customer mix											
Customers average - 000s		**0**	**15**	**55**	**128**	**230**	**363**	**656**	**1,025**		**4,770**
% on passive		**0%**	**2%**	**4%**	**6%**	**8%**	**10%**	**15%**	**20%**		**60%**
Customers average - 000s		0	15	33	77	138	218	394	615		2,862
% on discount		0%	2%	2%	4%	5%	6%	9%	12%		36%
Customers average - 000s		0	0	22	51	92	145	263	410		1,908
% on tag price		0%	0%	2%	2%	3%	4%	6%	8%		24%
Customers average - 000s		**340**	**735**	**1,320**	**1,998**	**2,645**	**3,263**	**3,719**	**4,100**		**3,180**
% on active		**100%**	**98%**	**96%**	**94%**	**92%**	**90%**	**85%**	**80%**		**40%**
Customers average - 000s		170	368	660	999	1,323	1,631	1,859	2,050		1,590
% on discount		50%	49%	48%	47%	46%	45%	43%	40%		20%
Customers average - 000s		170	368	660	999	1,323	1,631	1,859	2,050		1,590
% on tag price		50%	49%	48%	47%	46%	45%	43%	40%		20%
ARPU average - €		**14.0**	**13.9**	**13.8**	**13.8**	**13.7**	**14.0**	**13.8**	**13.6**		**12.8**
On passive											
% on discount	9	9	9	9	9	9	9	9	9		10
% on tag price	12	12	12	12	12	12	12	12	12		13
On active											
% on discount	13	13	13	13	13	13	13	13	13		14
% on tag price	15	15	15	15	15	15	15	15	15		16
Activation fee - €		50	50	50	50	50	50	50	50		50

Source: Open Fiber, Barclays Research

FIGURE 14

Open Fiber – Financials, based on company statements

€m	2016	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e	....	2037e
Wholesale service revenues		57	125	228	351	473	610	726	839	927	1,222
Activation fee		16	25	38	38	38	38	38	38	25	5
Other revenues			0	0	0	0	0	0	0	0	0
Total revenues		**73**	**150**	**266**	**389**	**510**	**648**	**764**	**876**	**952**	**1,227**
Change yoy - %			105%	77%	46%	31%	27%	18%	15%	9%	1%
Opex		50	60	85	117	143	148	183	219	248	346
Change yoy - %			20%	42%	37%	22%	3%	24%	20%	13%	1%
EBITDA		**23**	**90**	**181**	**272**	**367**	**500**	**580**	**657**	**705**	**881**
Change yoy - %			289%	101%	50%	35%	36%	16%	13%	7%	1%
EBITDA margin		31.6%	60.0%	68.0%	70.0%	72.0%	77.2%	76.0%	75.0%	74.0%	71.8%
D&A		-39	-59	-82	-104	-127	-154	-176	-178	-180	-200
EBIT		**-16**	**31**	**99**	**168**	**240**	**346**	**405**	**479**	**525**	**681**

Note: All financial line items above are as provided by Open Fiber, per the company's stated targets in terms of network rollout, subscribers, ARPU, EBITDA and Capex.
Source: Open Fiber, Barclays Research

FIGURE 15
Open Fiber announcements to date

Region/City	Date	Homes targeted 000s	Target date	Capex - €m	Capex per HH - €
Catania	19/06/2016	115,000	Dec-18		
Cagliari	24/10/2016	66,000	Dec-18		
Padova	19/12/2016	116,000	Dec-18	30	259
Palermo	19/01/2017	224,000	Apr-19	90	402
Perugia	25/01/2017	80,000	May-17	20	250
Matera	28/03/2017	19,000	Dec-18	7	368
Novara	07/04/2017	38,000	Dec-18	19	500
Bari	14/04/2017	120,000		40	333
Venezia	03/05/2017	120,000	Jun-18	40	333
Novara	10/05/2017	38,000	Dec-18	16	421
Napoli	15/05/2017			100	
Genova	23/05/2017			60	
Ravenna	25/05/2017	58,000	Dec-18	20	345
Emilia Romagna		70% of city	Sep-18	503	
Parma	21/06/2017	30,000	Dec-18	20	667
Siracuse	23/06/2017	40,000	Dec-18	14	350
La Spezia, Savona, Sanremo, Imperia, Chiavari				40	
Milano - suburbs	25/07/2017	1,100,000		70	
ow Sondrio	25/07/2017	8,000	Jan-18	3	375
ow Pavia	25/07/2017	29,000	Jan-19	10	345
Treviso	02/08/2017	32,000	Jan-19	11	344
Torino - suburbs	22/08/2017	132,000		40	303
Sassari	19/10/2017	44,000	Mar-19	15	341
Pisa	30/10/2017	35,000	Mar-19	12	343
Grosseta	02/11/2017	29,000	Mar-19	10	345
Vercelli	03/11/2017	14,000	Mar-19	5.5	393
Varese	13/11/2017	31,000	Apr-19	12	387
Salerno	16/11/2017	44,000	Apr-19	15	341
Lecce	22/11/2017	35,000		12	343
Treviso	30/11/2017	32,000		11	344
Udine	06/12/2017	40,000	May-19	15	375
L'Aquila	13/12/2017	23,000	Apr-19	8	348
Matera	20/12/2017	19,000	Jun-19	7	368
Ferrara	21/12/2017	52,000		18	346
Roma	12/01/2018	1,200,000		375	313
Alessandria	25/01/2018	34,000	Jan-19	12	353
Piacenza	02/02/2018	39,000	Jun-19	14	359
Busto Arsizio	20/02/2018	29,000	Aug-19	10	345
Total		**3,988,000**		**1,202**	**362**

Source: Open Fiber

Implications for incumbent FTTH strategy

We see "Wholesale-only" providers such as Open Fiber potentially shifting the risk-reward profile for FTTH investment in Europe, principally in markets like the UK and Germany where there is a heavy reliance on the incumbent for wholesale access, and a lack of existing FTTH infrastructure. It is here where incumbents such as BT/DT have struggled to make the FTTH business case work, largely because they assess the FTTH investment against the value of the copper revenue annuity in a way that Wholesale Only does not have to, or they see limited demand and high roll-out costs. As such an acceleration of FTTH investment looks highly likely in our view, but expectations of "incremental returns" for FTTH investments look unlikely to be realised. However, not investing, although having a limited impact on near-term FCF, runs the risk of ceding market share (and thus future value).

Summary of EU-wide risks

We rank each of the key EU markets by the state of its current infrastructure competition and also by the "risk" of this infrastructure changing/deteriorating. The UK and Germany stand out as markets with clear alternative infrastructure risk, unless DT/BT accelerate FTTH builds. Orange does have competitive build but the outlook is certain, with limited headwinds. Spain/Portugal has vibrant infrastructure competition already and is unlikely to worsen, and we deem Belgium/Netherlands risk to be very low. For EU Cable, the concept of wholesale-only clearly presents a potential risk. However we would anticipate the majority of infrastructure competition (incumbent and alternative) is likely to focus on non-cable areas where market share opportunities clearly lie.

FIGURE 16

Assessing Wholesale-Only Opportunity

	Cable Infra	FTTH Fibre	Disruptive Stakeholders	Retail support	Risk
Italy	None	Low	Enel	High	High
UK	Medium	Low	-	High	High
Germany	High	Low	Local carriers	Medium	High
Switzerland	Medium	High	Utilities	Low	Medium
France	Medium	Medium	-	Medium	Low
Spain	Medium	High	-	Low	Low
Netherlands	High	Medium	-	Low	Low
Belgium	High	Low	-	Low	Low
Portugal	Medium	High	-	Low	Low

Source: Barclays

After Italy, UK/Germany most at risk from Wholesale-Only model

Fibre Wars – UK/Germany were supposed to drive higher returns through higher wholesale revenues

In our report *Fibre Wars: Quantifying fibre upside*, 16 June 2016, we analysed in detail the different incumbent strategies for FTTx and drew the below broad conclusions:

a) **Markets without mature wholesale arrangements** (Spain/Portugal/Italy) would likely suffer from significant competitor overbuild, which would increase retail competitive intensity,

b) **Markets with mature wholesale arrangements** (UK/Germany) would see lower FTTH build and more of a VDSL/g.fast focus, which would provide tailwinds for EU incumbents' wholesale revenues, and drive retail ARPU inflation

c) **The France co-investment** would be somewhere in the middle of this.

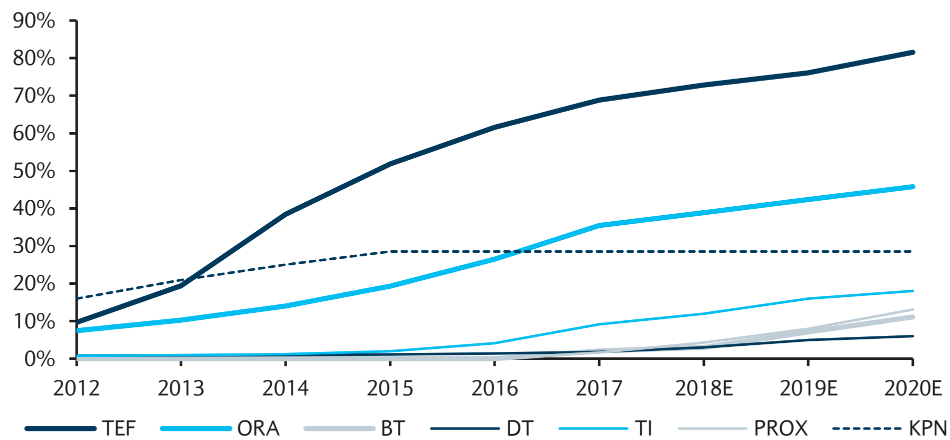
Two years on, we have indeed seen continued overbuild in Spain, Portugal and Italy, with associated elevated competition. France has seen steady FTTH build as predicted, with consistently strong co-investment support. In both these cases there has been no real evidence of a resulting retail Fibre ARPU premium. In the heavy wholesale markets of UK/Germany we have seen limited FTTH build, and we have seen wholesale and retail Fibre tailwinds (VDSL-led) as penetration increased significantly – Our FibrEconomics theme *BT Group PLC: FibrEconomics returns* (03 April 2017) showed a significant achieved wholesale tailwind from VDSL take-up. What we did not expect was that in UK/Germany, incumbent FTTH rollout delays and reliance on VDSL/g.fast would encourage (and in fact incentivise) alternative infrastructure build.

UK risk appears greater than Germany due to lower cost to build

We note, however, that Open Fibre estimates a cost for the horizontal of c€300, moving towards €250 over time, with economic benefit (i.e. saving) from using Enel/Municipality infrastructure. In the UK, BT/CityFibre indicate a cost of c£400-500 for the horizontal. In Germany the cost is estimated to be >€1,000 for the horizontal, which would necessitate both subsidies and municipality co-operation to make the business model work.

FIGURE 17

European Telcos: Incumbent FTTH rollout (% of HHs covered)



Source: Company data, Barclays Research estimates

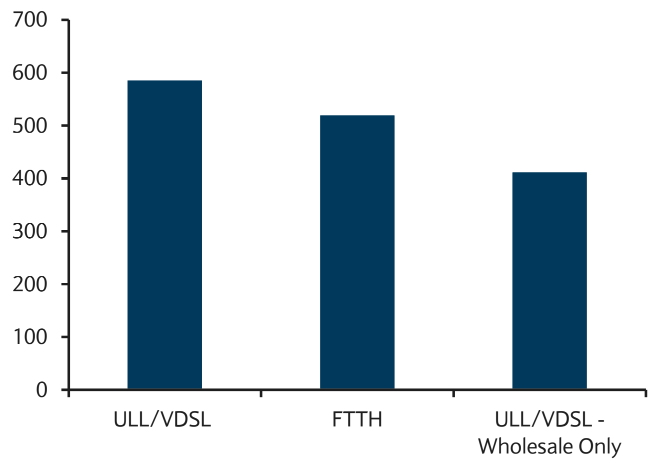
Wholesale-only risks changing the risk/reward of FTTH

The issue facing both BT and DT is that they clearly struggle with the business case for FTTH. This is partly because the annuity value of the legacy ULL (copper) and VDSL (FTTC) revenues is so strong, making the incremental value required from FTTH very high, without major regulatory support (which is typically lacking). Also demand for FTTH is seen as limited and the cost of FTTH roll-out higher than in other countries. Here the EU had an opportunity to facilitate Fibre build, but has in our view continually failed to deliver. For more detail please refer to *Early thoughts on EC Framework Review: More carrots than sticks*, 19/09/16). For the incumbents the business case for FTTH is typically compared against "pushing copper harder", i.e. focusing on VDSL and other copper-based variants such as g.Fast. In the absence of competitor infrastructure build, this outcome would leave DT/BT in the position of rolling out FTTH on an incremental basis whilst trying to get key stakeholder buy-in (government, regulator, local authorities and service providers). The potential rise of the Wholesale-only model risks incumbents having an inferior network in areas where there is no FTTH, and increases the risk of those incumbents losing wholesale (and retail) customers.

We covered this in our detailed report *UK Fibre - playing the long game* (28 February 2018). In the note we analysed the NPV for incumbents of different Fibre strategies.

