

The WACC for KPN and VodafoneZiggo

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ACM

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I. Introduction and Summary

The Dutch Authority for Consumers and Markets (ACM) has commissioned The Brattle Group (Brattle) to calculate the Weighted Average Cost of Capital (WACC) for KPN and VodafoneZiggo for the current three-year regulatory period, October 2018-September 2021. As part of the assignment, the ACM has also asked us to investigate whether KPN's fiber-optic network business (the fiber business) involves a systematic risk that is not captured by KPN's WACC and, if so, to calculate the premium required to compensate KPN for the additional systematic risk of the fiber business (the fiber premium).¹

KPN is the “incumbent” fixed telecom network operator in the Netherlands, in the sense that it is the owner of the legacy copper network.² Historically, the ACM has required KPN to provide non-discriminatory unbundled access (physical or virtual) to its copper network and to its fiber-optic (fiber) network at regulated prices. VodafoneZiggo – a joint venture between Vodafone and Liberty Global established in 2016 – is the major cable operator in the Netherlands and owner of an almost nationwide fixed cable network. The ACM has recently imposed non-discriminatory access obligations also on VodafoneZiggo. More specifically, in its September 2018 decision on Wholesale Fixed Access,³ the ACM determined for the first time that VodafoneZiggo would be required to provide wholesale bitstream access to its cable network at regulated prices.

¹ The ACM commissioned Brattle to estimate the WACC for KPN's telecoms activities in 2013 and 2015. See, respectively, Dan Harris and Cosimo Fischetti, “The WACC for Wholesale Broadband and FttO”, 29 May 2013 (“Brattle 2013 Report”); Dan Harris, Cosimo Fischetti and Ying-Chin Chou, “The WACC for KPN and FttH”, 11 June 2015 (“Brattle 2015 Report”). Also, in 2016, the ACM commissioned the economic consultancy NERA to estimate the WACC for fixed termination rates and mobile terminations rates in the Netherlands. See NERA, “Estimating the WACCs for FTR-MTR”, July 2016 (“NERA 2016 Report”).

² In this report we refer to fixed telecom network operators who own a legacy copper network in a given country as “incumbents” in that country.

³ ACM, “Marktanalyse Wholesale Fixed Access”, September 2018 (available at: <https://www.acm.nl/sites/default/files/documents/marktanalyse-wholesale-fixed-access-20180928.pdf>). See also, ACM, “Market analysis of Wholesale Fixed Access: Summary”, September 2018, for a summary of the decision in English (available at: <https://www.acm.nl/sites/default/files/documents/2019-04/market-analysis-wholesale-fixed-access-2019-04-19.pdf>).

To ensure consistency between the two regulated telecom operators, the ACM has asked us to estimate KPN's and VodafoneZiggo's WACC based on a common methodology. Because KPN is listed, in the past the ACM estimated KPN's WACC using KPN's beta, gearing and cost of debt. However, applying the same methodology to VodafoneZiggo is not possible because VodafoneZiggo is not listed. Accordingly, we have made some changes to the methodology that was used in the past to estimate KPN's WACC. We estimate the beta and gearing for KPN and VodafoneZiggo based on a group of comparable European telecom companies engaged in similar activities and facing similar risk, and estimate the cost of debt based on the staircase model, which is the methodology used by the ACM for calculating the cost of debt of energy networks. We estimate all other WACC parameters based on ACM's general methodology. In preparing this report, we use data up to and including November 2019, being the most recent data available at the time we started our analysis. Below, we summarize our approach and findings.

There are several reasons to believe that a fiber network could have a higher cost of capital than a legacy copper network. Fiber networks require large investments, which increases operating leverage and hence beta. Demand for fiber networks could be more sensitive to economic conditions than the copper network, and the assets are long-lived, meaning that their value is more heavily affected by changes in expectations of future economic conditions.