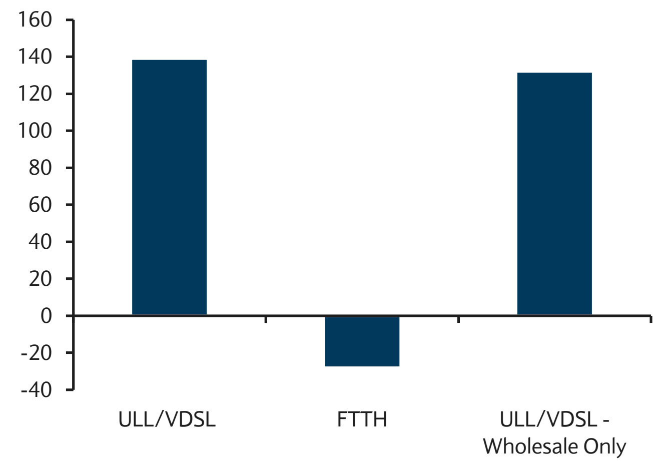
- **Base case scenario (ULL/VDSL focus, no FTTH) - Assume continued upsell of VDSL and G.fast.** We assume stable wholesale ARPUs (i.e. no major deflationary intervention from regulators). We assumed maintenance capex remains high (no copper switch-off). In this scenario EBITDA and OpFCF remain strong and grow over time.
- **FTTH scenario – With gradual copper switch-off.** We assume a £5/month wholesale premium, and see opex efficiencies due to copper switch-off. The NPV is lower than the base case above due to increased capex (£350/home passed plus £170/home connection). FCF is negative for 5 years in areas where Fibre is rolled out. *The outcome of this scenario is would clearly depend on many factors, as we covered in BT Group PLC: Openreach CEO for a Day (01 August 2017)*
- **ULL/VDSL + Wholesale-only scenario.** We would expect very limited impact on FCF compared to our base case over the first 5 years, as competitor build takes time to ramp. However, we assume 90% of homes on the incumbent network falls to 54% over 7 years, which implies an NPV c20% lower than the base case. *We conclude that investing in FTTH would have been a better outcome.*

FIGURE 18
NPV of Different FTTx Strategies (£m)



Source: Company reports, Barclays research estimates

FIGURE 19
OpFCF: Next 5 years for Different FTTx Strategies (£m)



Source: Company reports, Barclays research estimates

Eir – sobering anecdote from Ireland

The example of Irish incumbent Eir shows what is at stake, and how things can go wrong for an incumbent if they lose out in the shift towards (wholesale-only) fibre. Eir recently withdrew from bidding for the national broadband network deployment, taking the view that it's not going to deliver an efficient rollout of FTTH for Ireland. They believe it will be difficult for other bidders to ramp up and deliver against their commitments, but should the winning bidders deliver then Eircom will likely see its legacy fixed business diminish over time. Meanwhile, the winning bidders will use Eir ducts and polls to deliver their services, so there's still some return for Eir on their infrastructure assets, but presumably significantly below current returns.

The major overbuild risk is in non-Cable areas

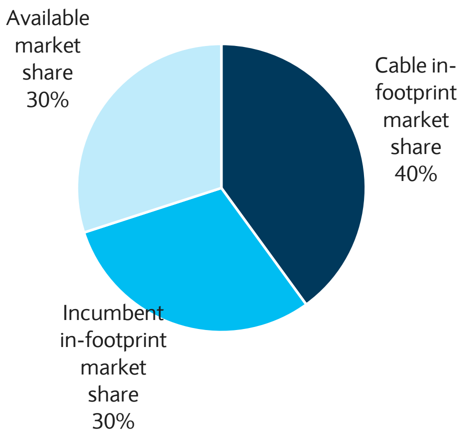
Earlier in this report we made the point that the Wholesale-only business model works best where there is low incumbent FTTH investment, and low Cable investment. Cable is likely to use its own infrastructure, and typically has a high in-footprint market share. Assuming the incumbent does not use the wholesale-only provider, the target market share is probably just 30%, not enough to make the maths work. Where there is no cable, however, the target market share is likely to be c60%, or maybe even higher should Cable operators now want to pursue an off-net strategy, and mobile operators move into broadband.

EU Cable looks well insulated

We do not imagine material alternative overbuild of Cable networks, largely due to the reasons above – that the addressable market is just not large enough, with exceptions being where there are very strong existing local brands/operators, such as Net Cologne or M-Net. As such, we see stocks such as Liberty Global and Telenet (both OW) having low downside risk from overbuild. Accelerating incumbent FTTH build (with associated service partners) would be a risk to retail market share, but this should be offset by ARPU gains due to focus on higher speeds.

FIGURE 20

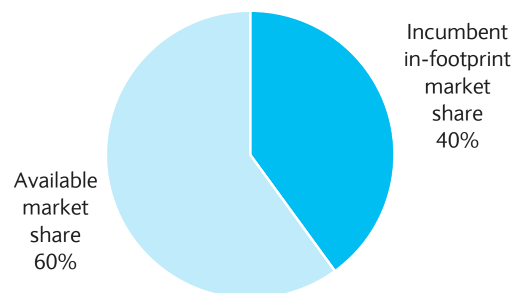
Wholesale-Only – Available market share in Cable areas



Source: Company reports, Barclays research estimates

FIGURE 21

Wholesale-Only – Available market share in Non-Cable areas



Source: Company reports, Barclays research estimates

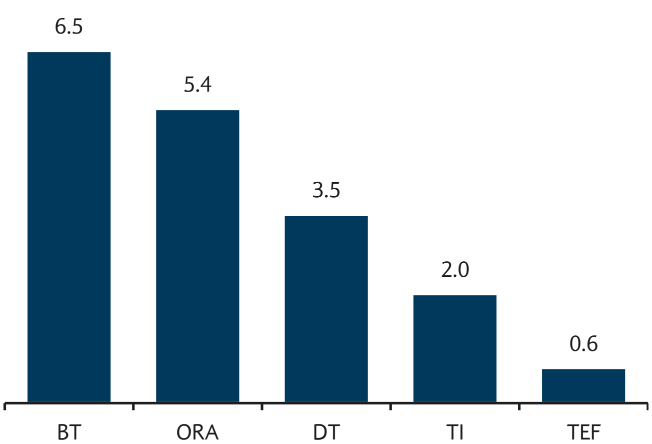
How can we quantify this risk?

There are three key risks to quantify for incumbents:

- **The wholesale revenue loss** to alternative providers such as Open Fiber,
- **The potential retail broadband market share loss** due to new entrants, and
- **The potential retail ARPU pressure** from increased retail competition.

FIGURE 22

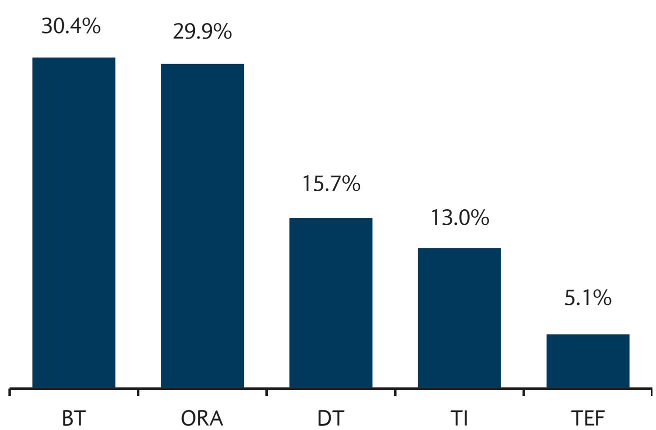
EU Incumbents: Wholesale Revenues (€bn)



Source: Company reports, Barclays research estimates

FIGURE 23

EU Incumbents: Wholesale as % of Domestic Revenues (%)



Source: Company reports, Barclays research estimates

Taking the UK as an example:

- **Wholesale loss.** If we assume there are 10m homes in the UK that see alternative FTTH build, and see BT's Openreach division losing 50% in-footprint market share, based upon an estimated Openreach wholesale ARPU of £11/month, this implies a c£650m revenue headwind, or c£450m EBITDA assuming a 70% gross margin. This is c20% of Openreach EBITDA (This is c30% of current consumer-related Openreach EBITDA). *As an aside, from the Openreach perspective, a greater loss of wholesale customers would be compensated near term by higher fees for remaining customers on copper – We would see this as unsustainable however.*

- **Retail risk – Market share and ARPU.** Losing 5pp of market share in this area is worth c£75m EBITDA, whereas each £1/month of Consumer ARPU (4%) across the UK as a whole is c£120m EBITDA. So £200m in total. In aggregate (wholesale plus retail), we calculate there is c10% of EBITDA at risk.

Is structural separation the answer?

EU incumbents could of course look to solve the issue of Wholesale-Only by separating their networks from the retail operations – structural separation. At some point we expect the debate around structural separation to increase, especially where the tension between alternative FTTH builders and willing service providers potentially undermines the incumbent's own FTTH investment. However, as we highlighted in *BT Group PLC: Lessons from New Zealand* (14 March 2018), New Zealand is often highlighted as a case study of how structural separation works, and drives FTTH rollout and penetration. Since 2011 separation, Chorus (NZ Openreach equivalent) now targets 87% FTTH coverage by 2022, has 42% penetration across the FTTH footprint, and an expected migration to a Utility-style RAB-based (Regulatory Asset Base) model post 2022 once the rollout is complete. The fans of structural separation point to Utility-style multiples (9-12x EV/EBITDA) compared to EU Telcos on 6-7x, and argue that a structurally separated network would face a lower regulatory burden (likely true), and greater incentive to invest (questionable in our view).

However, we note that creating structural separation is not without its risks. Incumbents make the point that having the network and retail customer base creates an anchor tenant which aids the business case. One significant side effect in New Zealand is accelerating hard mobile substitution (7% lines/year) as Chorus' customers look to optimize their costs (i.e. replace copper with owned mobile). Chorus also trades on c6x EV/EBITDA, far off regulated Utilities.

Stock implications

BT (Downgraded to EW, 280p price target)

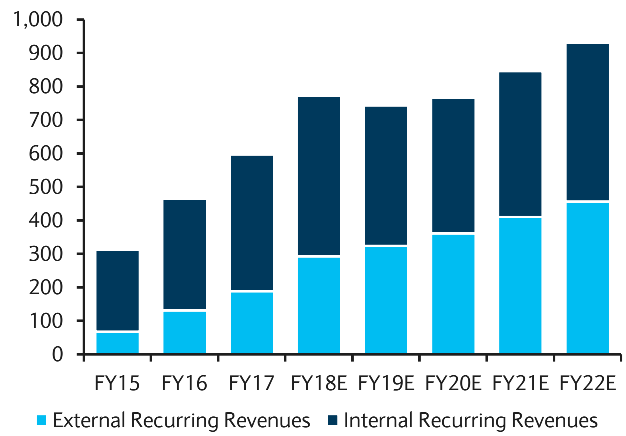
We see the rise of alternative Wholesale-only infrastructure providers as a negative for BT

We note that rollouts to date have been few and far between, but new ownership of CityFibre (EW, 50p) – The UK's largest alternative fibre infrastructure provider should change this. Not only does Wholesale-only undermine longer-term Openreach returns (as service providers migrate traffic onto alternative providers), it also opens up new competition and risks lower retail pricing, especially if the wholesale pricing is attractive relative to retail. We note headline UK retail VDSL/broadband tariffs of £30-40/month+ , BT Consumer ARPU of £41/mth (has risen +5%/year for past few years) and with FTTH wholesale rates of c£13-15/month from alternative FTTH builders it is hard to envisage a FTTH Fibre retail premium (Italy/France are already seeing this trend). On top of this, BT might have to accelerate FTTH investments without broad regulator/service provider support. As we highlighted in *UK Fibre - playing the long game* (28 February 2018), Openreach has yet to gather wide industry support for its FTTH rollout. We believe based on its recent public statements that UK communications regulator Ofcom is unwilling to change its current stance of enabling alternative infrastructure build, and that retail service providers (TalkTalk, Vodafone, other wholesalers – and even Virgin Media for its off-net) are in no hurry to sign long-term deals with Openreach, unless the wholesale price is attractive. Openreach has indicated a "value" premium of c£7/month for FTTH in a cutover model scenario, on top of the c£11-13/month already charged. Some of the £7/month could be lower opex – (i.e. this implies a wholesale price of at least £15/month, and possibly more). Openreach has 25m lines – Each £1/month is £300m/year EBITDA.

Price target cut 20% to reflect lower Consumer/Openreach estimates

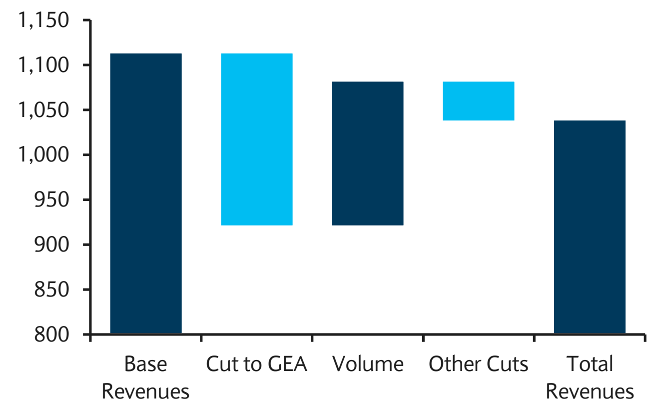
We changed our forecasts to reflect increased retail competition, price competition, and Openreach wholesale loss. Our FY20e/FY21e revenues/EBITDA fell 2%/3%, respectively, and our price target fell to 280p (was 350p). Please see our report *Wholesale-Only overhang*, 3 May 2018.

FIGURE 24
BT: Openreach Fibre Revenues (£m)



Source: Company reports, Barclays Research estimates

FIGURE 25
BT: Openreach Fibre Revenues (£m)



Source: Company reports, Barclays Research estimates

Telecom Italia (EW, €95c price target)

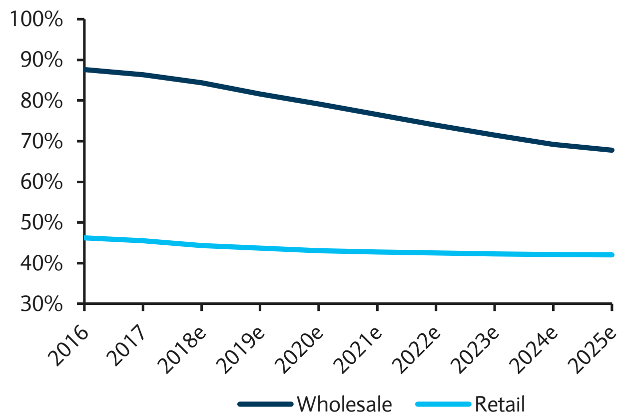
TI is most exposed – but we believe this is reflected in our current forecasts

Telecom Italia looks to us to be the most exposed to the development of wholesale only competitors with Open Fiber leading the way in Europe and planning to cover c.19m households by Y2022-2023. This is captured in our estimates as we expect TI market share of retail broadband to decline from 45% to42% from YE17 to YE25 and its market share of wholesale broadband to decline from 86% to 68%. In terms of revenue impact this should be offset by rising broadband penetration which is materially lower than EU peers at 66% vs 84% at YE17 and rising ARPU as TI upsells customers to faster speed broadband both on retail and wholesale.

As such we expect fixed revenues to remain stable/slightly positive despite the pressure on wholesale.

FIGURE 26

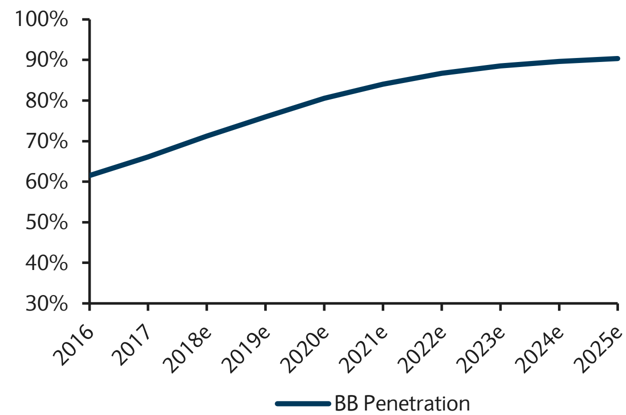
TI: Broadband market share to decline on wholesale and retail



Source: Company reports, Barclays Research estimates

FIGURE 27

TI: Broadband penetration in Italy set to rise



Source: Company reports, Barclays Research estimates

Combined with cost cutting that should enable slight growth in domestic EBITDA in the next few years, a positive development could be for TI and Open Fiber network to merge if the former is spun off, potentially clearing the way for regulatory approval. However we see no rush for Open Fiber to engage in such a deal as it can build FTTH leadership in the net few years. The investment case on TI is very uncertain in our view. If Elliott Management gains BOD control at the 4th May AGM it could lead to the departure of the CEO, and could also lead Vivendi to reconsider its 24% stake in TI creating a potential overhang.

TalkTalk (EW, 130p PT)

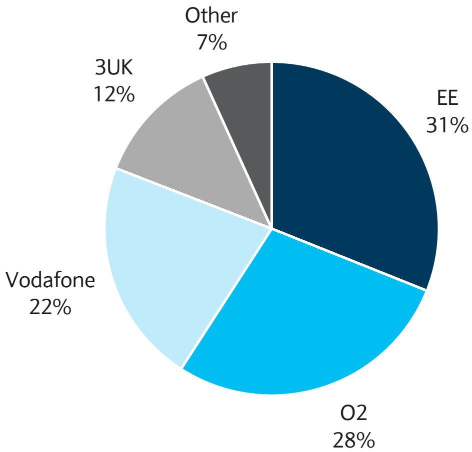
Alternative infrastructure implies tailwinds for EBITDA through lower wholesale costs

The rising significance of FTTH in the UK, and associated alternative build should be a clear positive for TalkTalk (or at least reduction of a negative). We estimate TalkTalk pays Openreach c£450m per year for wholesale access, and has faced incremental margin pressure in a Fibre/VDSL world, as the retail pricing “premium” for Fibre has been less than the wholesale charge. This pressure could well increase with FTTH, especially if Openreach is the only major builder of infrastructure. With wholesale-only providers able to make the business model work at scale on c£15/month, TalkTalk, with its 16% market share looks well positioned to leverage its scale and drive down cost. We also note the company has agreed heads of terms with InfraCapital regarding a 3m FTTH rollout over the coming years, and so is an active participant.

Increased retail competition (and market ARPU pressure) would be a negative

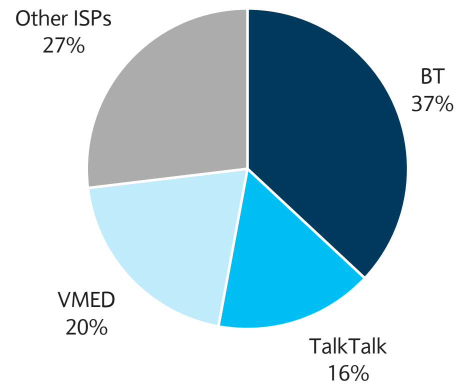
The negative for TalkTalk is potentially elevated retail competition, especially from “new” broadband entrants. We see Vodafone as becoming increasingly aggressive in the UK Fibre space, and we see O2/3UK potentially entering should the UK converge – and even Virgin Media for off-net customers should Wholesale-Only build.

FIGURE 28
UK: Wireless Market Share (%)



Source: Barclays Research estimates

FIGURE 29
UK: Broadband Market Share (%)



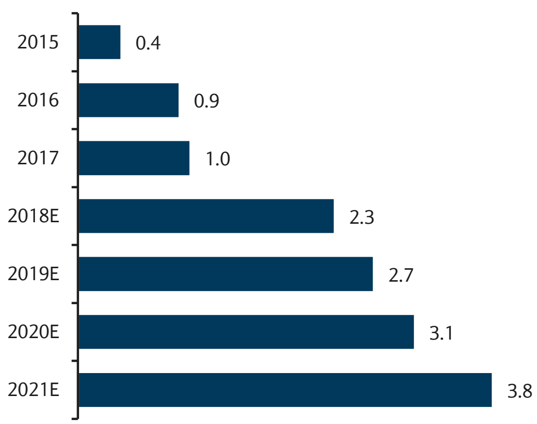
Source: Barclays Research estimates

Iliad (OW, €225 PT)

Iliad set to see EBITDA tailwinds in 2H18 from higher Fibre takeup

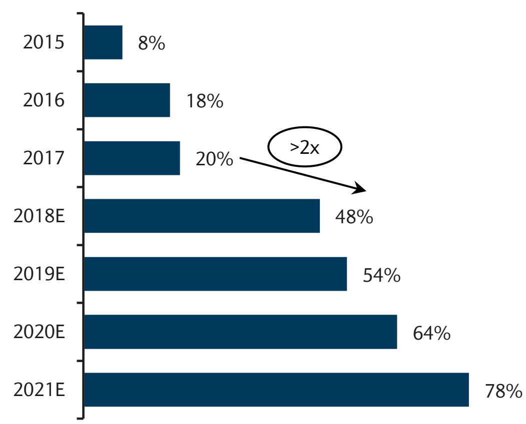
As discussed in the French market section, we view 2018 as 'the year of fibre', forecasting that c.50% of broadband gross adds will take a fibre product vs. only c.20% in 2016 and 2017. Iliad and Orange have both invested early and aggressively in FTTH, with Iliad particularly positively exposed given the opportunity to deliver margin tailwinds as the company trades c.€10/mth LLU costs in a copper world with €2-5/mth fibre maintenance costs in its FTTH footprint.

FIGURE 30
Estimated fibre market adds (m)



Source: Barclays estimates and company data

FIGURE 31
Estimated fibre share of gross adds pool (%)



Source: Barclays estimates and company data

LLU copper lines cost ILD €9.5/line/month vs. fibre at €2-5/line/month depending on the region – in the very-dense areas (c.5.5m homes) ILD spends c.€2/mth to rent the shared vertical/in-home wiring, whereas in the c.12m mid-dense zone ILD spends c.€5/mth to rent all of the FTTH network 'downstream' of the fibre mutualisation point. As such there's a c.€7.5/mth saving per line in very-dense regions when ILD switches customers to FTTH and a c.€4.5/mth saving in the mid-dense regions.

Furthermore, given LLU rates are set to rise over the medium term, on an absolute basis these savings should grow over time – we currently assume a €10.2/mth LLU rate by 2021E in all our French telecom models, driving revenue growth at Orange and increasing the cost base at competitors. This assumption is supported by our meetings with the regulator, which suggests an ongoing desire to actively drive the migration of customers towards FTTH and reduce the attractiveness of LLU.

Our analysis suggests that ILD's FTTH investment offers a significant mid-term cost-saving opportunity that we calculate at a c.60-70bp margin tailwind annualized, or €30-50m/year, and growing over time. On the 4Q17 results conference call management pointed to fibre tailwinds as a key driver of 2H18 EBITDA margin expansion, a trend we expect to be sustained into 2019E and beyond. For further details please see our note, *Iliad SA: 1H headwinds, 2H tailwinds* (5 April 2018).

TEF DE (Upgraded to OW, €4.7 PT)

We believe TEF DE would be a clear beneficiary of increased alternative infrastructure investment (we are also more bullish on its revenue turnaround)

Pressure and subsidies to invest in FTTH are rising. On 4 December 2017, the President of BNetzA indicated in a public speech that investment in networks going beyond 50Mbps was necessary: "From a business point of view, the available infrastructure is often no longer fit for purpose nowadays….It is clear that we need to look further ahead than the target of 50Mbps for 2018.…Germany needs a gigabit-ready infrastructure,…a goal on which there is cross-party consensus.'. With regards to the models being considered to foster that investment President Homan said that "it is at least worth thinking about other models, such as concession models or temporary exemptions from regulation.…It should be possible to reduce costs for the rollout by making use of potential synergies….in particular if companies share usage or lay cables in the same trenches". This all suggests that the regulator is willing to have an environment that supports investment from different players, but also DTE, by pursuing light wholesale regulation. Importantly the grand coalition that is now ruling the country has set up more ambitious targets for a network roll-out with the goal of having a gigabit network by 2025. To that effect the subsidies that will be made available should reach EUR10-12bn over the next 5 years, nearly a doubling from the previous levels. These subsidies can be tapped by all players and will be directed at FTTH only. One bottleneck, however, is the roll-out process with DTE highlighting that most suppliers are already operating at full capacity, which has led to rising prices. So whilst the higher subsidies are a potential positive for wholesale only players, execution is not trivial.

We see TEF DE as a potential beneficiary of renewed fixed infrastructure competition from wholesale only as it brings more opportunities to offer a fixed line product. More generally we expect the company to gradually improve its network quality as it finishes the integration of the E-Plus and O2 assets. We believe that concerns that TEF DE is underinvesting are misplaced. Adjusted for leases that are currently expensed the capex/sales is c. 19pc. With a better network TEF DE portfolio of tariffs would be ideally placed 20pc cheaper than peers in some key segments, in our view.

Finally we note that the weakness in wholesale trends evidenced in Q1 is partly voluntary with a de-emphasis of some MVNO to the benefit of retail. Also we believe retail trends are actually starting to turn around.

Please see our report *Inflection ahead – Upgrade to OW*, 3 May 2018.

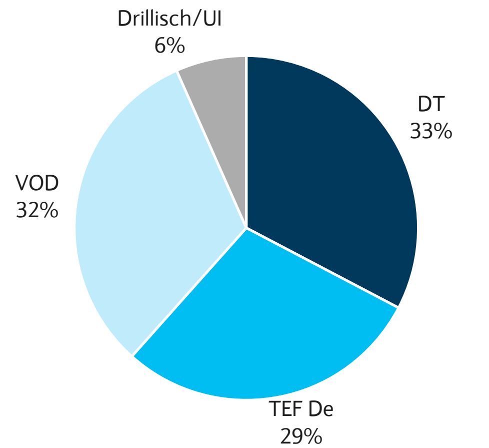
1&1 Drillisch (OW, €75 PT)

1&1 Drillisch would also be a clear beneficiary of increased alternative infrastructure investment

1&1 Drillisch has c6% market share of mobile, and 13% of retail broadband. CEO Ralph Dommermut has indicated a clear desire to co-invest in Germany for FTTH (likely at the 1&1 Versatel level at United Internet rather than 1&1 Drillisch), and we see 1&1 Drillisch set to benefit should there be increased wholesale competition (be it City Carriers/Networks or 1&1 Versatel). This would help both 1&1 Drillisch market share and wholesale economics.