All the factors above would be reflected in a higher beta for a fiber network, relative to a legacy copper network. The simplest approach to estimate a fiber premium would be to compare the beta for a pure-play copper network and the beta for a pure-play fiber network. However, such an approach is not feasible in practice, because there are no 'pure play' copper or fiber telecoms operators from which we can estimate betas. In reality, KPN operates a combination of copper and fiber. KPN's beta already reflects the risk of both its copper and fiber networks. That is, there is already some 'fiber premium' bundled into KPN's beta. Accordingly, we define the fiber premium as the additional return required by a pure fiber business for the additional systematic risk it faces relative to operating a mix of fiber and legacy copper networks.

Within the universe of European telecoms operators, we first identify three types of firms, each of which could face a different systematic risk. Incumbent operators are the owners of the legacy copper networks, generally offering fixed broadband access through a combination of copper and fiber. These operators also offer mobile services through their own mobile network. Alternative telecom operators are fixed and mobile providers that are not incumbents. These operators typically own a fiber backbone network and a mobile network. In most cases, these also operate a fiber network of their own in selected areas. Cable operators are converged wireline and mobile providers that offer fixed services in one or more countries through a

hybrid fiber-coaxial (*i.e.*, cable) network. Cable operators typically own also a mobile network, and in some cases operate as an alternative telecom operator in one or more countries.

Incumbent operators are the closest comparable group for KPN. Accordingly, we rely on this group of companies to estimate KPN's beta and gearing. Fiber and cable networks are both high-capacity networks able to deliver triple-play bundles at similar cost, quality, and pricing, and both type of networks require large investments. Importantly, there are no 'pure play' cable or fiber telecoms operators from which we can estimate a beta directly. Accordingly, we consider both alternative telecom operators and cable operators to estimate VodafoneZiggo's beta and gearing, and the beta for KPN's fiber business.

To determine our group of 'comparable firms' or 'peers', we start with a broad group of European telecom carriers. We test that the shares of the potential peers are sufficiently liquid to provide a reliable beta estimate, and then classify them as either incumbents, alternative telecom operators, and 'cable operators'. Based on the methodology discussed above, we select the average asset beta (0.46) and gearing (64.6%) of incumbent operators to estimate KPN's cost of equity. Similarly, we select the average asset beta (0.59) and gearing (50.7%) of alternative telecom and cable operators to estimate VodafoneZiggo's cost of equity. We also apply the average asset beta (0.59) of alternative telecom and cable operators for KPN's fiber business, which implies an uplift of 0.14 over KPN's beta. This difference reflects the fiber premium. Below, we show that applying a beta of 0.59 to KPN's fiber business results in a premium of 1.03% to the cost of equity and 0.81% to the real pre-tax WACC of KPN.

In line with ACM's general methodology, we calculate the risk-free rate (RFR) as the average between the three-year average yields of ten-year government bonds in the Netherlands and in Germany. Over the three-year period December 2016-November 2019, yields were 0.22% on average in Germany, and 0.36% on average in the Netherlands. Taking the average between the two gives us a RFR of 0.29%.

We calculate the ERP using long-term historical data on the excess return of shares over long-term bonds, using data from European markets. Specifically, the methodology requires that the projected ERP should be based on the average of the arithmetic and geometric realized ERP for the Eurozone, using the market capitalization of each country's stock market as weights. The methodology also requires considering whether adjustments to the final ERP need to be made based on considerations of the historical average ERP, and ERP estimates based on dividend-growth models. Based on the available data, the methodology yields an ERP of 4.95%.

We calculate the cost of debt of KPN and VodafoneZiggo based on the ‘staircase model’, which assumes that the regulated companies finance their existing investment with ten-year loans, and refinance 10% of their debt every year. We calculate the cost of debt using an index of 10-year generic industry bonds with a rating of BBB- to BBB+, which is consistent with the credit rating of KPN-issued and Vodafone-issued bonds, and with the typical credit rating of telecom bonds more generally. We add 15 basis points to cover the costs of issuing debt. This methodology results in a pre-tax cost of debt of 2.71%.