FIGURE 32

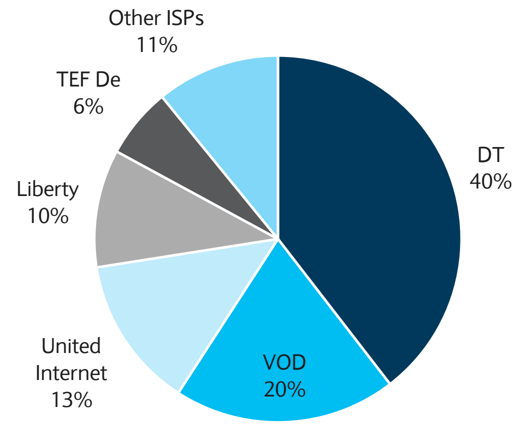
Germany: Wireless contract Market Share (%) – 4Q17



Note: Non-Drillisch MVNO subscribers included in MNO market share
Source: Barclays Research Estimates

FIGURE 33

Germany: Broadband Market Share (%) – 4Q17



Source: Barclays Research Estimates

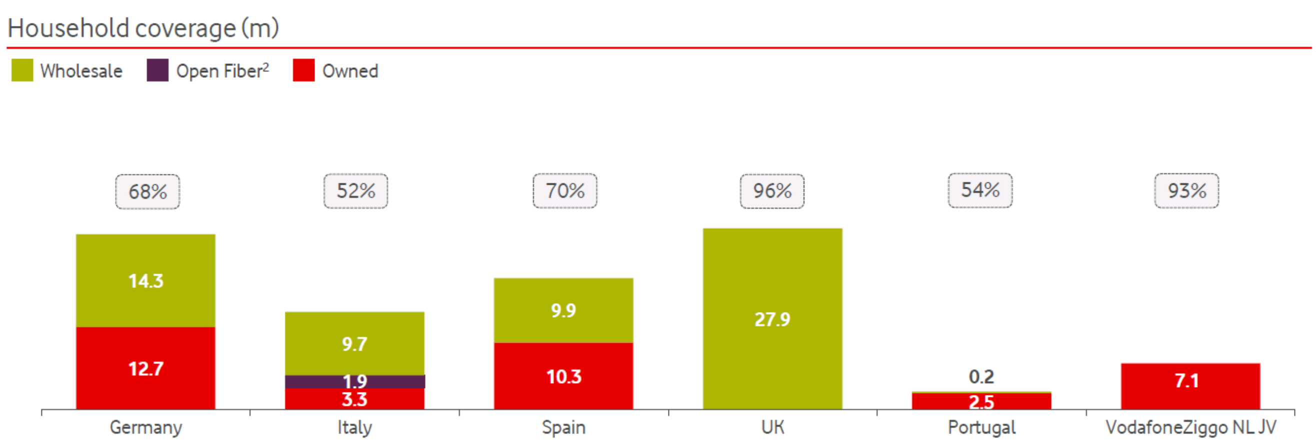
Vodafone (OW, 265p PT)

Wholesale-Only model improves Vodafone convergence economics

The perceived lack of convergence for Vodafone (vs corresponding incumbent strength) has been a consistent overhang for Vodafone over the past few years, despite the company insisting that it has a strong convergent position in all markets (Cable acquisitions, own-built FTTH, wholesale models), with the UK as the key exception. With wholesale-only rising in prominence in Italy, the UK and Germany, we see this largely complementing Vodafone's existing Mobile and Fixed coverage, and providing a solid platform with which to take Fixed market share, especially in Italy and the UK. Vodafone has consistently added c240-340k fixed broadband net adds per quarter over recent periods, and we see that increasing over the coming 2-3 years. In terms of quantifying this boost, Vodafone is adding c1.1m fixed broadband subs per year, and assuming 25% of market gross adds across Europe, this could be c2m – i.e. double the growth run rate. Vodafone is already seeing c0.9pp of weighted group service revenue growth from Consumer Fixed Line – We estimate an additional 1m net adds at €25/month ARPU would provide a c0.7pp service revenue tailwind – implying service revenue growth should accelerate. This is before any churn benefit – Reducing customer costs by c5% presents a €400m annual tailwind to EBITDA.

FIGURE 34

Vodafone: European Homes reached with High Speed Broadband



Source: Vodafone

Country Analysis

UK – Several wholesale-only announcements, yet to gather momentum

We definitely see scope for the wholesale-only model to work in the UK, although only really in the c40% of the country not covered by cable. One of the key attractions is the number of potential broadband service providers that would be keen to see an alternative to Openreach as a wholesale supplier – be it existing broadband service providers, or mobile network operators, especially as the UK moves towards convergence. Having said that, the costs of FTTH build are not insignificant, and rollout itself is not trivial in part due to planning difficulties (wayleaves) - we note that Virgin Media has struggled with its Project Lightening build (a c. 4m network expansion plan). We also note that although BT has not started a major FTTH build yet, it clearly appears keen to do so (based upon recent management commentary) , and a potential wholesale-only player (such as CityFibre) runs the risk of being overbuilt by Openreach.

Level of Cable infrastructure and incumbent FTTH build

BT has yet to commit to FTTH, although appears keen to do so

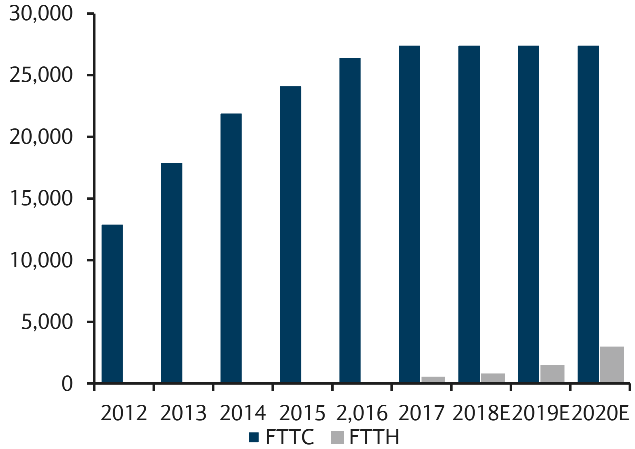
BT has to date favoured the VDSL/g.fast strategic path over that of FTTH, which can clearly be seen by its rollout to date. BT covers c95% of UK homes with VDSL, but just c4% of homes (with FTTH. The company has shifted direction of late, increasing its 2020 target for FTTH to 3m homes (was 1m), and has an open consultation with its service provider partners to roll out 10m homes.

Cable is expanding its footprint, albeit slower than expected

Virgin Media reached a footprint extension milestone at the end of 2017, surpassing 1m incremental premises passed and reaching a total of 14m homes in the UK. The company maintains a c4m network expansion plan ('Project Lightening') but implementation has not been straightforward, with the company adding c.500k homes in 2017 having initially anticipated passing 1m *per year* by this stage. In 2016 300k additional homes were passed, in 2015 250k, so the project is ramping up significantly, however we don't currently forecast an annual runrate of incremental homes above 800k in our LBTYA model. The company has cited a number of teething problems with the network build, with wayleave (planning) process highly granular and time-intensive, also with long lead times. Workforce build-up and training have also taken considerable time and resources. Finally, delivering power to new aggregation points has resulted in a further bottleneck. However, LBTYA notes they now have all processes in place and have also streamlined some processes, so that they now see themselves as dominating available capacity in the key bottlenecks of planning, power delivery, and skilled workforce, limiting the near-term opportunity for others in the UK.

FIGURE 35

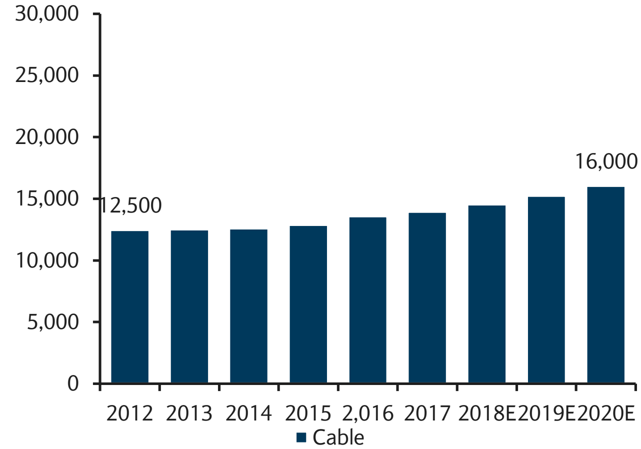
UK: FTTH & FTTC Coverage (HHs passed)



Source: Barclays Research estimates

FIGURE 36

UK: Virgin Media's Project Lightening (HHs passed)



Source: Barclays Research estimates

Having partners able to facilitate network build and reduce cost

Ofcom seeks to encourage alternative Fibre build

In terms of regulatory support, we note that Ofcom has made clear its desire to facilitate alternative FTTH build through its strategic review, and more recent wholesale line access review. Ofcom is looking to make Openreach's passive infrastructure (ducts and poles) available to third parties to facilitate FTTH build. *Ironically Ofcom has also cut the price of Openreach's 40:10 basic VDSL service, which in our view makes the FTTH business case harder.*

There have been several alternative FTTH announcements, though none with strategic partners

There have also been a number of announced alternative FTTH build. CityFibre has announced 1m homes, with the potential to increase this to 5m. TalkTalk has agreed heads of terms with Infracapital with the plan to roll out 3m homes. GigaClear has 150 targeted for end 2018, and HyperOptic 350k at July 2017 (2m target by 2022, 5m by 2025).

In November 2017 CityFibre announced a 1m FTTH plan, and that it had signed Vodafone as a strategic partner. The key parts of the announcement are: A) CityFibre will pass 1m homes across 12 existing CityFibre towns/cities, with a framework for an additional 4m homes. B) Construction is to start in 2018, peak in 2020, and be largely complete inside four years. C) £350-480 per home passed capex (plus connection), giving £500-700m total capex once complete **(i.e. £500-700/home connected)**. D) Vodafone has committed to 20% of total volumes, and the company estimates subscriber penetration to reach at least 50% within five years of each rollout phase, the revenue yield on net capital expenditure is targeted to be approximately 18% to 22% per cabinet at maturity, being five to seven years following cabinet construction.

We note that Fibre announcements and M&A in the UK alternative Fibre market have picked up in recent weeks. Firstly Infracapital has agreed to acquire GigaClear, and CityFibre has recommended a bid at 81p/share, a c90% premium to the prior day share price. We see CityFibre owned/backed by infrastructure funds as a more viable competitive proposition to Openreach than before, especially with the number of infrastructure funds interested in UK fibre only increasing.

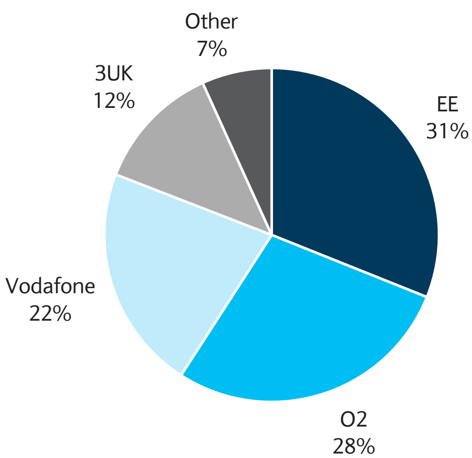
We believe there are many potential service providers that would be interested in an alternative to BT

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure. Key for driving high on-net penetration

The UK broadband market has been relatively stable for some time, with BT, Virgin Media and TalkTalk Retail controlling c73% of the market, and dominating market net additions. Of the mobile network operators, O2 disposed of its broadband base years ago, 3UK has shown limited interest in fixed, and Vodafone has had a limited impact (until recently) on the market.

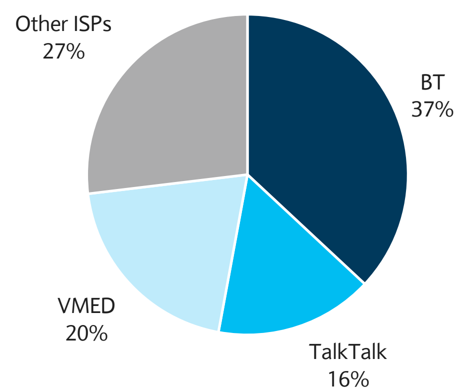
From the broadband players, TalkTalk has invested itself in Fibre and is targeting 3m homes rollout. Virgin Media controls 20% of the UK broadband market, or c40% in its footprint area. We would imagine that in Virgin Media areas, c70% of the broadband market is controlled by Virgin Media or BT Consumer/EE, which would limit the attractiveness of alternative Fibre build.

FIGURE 37
UK: Wireless Market Share (%)



Source: Barclays Research estimates

FIGURE 38
UK: Broadband Market Share (%)



Source: Barclays Research estimates

Germany: Opportunity for wholesale only

We see scope for the development of wholesale-only models in Germany and in fact there are already a number of small regional players that are deploying such a model. Also with a number of retail broadband providers now developing their own infrastructure or having a limited coverage, there are potential retail partners for wholesale only providers.

Level of cable infrastructure and incumbent FTTH build

The main player in Germany is DTE, which has focused on FTTC/vectoring.

DTE decided in 2012 to upgrade its network to FTTC which enables speeds of up to 50Mbps with VDSL. The plan was initially to cover 80% of households by 2018. This has been upgraded thanks to subsidies from the German government, which announced a €2.7bn plan complemented by local community subsidies for a total of €5bn. We assume that DTE captures c. 50% of the subsidies (in line with its market share) which together with a c. €1bn capex increase vs initial plans should enable DTE to cover c. 90% of households by 2020.

DTE's plans do not stop there: the company is upgrading parts of its FTTC network as it benefits from relatively short sub-loop lengths (c.400m) and a relatively young/small VDSL rollout, making an upgrade to vectored VDSL a sensible next step with enhancements to FTTC/VDSL promising speeds in the 100Mbps-1Gbps range on short copper sub-loops. We estimate DTE had rolled out vectoring to around 40% of homes by YE17.

Finally Deutsche Telekom announced in December 2017 that it has signed a declaration of intent with utility company EWE to set up a 50-50 JV to invest €2bn to connect more than one million private households to FTTH/B in North Western Germany. Both companies will retail the services to end customers and could also enter into wholesale deals with third parties. This entity will not be consolidated into DTE accounts; hence the additional capex that DTE will spend (c. EUR100m per year for 10Y) will not appear in DTE's German figures. The company has indicated that it comes in addition to the EUR4.3-4.4bn per year that DTE indicated would be the run rate for German capex until 2021. DTE could announce more projects along these lines as it also gradually develops a FTTH network. At YE2017 we estimate that DTE had c. 750k FTTH homes passed, and we expect it to gradually redirect capex from FTTC/vectoring to FTHH as it reaches its coverage targets for the former.

Liberty Global has an upgraded cable network that covers 12.9m homes. LG is building additional footprint and we assume c.600k of coverage expansions by YE2020.

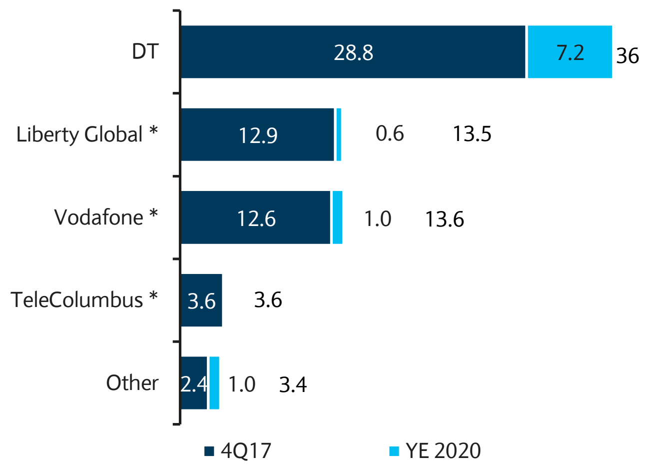
Vodafone currently covers 12.6m homes through the cable network of KDG that it acquired. In September 2017 VOD announced a plan to add 1m households and 2,000 business parks through a FTTH build-out. In addition to its own network Vodafone wholesales capacity from DTE FTTC/vectoring wholesale offering enabling it to reach an additional 13.8m households.

TeleColumbus has 3.6m homes passed and is focused on upgrading c.0.4m homes to direct connections and two-way capabilities but not on geographic expansion.

Other. A number of small regional players are developing fibre with a wholesale-only model. According to VTAM (association of alternative operators that invest in FTTx) these operators had around 2.4m homes passed with FTTH by YE 2017, which compared with 0.7m for DTE. The main players at YE 2017 were Deutsche Glasfaber (250k homes passed with FTTH), Net Cologne (c. 250k homes passed with FTTC), and M-Net (180k homes passed with FTTH).

FIGURE 39

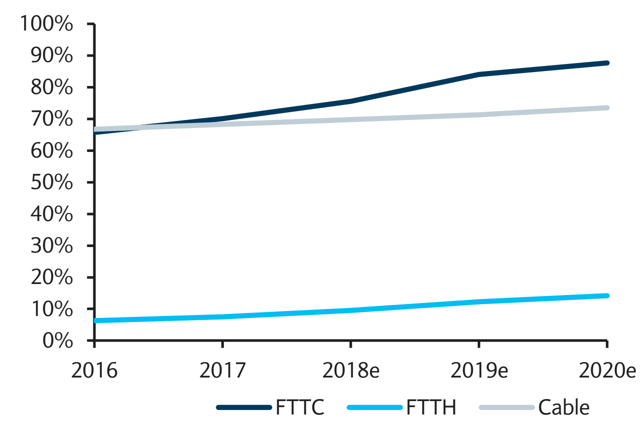
Germany: NGN players – Homes passed (m)



Source: Barclays Research estimates * Cable

FIGURE 40

Germany: – FTTC, FTTH and Cable network penetration – 2015-2020



Source: Barclays Research estimates

Having partners able to facilitate network build and reduce cost

Two types of players have emerged as wholesale-only players.

- **'City carriers'** that stem from local utilities that developed telecom businesses in the 1990s and then decided to invest in FTTx network. The main ones are Net Cologne, M-Net and EWE.
- **Fiber builders mostly funded by construction companies** or P/E and decided to roll out FTTh in areas where there was no cable and DTE was not investing in FTTH. Typically these companies have benefitted from local municipalities' support that helped lower the cost of the build. Deutsche Glasfaber is the main operator that has developed this model and is supported by the PE firm KKR.

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure.

Pressure and subsidies to invest in FTTH are rising. On 4 December 2107, the President of BNetzA indicated in a public speech that investment in network going beyond 50Mbps was necessary: "From a business point of view, the available infrastructure is often no longer fit for purpose nowadays….It is clear that we need to look further ahead than the target of 50Mbps for 2018….Germany needs a gigabit-ready infrastructure,…a goal on which there is cross-party consensus'. With regards to the models being considered to foster that investment President Homan said that "it is at least worth thinking about other models, such as concession models or temporary exemptions from regulation.…It should be possible to reduce costs for the rollout by making use of potential synergies….In particular if companies share usage or lay cables in the same trenches". This all suggests that the regulator is willing to have an environment that supports investment from different players, but also DTE, by pursuing a light wholesale regulation.

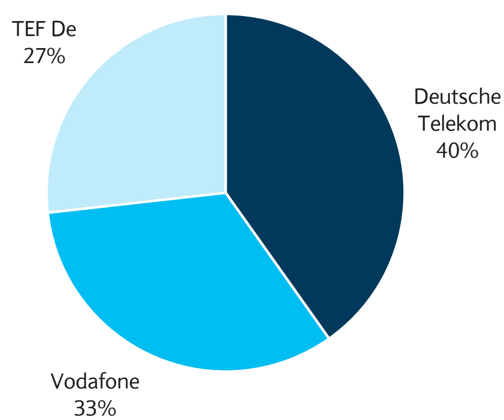
Importantly the grand coalition that is now ruling the country has set up more ambitious targets for network roll-out with the goal of having a gigabit network by 2025. To that effect the subsidies that will be made available should reach EUR10-12bn for the next 5 years, nearly a doubling from the previous levels. These subsidies can be tapped by all players and will be directed at FTTH only. One bottleneck, however, is the roll-out process, with DTE highlighting that most suppliers are already operating at full capacity, which has led to rising prices. So whilst the higher subsidies are clearly a potential positive for wholesale only players, execution is not trivial.

The German regulator is currently doing a consultation around the FTTH market. The regulator is considering whether to regulate FTTH at all and if it is regulated how does it determine wholesale prices, i.e. 'retail minus' or cost plus.. This deal is subject to regulatory approval by the Kartel Office. A decision is expected this year and will be key to determining how attractive the investment in FTTH would be for DTE. Setting wholesale prices too low would be a disincentive to investments from DTE and would leave the opportunity for wholesale-only operators, which would most likely be unregulated, to capture this opportunity.

The German market offers an opportunity for a wholesale only business model with two relatively large retail broadband operators, TEF DE (6% market share) and United Internet/Drillisch (13% market share) having none or little own infrastructure. We note the CEO of UI/Drillisch has indicated in the German press (*Die Welt*) that German broadband providers should team up to create an FTTH wholesale company. Finally we note that Vodafone has limited coverage with its own fixed network and could be interested in signing wholesale deals with other parties than DTE. A potential merger between Vodafone and Liberty Global in Germany (as per Vodafone RNS, 2/2/18) could open up infrastructure further.

FIGURE 41

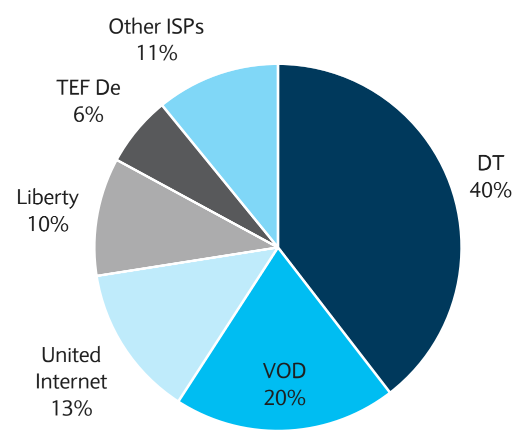
Germany: Wireless contract Market Share (%) – 4Q17



Source: Barclays Research estimates

FIGURE 42

Germany: Broadband Market Share (%) – 4Q17



Source: Barclays Research estimates

Spain: With 4 players already investing in NGN we see no opportunity for wholesale-only

We see very limited scope for a wholesale only business in Spain given the already high number of fixed NGN networks being rolled out. Also we note all the large broadband retail players have their own network and in addition for the most part have signed wholesale deals with TEF.

Level of Cable infrastructure and incumbent FTTH build

Already three large Fibre infrastructure providers

Spain is unusual in that three large players are rolling out a national NGN infrastructure. This can be partly explained by the fact that rollout costs are lower in Spain than in other countries, notably because of low civil engineering costs, easy access to ducts and the outside location of the aggregation/connection points. Telefonica has taken the leadership and covered c. 69% of households with FTTH at the end of 2017 and we expect this to rise to 80% by 2020.

With the acquisition of the cable company ONO, we estimate **Vodafone** covers 9m households at YE2017 (although we estimate this includes 7.5m of cable and 2.3m FTTH from JV arrangements and 0.5m overbuild). The main strategy for providing service to the rest of the 19.4m estimated total households in Spain is through a wholesale deal with TEF that was announced in 2017 in areas subject to regulation but also in others where there was no obligation. This allows Vodafone to expand its fibre-optic coverage and offer 300 Mbps symmetric broadband and pay-TV. Based on company comments, VOD is committing to upfront payment and volume commitments in exchange for lower prices than the regulated ones. For TEF this is positive as it should be a disincentive to VOD from further expanding its NGN as initially planned and so should enable TEF to generate more wholesale revenues out of its infrastructure. In theory a similar deal could be signed with other players. Vodafone has not given any official target to extend its coverage, but we note the company adds a few 100k's per year.

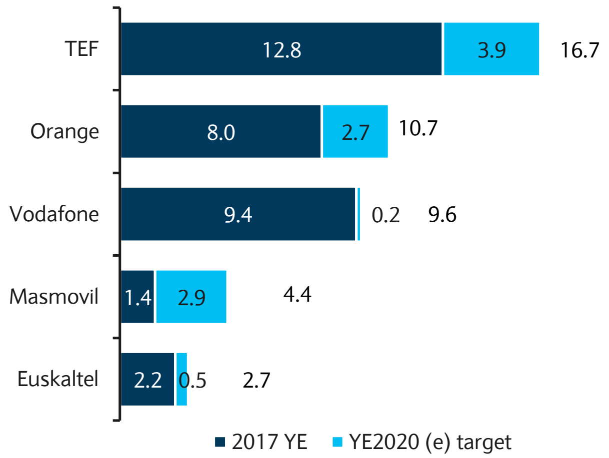
After the acquisition of Jazztel, **Orange** covered 8.0m households partly through shared investments with TEF, access through a JV with Vodafone and co-investment with Masmovil. The company has set aggressive targets for the future and plans to cover an estimated 10.7m households (16m premises) by YE 2020, partly through co-investment with Masmovil. On February 2018, Telefonica and Orange announced a wholesale agreement whereby Orange will access the FTTH network of TEF in areas where the former does not plan to deploy FTTH.

Masmovil is the last player to emerge with a combination of direct investments (own build, assets from remedies and co-investment with Orange). By YE 2017 Masmovil was covering an estimated 1.4m households (2.1m premises) and guided for a coverage of 6.5m premises (c. 4.3 households) by YE 2020 with notably a co-investment agreement with Orange for a total of 4.4m premises (up from 2.4m previously). In addition, Masmovil has an ADSL wholesale deal with ORA as part of the remedies of the Orange/Jazztel deal. Finally Masmovil signed an FTTH wholesale agreement with Orange for the whole network of Orange in February 2018 with no restriction, lifting a prior limitation to only 250k subscribers.

Finally **Euskaltel** has a cable network in the three regions where it operates: Basque Country, Asturias and Galicia. The company is planning to expand its network in these regions but also on a more granular basis in Asturias.

FIGURE 43

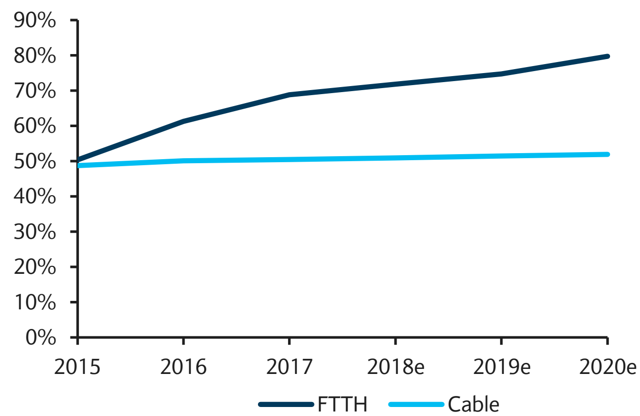
Spain: NGN players – Homes passed in m



Source: Barclays Research Estimates

FIGURE 44

Spain: FTTH and Cable network penetration – 2015-2020



Source: Barclays Research Estimates

Having partners able to facilitate network build and reduce cost

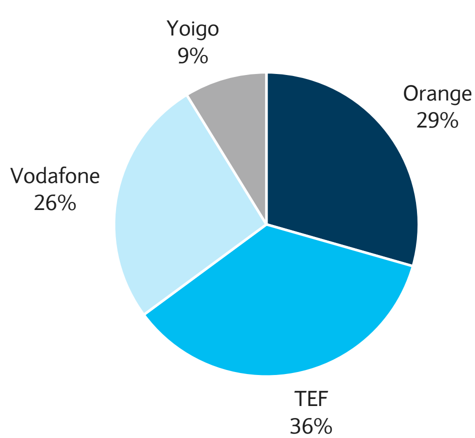
There are no obvious partners for a potential new wholesale only player. Unlike in some other countries, electricity companies have not supported FTTH roll out plans in Spain

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure.