We calculate the applicable tax rate for the three-year regulatory period October 2018–September 2021 as a weighted average of the current corporate tax rate of 25% and the corporate tax rate of 21.7% which will be applicable in 2021. This results in an applicable tax rate of 24.18%.

The methodology requires that the nominal WACC is converted to a real WACC using an estimate of inflation using both historic and forecast inflation in the Netherlands and Germany. Based on this methodology, we derive at an estimate of inflation of 1.50%, which we use to convert the nominal WACC of KPN and VodafoneZiggo into a real WACC.

Table 1 reports our estimates of the WACC for KPN, VodafoneZiggo, and for KPN’s fiber business. The table further calculates the size of the fiber premium, defined as the additional return required by KPN for its fiber business.

- For KPN, we estimate a nominal post-tax cost of equity of 3.65%, a nominal post-tax WACC of 3.03%, and a real pre-tax WACC of 2.46%.
- For VodafoneZiggo, we estimate a nominal post-tax cost of equity of 4.37%, a nominal post-tax WACC of 3.59%, and a real pre-tax WACC of 3.19%.
- For KPN’s fiber business, we estimate a nominal post-tax cost of equity of 4.68%, a nominal post-tax WACC of 3.65%, and a real pre-tax WACC of 3.27%.
- Overall, applying a beta of 0.59 to KPN’s fiber business results in a premium of 1.03% to the cost of equity and 0.81% to the real pre-tax WACC of KPN. We note that this premium is lower than our 2015 estimate of the premium and explain why the fiber premium has reduced since 2015.

Table 1: WACC Calculation Summary

		KPN [A]	KPN's Fiber Business [B]	Vodafone Ziggo [C]	Fiber Premium [D] [B]-[A]
Gearing (D/A)	[1]	[2]/(1+[2])	39%	39%	34%
Gearing (D/E)	[2]	See note	64.62%	64.62%	50.70%
Tax rate	[3]	See note	24.18%	24.18%	24.18%
Risk free rate	[4]	See note	0.29%	0.29%	0.29%
Asset beta	[5]	See note	0.46	0.59	0.59
Equity beta	[6]	[5]x(1+(1-[3])x[2])	0.68	0.88	0.82
Equity Risk Premium	[7]	Table 2	4.95%	4.95%	4.95%
After-tax cost of equity	[8]	[4]+[6]x[7]	3.65%	4.68%	4.37%
Premium for fiber	[9]	[8][B] - [8][A]		1.03%	
Pre-tax cost of debt	[10]	Table 7	2.71%	2.71%	2.71%
Nominal after-tax WACC	[11]	((1-[1])x[8])+([1]x(1-[3])x[10])	3.03%	3.65%	3.59%
Nominal pre-tax WACC	[12]	[11]/(1-[3])	3.99%	4.81%	4.73%
Inflation	[13]	Table 8	1.50%	1.50%	1.50%
Real pre-tax WACC	[14]	(1+[12])/([1+[13])-1	2.46%	3.27%	3.19%
					0.81%

Notes and sources:

[2][A][B]: Average gearing of incumbents. See Table 4.

[2][C]: Average gearing of alternative telecom and cable operators. See Table 4.

[3]: Weighted average of current and future corporate tax rate, assigning a weight of 9/36 (January-September 2021) to the future rate of 21.7% and a weight of 27/36 (October 2018-December 2020) to the current rate of 25%.

[4]: Average German and Dutch 10Y Government Bond yield over the period 12/01/2016 - 11/30/2019.

[5][A]: Average asset beta of incumbents. See Table 4.

[5][B][C]: Average asset beta of alternative telecom and cable operators. See Table 4.

The remainder of the report is organized as follows:

In Section II, we explain our approach and methodology to estimate the beta and gearing for KPN and VodafoneZiggo, and the beta for KPN's fiber business.

In Section III, we identify listed telecoms firms, and organize them into the three groups identified above.

In Section IV, we calculate the beta and gearing for KPN and VodafoneZiggo, and the beta for KPN fiber business.