Each of the four Spanish mobile players is rolling out its own NGN infrastructure. Also Vodafone and Orange have signed up wholesale deals to access the FTTH of Telefonica. These players are also the main broadband players in the market so there is no obvious retail partner for a new entrant.

FIGURE 45

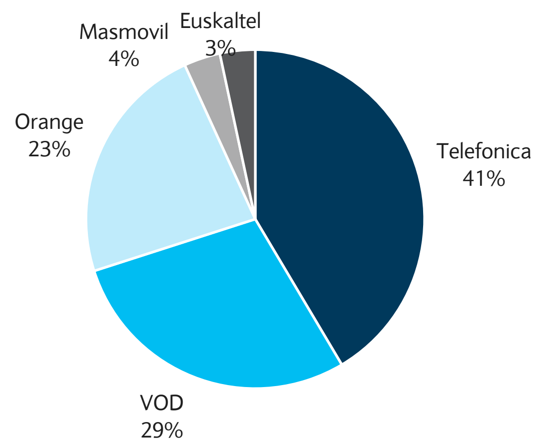
Spain Wireless Market Share (%) – contract subscribers - 4Q17



Source: Barclays Research Estimates

FIGURE 46

Spain: Broadband Market Share (%) - 4Q17



Source: Barclays Research Estimates

France – co-investment model well defined, wholesale only a part of that

Wholesale only is a reality already in France, with the rural 'PIN' areas being rolled out based on a subsidised open network infrastructure, allocated based on a competitive reverse auction process, as we discussed in detail in our Fibreconomics; rural risk contained research (5 July 2017). As such, we view France's fibre regulatory backdrop, capex needs and competitive dynamics as offering significantly better visibility vs. other key European markets, as we discuss elsewhere in this report. This is a key premise for our ORA OW call, and we also note that ILD (OW rated) is significantly and positively exposed to owned and wholesale fibre dynamics in both France and Italy.

Level of Cable infrastructure and incumbent FTTH build

France has a fully developed fibre rollout plan

As we first discussed in our *Orange: Fibreconomics* (30 March 2015) research, France's national super-fast broadband plan (Plan France Très Haut Débit) has resulted in FTTH co-financing arrangements that see the country divided into three different zones, each with a different regulatory regime and differing expectations of private vs. public investment. The c.33m households in France are split into three regions for the purposes of regulation, with a different co-investment option stipulated in each area:

The first c.5.5m households constitute the 'Very Dense Area' (ZTD) in which there is no regulated access to the horizontal part of the network, but the vertical (in-home wiring) is regulated with the option of either rental or co-investment. Within this ZTD zone there are also sub-categories to address a wide variety of building types and associated challenges, per the following figure.

FIGURE 47
French fibre co-financing zones

<table>
<tr><th colspan="2">High-density areas</th><th rowspan="2">Lower density areas</th></tr>
<tr><th>Outside low-density pockets</th><th>Inside low-density pockets</th></tr>
<tr><td>For buildings with at least 12 residential or business units or accessible through a visitable sewer network: multi-fibre concentration point at the building entry point
3.2 million premises</td><td rowspan="2">Concentration point of 300 single fibre lines, regardless of the size of the building
0.8 million premises</td><td rowspan="2">Concentration point of 1,000 single fibre lines, regardless of the size of the building

Exception: a concentration point of 300 lines if the backhaul portion of network is shared
27.7 million premises</td></tr>
<tr><td>* For other buildings (i.e. fewer than 12 units and not accessible via visitable sewer):
- general rule: concentration point of 100 single fibre lines (cabinet)
- special cases (isolated buildings): multi-fibre concentration point (manhole, façade, terminal)
1.5 million premises</td></tr>
</table>

Source: ARCEP, Barclays Research

The next c.12m households constitute the 'Less Dense Area, Private Initiative' (ZMD AMII) in which there is regulated access to the horizontal part of the network through Indefeasible Rights of Use (IRUs) and regulated vertical (in-home wiring) access through the option of either rental or co-investment in steps of 5% share of connections per district.

Wholesale only plays a part – in the 'PIN' rural zone

The final c.15m households constitute the 'Less Dense Area, Public Initiative' (ZMD RIP) in which there is regulated access to the horizontal part of the network through rental or Indefeasible Rights of Use (IRUs), and regulated vertical (in-home wiring) access through the option of either rental or co-investment in steps of 5% share of connections per area. In this region, the expectation is that private financing will not be attracted to the potential returns on offer and that public funding will be provided. This is effectively a wholesale only model for network operation.

FIGURE 48

French co-financing regulation per region

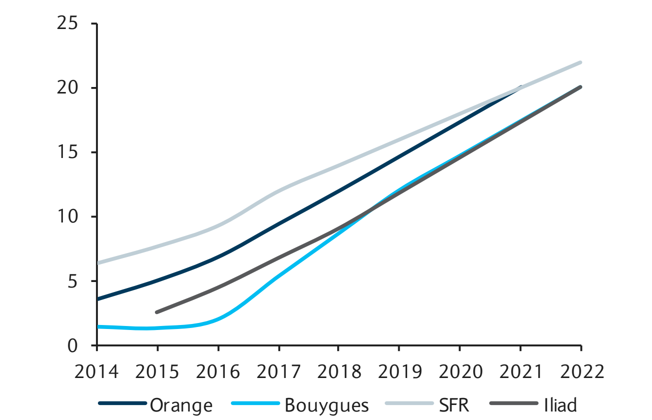
	Horizontal	Vertical
Very Dense Area (ZTD) 5.5m premises	No regulation	Regulated Rental or co-investment
Less Dense Area Private initiative (ZMD AMII) 12m premises	Regulated and scalable	
	IRU (Indefeasible right of use)	Rental, or co-investment by steps of 5% connections per district
Less Dense Area Public initiative (ZMD RIP) 15m premises	Regulated and scalable	
	Rental or IRU	Rental, or co-investment by steps of 5% connections per area

Source: Barclays Research, Bouygues

The following charts summarise the fibre deployment plans of the French operators, with significant increase in coverage planned by all and seemingly limited room for alternative operators – we note that SFR's plans include the cable network upgrade (which is required to be advertised differently to 'full fibre' (FTTH) in France) and that their 'full' fibre deployment plans may be impacted by high leverage and the announced corporate reorganisation – as such we expect their FTTH fibre rollout to lag peers somewhat.

FIGURE 49

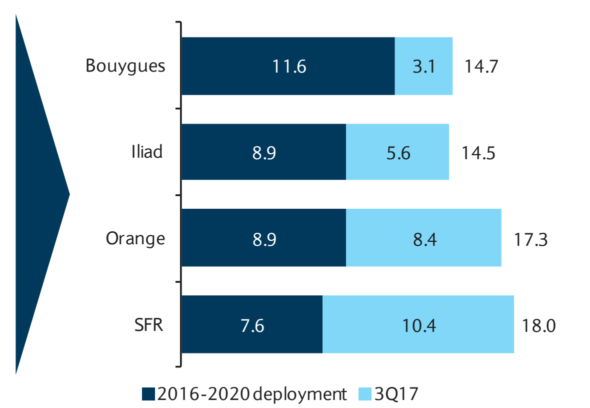
Fibre deployment timeline (m households passed)



Source: Company data

FIGURE 50

Incremental deployment plans 2016-2020E (m households)



Source: Company data

As discussed earlier in this report, we see a number of key factors driving wholesale only, which don't appear in France, and therefore it would only be in the case that e.g. Bouygues and SFR were interested in covering the remaining dense area regions that further wholesale only could play a part.

Having partners able to facilitate network build and reduce cost

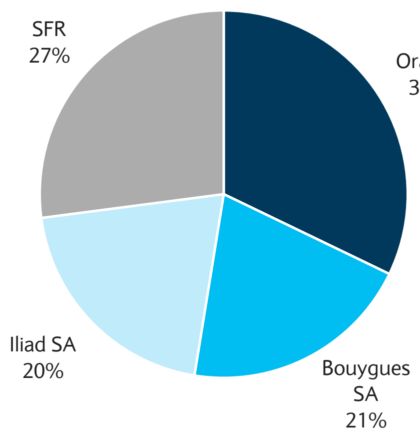
There are no obvious partners for a potential new wholesale only player, given the co-financing arrangements and operator commitments.

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure.

Each of the four French mobile players is rolling out co-financed FTTH infrastructure and these players are also the main broadband players in the market so there is no obvious retail partner for a new entrant.

FIGURE 51

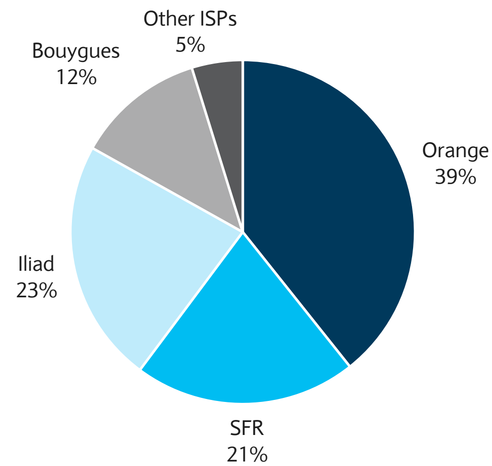
France: Postpaid wireless Market Share (%)



Source: Barclays Research estimates

FIGURE 52

France: Broadband Market Share (%)



Source: Barclays Research estimates

Belgium – regulatory uncertainty, high cable market share limit opportunity

Wholesale only appears a distant prospect across the whole of Belgium given TNET's very high cable broadband market share. We estimate TNET has >65% in-footprint share in Flanders, with the remaining held by incumbent Proximus. We note that LLU/wholesale copper is almost extinct in Belgium, with #2 mobile operator Orange Belgium focusing its fixed efforts on a relatively mature, regulated, national cable wholesale offer. Alongside, there is increased uncertainty around wholesale only given an ongoing FTTH consultation that could yet shift the dynamics of Proximus' planned FTTH rollout, with scope for co-investment still a possibility (albeit unlikely, in our view). In Wallonia, the situation is reversed given a high market share of incumbent Proximus (we estimate c.65%) and a relatively underpenetrated cable network, Voo. In this region there would appear some scope for wholesale only, but only if the Voo sales process doesn't proceed, as discussed in Belgian cable consolidation - finally on the cards? (29 March 2018).

Level of Cable infrastructure and incumbent FTTH build

Concentrated market shares

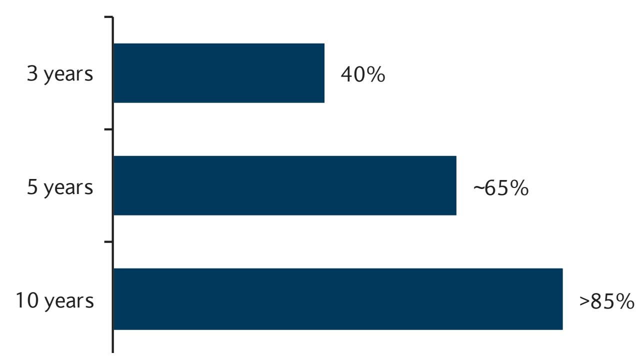
Belgian fixed market shares are concentrated, with incumbent Proximus having 46% of broadband subs, cable operators TNET with 16, respectively, and OBEL/other c.16%. With only one scale/growing fixed alternative operator in the market (OBEL) any wholesale only operator would be very limited in terms of potential partners and would struggle to compete vs. a dominant cable operator in Flanders, in our view. In Wallonia there appears to be greater opportunity to differentiate, given incumbent Proximus has focused on its VDSL rollout so far, and will implement its FTTH rollout in a very slow and steady manner, as we discussed in *Proximus - Fibre wars: a shift away from copper* (19 January 2017).

Slow incumbent FTTH rollout

On 16 December 2016 Proximus surprised the market by outlining a new FTTH deployment plan, targeting an eventual coverage of >85% of businesses and >50% of households, and marking a significant step away from copper technologies, in our view. The FTTH investments will be focused in the densest regions of Belgium, across Flanders and Wallonia. Proximus' rollout plans are relatively slow and steady, with business fibre coverage reached in c.10 years and residential coverage in c.15 years.