In Sections V-VIII, we estimate the other common parameters required to estimate the cost of capital, namely the RFR (Section V), the ERP (Section VI), the cost of debt (Section VII), tax and inflation (Section VIII).

In Section IX, we combine the analyses from the preceding sections and calculate the WACC for KPN, Vodafone Ziggo, and for the fiber business. We also calculate the size of the fiber premium and discuss why the fiber premium might have decreased since our last report on this issue in 2015.

II. Methodology

The ACM has asked us to undertake three tasks:

- Calculate KPN's WACC;
- Calculate the WACC for VodafoneZiggo;
- Investigate whether KPN's fiber business involves a systematic risk that is not captured by KPN's WACC and, if so, quantify the premium required to compensate KPN for this additional systematic risk. In this report, we define the fiber premium as the additional return required by a pure fiber business for the additional systematic risk it faces relative to operating a mix of fiber and legacy copper networks.

In the past, the ACM estimated KPN's WACC based on KPN's own data for beta and gearing. However, the same approach would not be possible for VodafoneZiggo, because it is not publicly traded. Therefore, to apply a common methodology for both KPN's and VodafoneZiggo's WACC, we estimate the beta and gearing for KPN and VodafoneZiggo based on a group of European telecom companies engaged in relevant activities.

Within the universe of European telecoms operators, we see three types of firms or activity, each of which could face a different systematic risk:

- **Incumbents:** we define incumbents as the operators who own the legacy copper network. In practice, all of these operators are converged fixed and mobile providers that also own fiber assets and offer fixed broadband access through a combination of copper and fiber.
- **Alternative telecom operators:** these are fixed and mobile providers that are not incumbents. These operators typically own a fiber backbone network and a mobile network. In most cases, these operators also have a fiber network of their own in selected areas. Most of these operators lease the incumbent's copper and fiber networks through physical and virtual unbundling.
- **Cable operators:** cable operators are converged wireline and mobile providers that offer fixed services in one or more countries through a hybrid fiber-coaxial (*i.e.*, "cable") network. In addition to owning a cable network, these operators typically own a mobile

network, and in some cases operate as an alternative telecom operator in one or more countries.

With respect to alternative telecom operators and cable operators, the historical distinction between fiber and cable networks has progressively blurred.⁴ Telecom services and networks have become increasingly data-centric. Voice and content services have both become digital, and can be easily delivered as data, through Voice over Internet Protocol (VOIP) or Internet Protocol TV (IPTV) services. Fiber and cable networks today are both high-capacity networks able to deliver triple-play bundles (voice, data, and content) at similar cost, quality, and pricing. Importantly, there are no ‘pure play’ cable or fiber telecoms operators from which we can estimate a beta directly.

II.A. The Fiber Premium

In the Brattle 2015 Report,⁵ we noted three main reasons why a fiber business could have a higher WACC than a copper-based network.

1. Operating leverage. The fiber business likely requires large investments to build fiber networks. The investment requirements increase beta, since they are a commitment for cash flows, and so act in a similar way to debt.
2. Demand uncertainty. Demand for fiber may be more sensitive to changes in economic performance and income. This could be the case, for example, if fiber demand could be seen as a premium product.
3. Long-lived assets. New fiber assets are long-lived, and so their value will be more sensitive to changes in macroeconomic conditions than a copper network, which has a shorter remaining lifetime.

All the factors above would be reflected in a higher beta for a fiber network, relative to a legacy copper network. The simplest approach to estimate a fiber premium would be to compare the beta for a pure-play copper network and the beta for a pure-play fiber network. However, such an approach is not feasible in practice, because there are no ‘pure play’ copper or fiber telecoms

⁴ There is a broad body of literature analyzing network convergence in wireline telecommunications. For a technical discussion on the topic see, *e.g.*, Singh and Raja, Convergence in information and communication technology: strategic and regulatory considerations, The World Bank (2010).