FIGURE 53

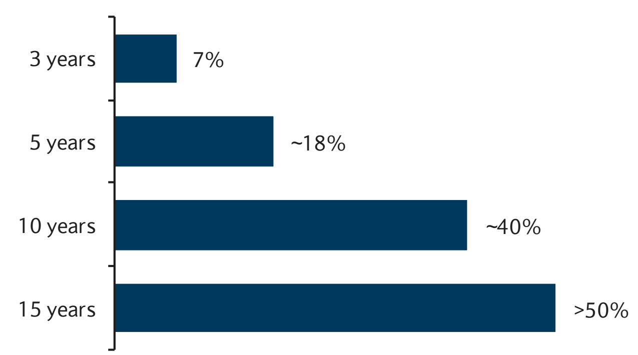
Enterprise roll-out targets



Source: Proximus

FIGURE 54

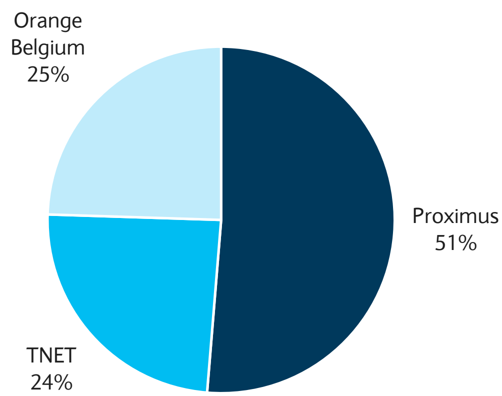
Residential roll-out targets



Source: Proximus

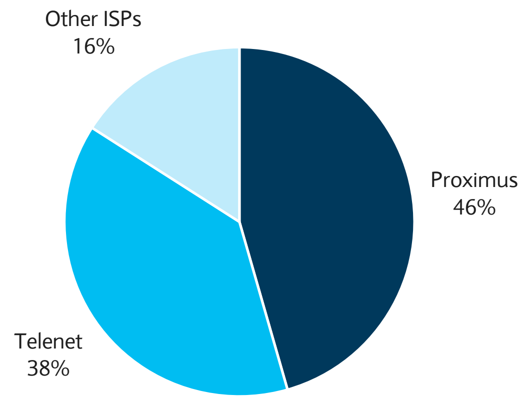
Compared to other European deployments the Proximus plan implies a rate of rollout similar to KPN at c.4% per year, but slower than Orange (8%/year), with operators such as TEF and PT having rolled out at a significantly higher rate historically. In particular, we note that Proximus' guidance implies a strong focus on business FTTH connectivity rollout in the early years of the program, with the consumer rollout backend loaded – e.g. only c.7% consumer FTTH coverage will be achieved by YE2019E. This could present a wholesale only opportunity, particularly in Wallonia, although as discussed earlier the broadband market is dominated by incumbent and cable operators, i.e. those with owned infrastructure, severely limiting the opportunities, in our view and per the following charts.

FIGURE 55
Belgium: Postpaid wireless Market Share (%)



Source: Barclays Research estimates

FIGURE 56
Belgium: Broadband Market Share (%)



Source: Barclays Research estimates

As discussed earlier in this report, we see a number of key factors driving wholesale only, which don't appear in Belgium. We note:

Having partners able to facilitate network build and reduce cost

There are no obvious partners for a potential new wholesale only player, given the cable wholesale arrangements and potential for FTTH co-financing

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure

Of the three Belgian mobile operators only Orange Belgium is not convergent on owned fixed infrastructure, and already benefits from an attractive cable wholesale product. As such the opportunities for wholesale only appear limited.

Netherlands – two national infrastructures limit the appeal

Wholesale only appears a very distant prospect in the Netherlands given a national convergent cable/mobile operator with c.half the broadband market (VodafoneZiggo) is balanced by incumbent KPN with most of the remaining broadband market share. We note that LLU/wholesale copper is almost extinct in NL, with the alternative mobile operators relying on a VULU VDSL product from KPN for their fixed access. KPN already has c.40% of homes passed by fibre and the remainder passed by high-speed copper. NL is unique in that the copper infrastructure offers double pairs to most premises, allowing KPN to exploit channel bonding technology to deliver double speeds vs. other incumbents for a very similar capital outlay. As such KPN should be able to deliver >200Mbps speeds to the majority of the population in our view.

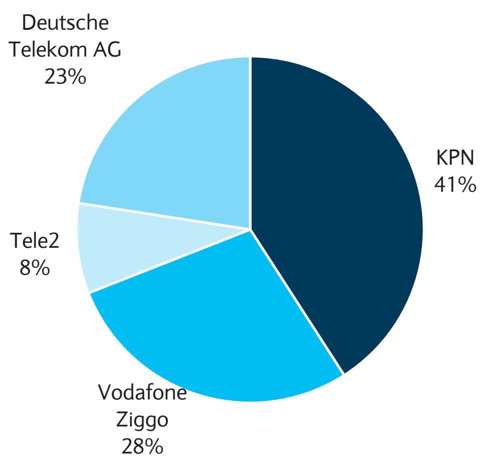
Level of Cable infrastructure and incumbent FTTH build

Concentrated market shares

Netherland's fixed market shares are concentrated, with incumbent KPN having 39% of broadband subs, cable operator Vodafone/Ziggo c.43%, and other operators with just c.18% share of the market. However, we note that the #3 and #4 mobile operators do have significant mobile market share, per the following charts, and could be potential customers for a wholesale only operator – however we note that there is an ongoing consultation around cable wholesale access in NL, that could result in a similar outcome to that in Belgium thus limiting the appeal of another platform. Furthermore, with such extensive cable coverage and incumbent FTTH/'supercharged' copper, the opportunity appears very limited.

FIGURE 57

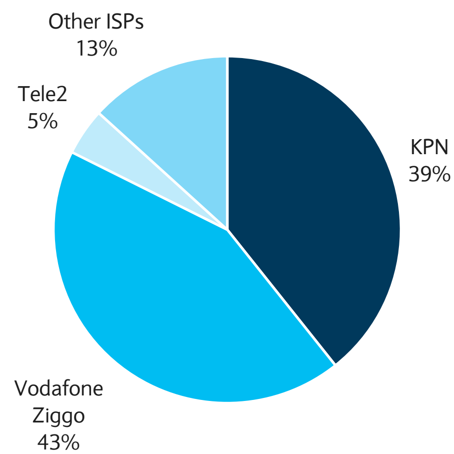
Netherlands: Postpaid wireless Market Share (%)



Source: Barclays Research estimates

FIGURE 58

Netherlands: Broadband Market Share (%)



Source: Barclays Research estimates

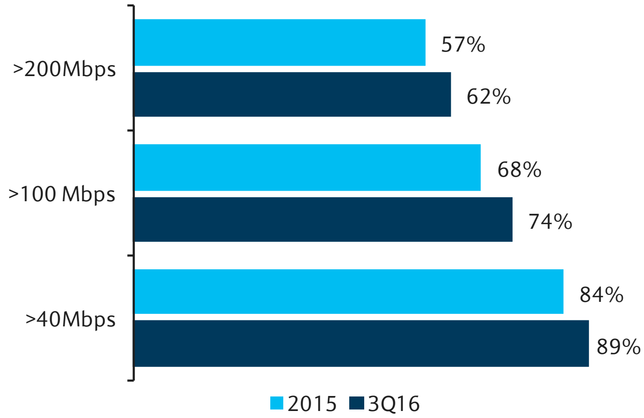
KPN initially rolled FTTH to c.29% of the population through the Reggefiber JV, which it eventually acquired outright. However, the company has recently shifted to greater exploitation of the copper network and had delivered >100Mbps speeds to 76% of the population by 4Q17.

We see the following differences between the two companies:

- KPN benefits from a unique infrastructure, with two copper loops connected into to the vast majority of households in NL, and is therefore able to exploit channel bonding technology to deliver >2x the speed over similar copper technology as any other European incumbent. As a result, KPN targeted c.70% coverage at >200Mbps already by YE2016. Therefore KPN sees a limited need for incremental FTTH spend, at least whilst there is plenty of speed headroom on current copper technology, and will still scope to deliver even higher speeds with Bonded VPLUS (up to c.400Mbps).

FIGURE 59

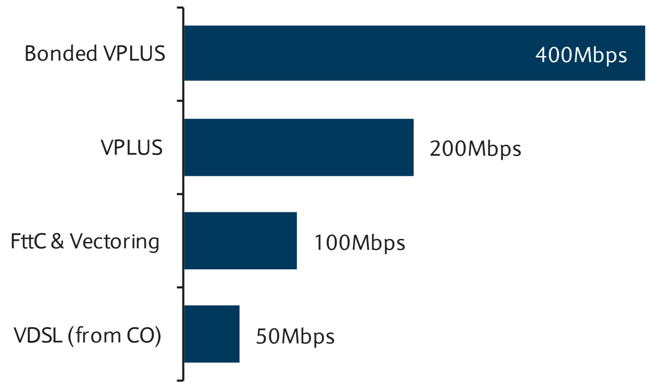
KPN: FTTx household coverage and speed (%)*



Source: Company. * latest available data – company stopped reporting since.

FIGURE 60

KPN: available FTTC speed upgrades



Source: Company

As discussed earlier in this report, we see a number of key factors driving wholesale only, which don't appear in The Netherlands,. e.g. we note:

Having partners able to facilitate network build and reduce cost

We believe there could be potential partners for a potential new wholesale only player, given the #3 and #4 mobile operators T-Mobile and Tele2 rely on a VULU copper product for convergent offers.

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure.

We do see the fixed retail market as relatively duopolistic following the merger between Vodafone and Ziggo, and as such we see limited potential here.

Portugal – low build cost has delivered heightened infrastructure competition

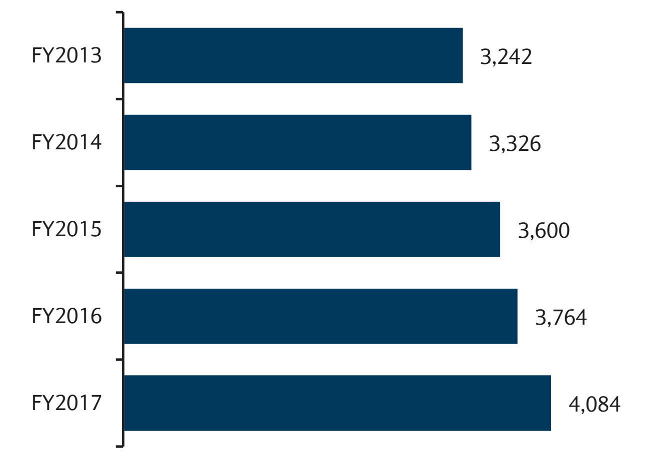
Incremental wholesale only fixed competition appears implausible in Portugal given all three convergent operators already have a route to national fibre coverage, at least of primary households. This reflects a significant shift in dynamics given that historically Vodafone has been in a significantly weaker position than peers, however the recent signing of a reciprocal wholesale deal with cable/FTTH operator NOS has rewritten the market structure, as we discussed in NOS - Share shifts; downgrade to UW (1 February 2018).

Level of Cable infrastructure and incumbent FTTH build

NOS was early to expand its footprint in Portugal

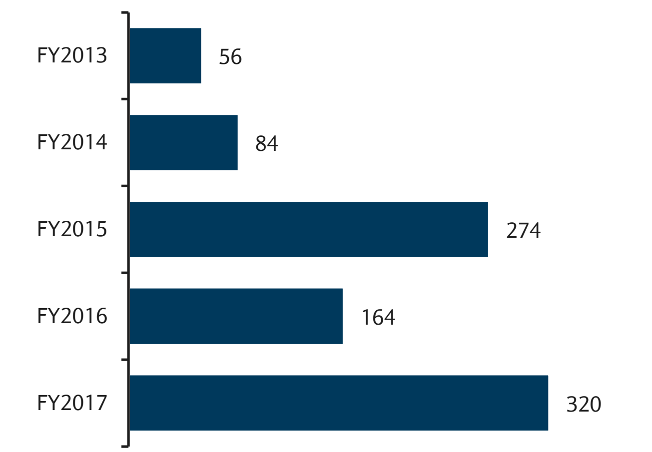
Cable operator NOS has been building additional Greenfield FTTH coverage over recent years, reaching an additional 0.8m homes (23% increase in footprint by YE2017 vs. 2014).

FIGURE 61
NOS: Households passed footprint (k)



Source: Company reports, Barclays Research estimates

FIGURE 62
NOS: Households net adds (k)

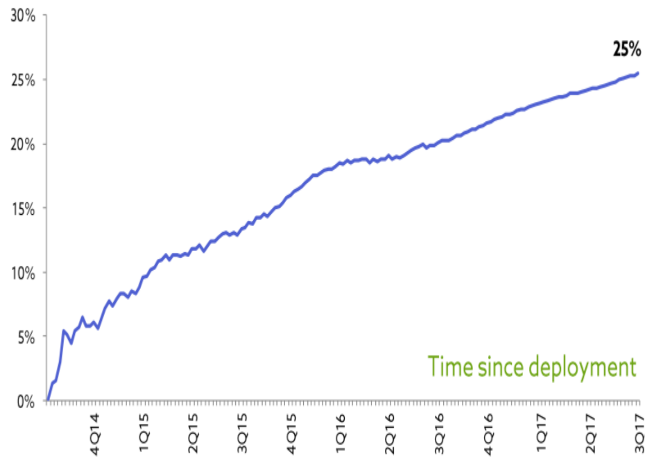


Source: Company reports, Barclays Research estimates

The company has benefited materially from the network expansion, taking an average of 25% market share in new coverage areas within c.2½ years and c.4pp of nationwide market share despite a resurgent Vodafone, which has focused on a price aggressive ‘discounter’ strategy to win share in fixed to help balance out an otherwise concentrated quad-play market carve-up between NOS and MEO.

FIGURE 63

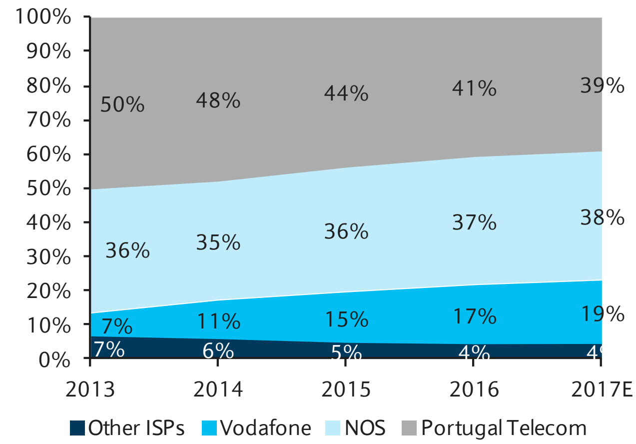
NOS: Average gross penetration rate per new FTTH location



Source: 3Q17 company presentation

FIGURE 64

Portugal: Broadband market share (%)



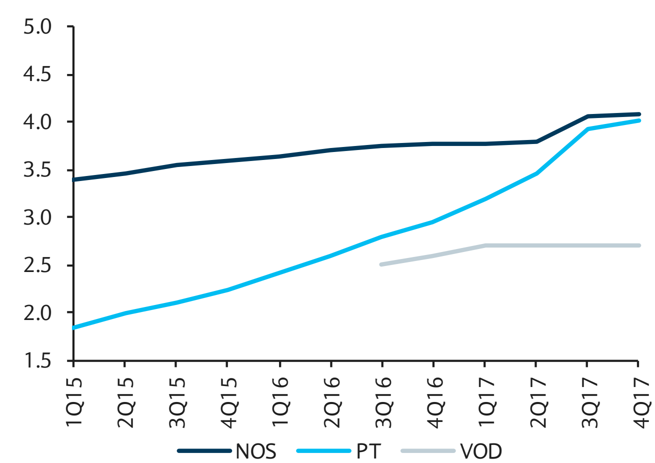
Source: Company reports, Barclays Research estimates

Vodafone network sharing significantly shifts fixed competitive landscape

We see dynamics in Portuguese fibre shifting again in 2018, as Vodafone's network sharing agreement comes on stream and MEO continues to penetrate additional footprint, as we detail in the following section. The charts below summarise the shift in competitive dynamics occurring in Portuguese wireline with competitors (finally) catching up with NOS' expansion given Vodafone's sharing deal (that we discuss later) and incumbent Portugal Telecom's national FTTH rollout plans.

FIGURE 65

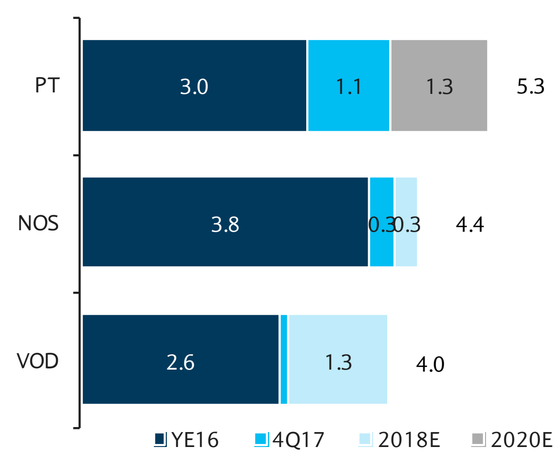
Fibre homes passed (m)



Source: Company reports, Barclays Research estimates

FIGURE 66

FTTH target (m)



Source: Company reports, Barclays Research estimates

In October 2017 Vodafone and NOS announced an agreement to deploy and reciprocally share a FTTH dark fibre network, with each company gaining access to c.2.6m homes. Alongside the companies also agreed to share mobile infrastructure, with at least 200 towers to be shared. As part of the agreement we note the following:

- Vodafone Portugal gains access to c.1.3m premises in new areas, comprising (1) new fibre builds in NOS' current cable footprint; (2) NOS' current fibre reach outside Vodafone regions; (3) new area/new build FTTH.

- Vodafone expects to increase its FTTH coverage from 2.7m homes to c.4.0m homes, or c.80% of Portuguese households.
- NOS should see an increase in its coverage from c.4.0m YE2017 to c.4.4m YE2018, benefiting from shared cost economics in these new regions, however without the 'first mover' advantage it has enjoyed in other regions given the co-building with Vodafone.

Vodafone's current FTTH deployment of c.2.7m homes (as of June 2017) comprises the following:

- 1.8m own built FTTH
- 0.5m through reciprocal access with MEO/Portugal Telecom
- 0.2m acquired from NOS following the Optimus/Zon merger remedies
- 0.2m via a wholesale agreement with public funded rural network with access obligations

As discussed earlier in this report, we see a number of key factors driving wholesale only, which don't appear in Belgium:

Having partners able to facilitate network build and reduce cost

We see no obvious partners for a potential new wholesale only player, given the JV arrangements between Vodafone and NOS.

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure.

The three national operators in Portugal are all infrastructure convergent in both fixed and mobile, and as such we see no opportunity for wholesale only.

Switzerland – wholesale remains a risk, limited impact to date

As we noted in Wholesale points to downside risk (6 July 2017) there is a significant amount of alternative fibre in Switzerland today. In addition, UPC is set to increase its cable coverage by 10pp of households in the next 5 years (although we believe a lot of cable is overbuilt). Both Sunrise and Salt, the two mobile operators without fixed assets, are already customers of wholesale only fibre operators. Sunrise utilises a combination of wholesaling Swisscom copper/fibre and wholesale only fibre from Swiss Fibre Net, EZW and others to provide fixed broadband. Salt finally launched its long anticipated entry into the fixed broadband market using alternative fibre. We view both as willing to utilise more wholesale fibre where possible. Fibre isn't regulated in Switzerland today but potential regulation is currently being debated with any potential impact from 2020.

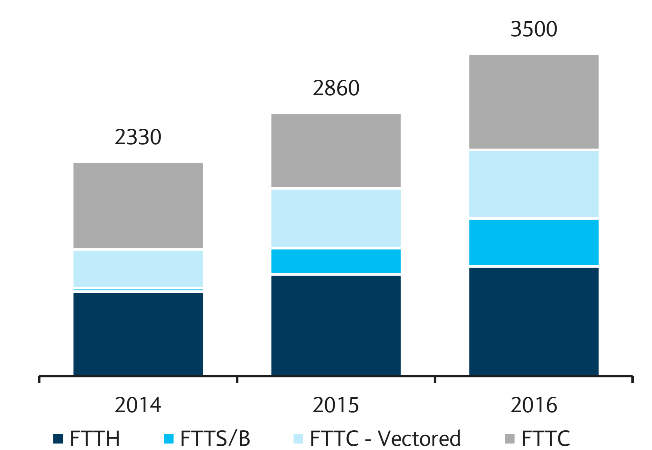
Level of Cable infrastructure and incumbent FTTH build

Swisscom focusing on FTTS/G.fast

Swisscom has switched focus to extract the fastest possible speeds from copper after initial FTTH deployments. FTTS/G.fast is 2 times quicker and 3 times cheaper to roll out than FTTH and is currently able to deliver 500Mbps (upgrades could see bandwidths above 1Gbps). Swisscom has a unique network topology that offers accessible drop points delivering 150-200m sub-loop lengths; hence, it has a strong motivation to maximise G.fast (see *Fibre Wars: Quantifying fibre upside*, 16 June 2016). Alternative fibre does have a modest speed advantage today. At the end of 2017 Swisscom could deliver speeds of >200Mbps to 27% of households and >80Mbps to a further 28% of households. By 2021, it aims to increase this to ca75%/ca15%.

FIGURE 67

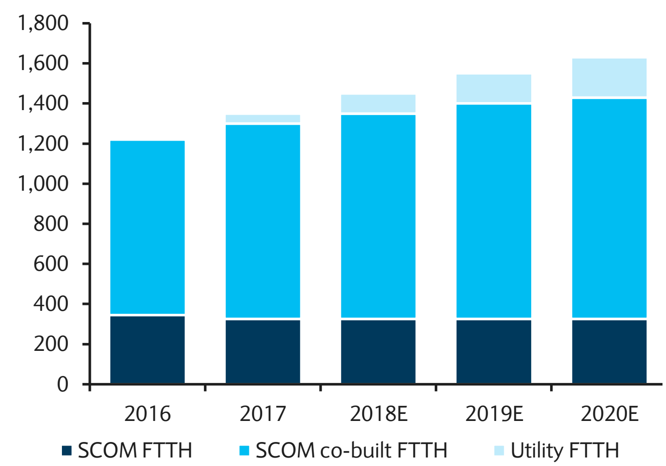
Swisscom: Fibre coverage (k HHs)



Source: Barclays research estimates, company data.

FIGURE 68

Switzerland: FTTH build (k HHs)



Source: Barclays research estimates, company data.

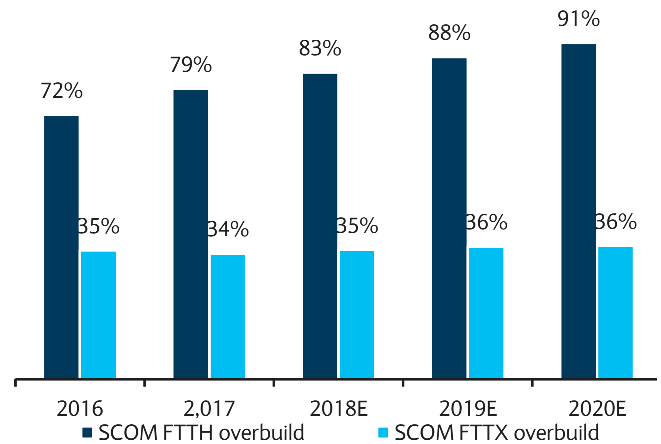
Alternative fibre is under-utilised

There are numerous fibre builds in Switzerland by various utility companies and municipalities. The majority of alternative fibre build has been carried out by partnerships between local utilities and Swisscom. These were coordinated by ComCom to reduce overbuild/duplicate networks (and minimise inconvenience to the public), standardise technical details and ensure consumers were free to choose any service provider they wished. We do believe the majority of alternative fibre remains unused/under-utilised but this has been the case for a long time per Wholesale points to downside risk (6 July 2017).

What about cable?

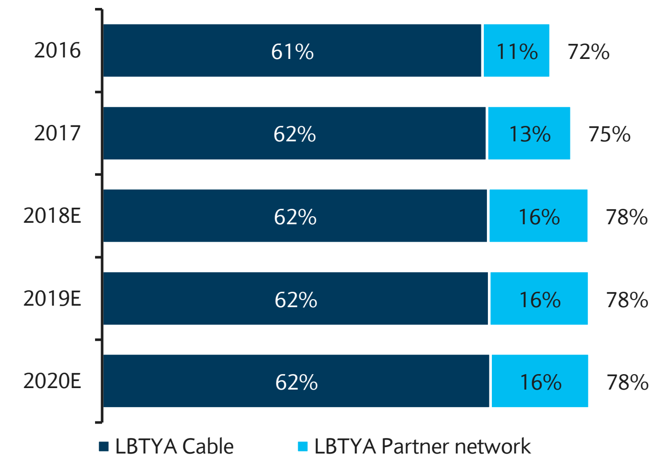
UPC, including partner networks, has covered at least 70% of Swiss households since 2010 and over 60% with its own cable network. UPC is rolling out a further 250k households across Switzerland and Austria. We believe the majority will be in Switzerland. In addition, UPC also announced the further development of its partner model which will see it reach up to an additional 200k households outside its current footprint. We estimate this will increase its coverage from 70% to 80%.

FIGURE 69
Switzerland: Fibre overbuild (% of homes passed)



Source: Barclays research estimates, company data.

FIGURE 70
UPC: Cable coverage (% of HHs)



Source: Barclays research estimates, company data.

Having partners able to facilitate network build and reduce cost

There has been a significant amount of sharing when it comes to FTTH rollouts in Switzerland whilst UPC has utilised the partner model to extend its cable network coverage. Swisscom has indicated a strong emphasis 'on cooperation and partnership with municipalities, construction partners and local fibre players' to extend its network further. Of the alternates, Swiss Fibre Net (SFN) is a joint venture between many of the local and regional energy providers in Switzerland. SFN amalgamates fragmented last mile fibre into a homogenous network. SFN then provides access to this network to national telecoms as well as private and public companies. SFN currently covers around 1m households and aims to increase this to 1.4m by 2020.

Having a fertile retail competitive environment with retailers very keen to support an alternative infrastructure

Sunrise and Salt would be the logical partners to facilitate network deployments owing to their ca25%/17% mobile market shares and lack of fixed infrastructure. We believe Sunrise is content wholesaling from Swisscom and utilising alternative fibre where required via upfront payments for lower ongoing wholesale fees. Sunrise currently has access to 22% of households through alternate fibre, although it likely wouldn't be averse to an alternative fibre build that would lower its dependence on Swisscom. Salt is already utilising alternative fibre to sell its new fixed broadband product. However, today it currently has access to 1.3m households (ca35% of households). We believe it would be a willing wholesale partner on potential future fibre rollouts owing to its stated desire to expand its coverage through further wholesale agreements.

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DNA Oyj (DNAO.HE)	Drillisch (DRIG.DE)	Elisa Oyj (ELI1V.HE)
Euskaltel SA (EKTL.MC)	Freenet (FNTGn.DE)	Gamma Communications PLC (GAMA.L)
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