⁵ Dan Harris, Cosimo Fischetti and Ying-Chin Chou, “The WACC for KPN and FttH”, 11 June 2015 (“Brattle 2015 Report”).

operators from which we can estimate betas. In reality, KPN operates a combination of copper and fiber. KPN's beta already reflects the risk of both its copper and fiber networks. That is, there is already some 'fiber premium' bundled into KPN's beta. Accordingly, we define the fiber premium as the additional return required by a pure fiber business for the additional systematic risk it faces relative to operating a mix of fiber and legacy copper networks.

II.B. The Systematic Risk of Fiber and Cable

As well as fiber premium, the ACM has also us to calculate the cost of capital for VodafoneZiggo's cable network. As we noted above, there are no 'pure play' cable or fiber telecoms operators from which we can estimate a beta directly. However, there are at least two reasons to think that the systematic risk for fiber and cable will be broadly the same. First, cable and fiber networks offer similar services – in terms of price, quality and intended use. Fiber and cable networks compete in the same retail market, offering fixed broadband connection to consumers at download speeds of more than 30 Mbps. They are also able to deliver voice and content services over the IP network. From the consumers' perspective, it does not matter whether these services are delivered though fiber or cable. That is, the two products are substitutes. Hence, demand for both fiber and cable are likely to move in tandem. Similarly, fiber and cable operators share much of their costs, including – but not limited to – customer acquisition costs, customer support and billing, and network maintenance. This means that the profits, and share prices of a fiber and cable business will be similarly affected by changes in overall economic conditions. That is, they should have similar systematic risk.

Second, both fiber and cable networks require large investments, so that their operating leverage should also be similar. In the Netherlands, for example, KPN plans to invest about € 1.1 billion annually for the deployment of its fiber network over the 2019-2021 period.⁶ Similarly, VodafoneZiggo typically invests approximately 20% of its revenues in its network every year, for total investments of approximately € 800 million in 2018.⁷

II.C. Intermediate Conclusions

Based on the above, we conclude that:

⁶ See KPN, "Strategy 2019-2021: Summary Presentation", November 2018 (available at: https://ir.kpn.com/download/companies/koninkpnvv/Presentations/KPN_Oct-Dec_2019_Investor_Presentation.pdf).

⁷ See also VodafoneZiggo, "Investing in the network of the future" (available at: <https://www.vodafoneziggo.nl/en/verhalen/investing-network-future/>).

- Incumbent operators are the closest comparable group for KPN. Accordingly, we rely on this group of companies to estimate KPN's beta and gearing.
- Fiber and cable operators have similar systematic risk, and so we can use both types of firms to estimate for the cost of capital for fiber and for cable. Accordingly, we consider both alternative telecom operators and cable operators to estimate VodafoneZiggo's beta and gearing, and the beta for KPN's fiber business.
- All listed telecoms firms operate fiber or cable and mobile networks. The key difference between incumbent operators and alternative telecom and cable operators is that the former operate legacy copper networks, and the latter do not.
- If there is a fiber premium, we would expect the beta for alternative telecom and cable to be higher than the beta for incumbent telecoms firms, because the latter will reflect the lower risk of the legacy copper networks. Hence, the difference between these two betas should reflect any fiber premium.

Our proposed approach is consistent with recent regulatory decisions on the fiber premium. In line with the European Commission's recommendation on regulated access to Next Generation Access Networks (NGA),⁸ many European regulators have analysed whether the risk for deploying fiber is higher than copper, and if so, whether a premium should be applied. However, while some regulators have applied fiber premia to compensate the regulated company for the non-systematic risk of new investments in fiber,⁹ no regulator has estimated a premium for systematic risk directly. Rather, most regulators have explicitly argued that there are no pure-play fiber providers to estimate the premium, and that the higher risk of investments in fiber would eventually decrease with the increase in the penetration of fiber services.¹⁰ The only instance of a purely systematic risk premium comes from the regulator in the UK. In 2018, Ofcom estimated two distinct asset betas, one for Openreach's copper access

⁸ 2010/572/EU: Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA), OJ L 251, 25.9.2010, p. 35–48.

⁹ In 2019, for example, the Italian telecommunications authority Agcom set a value of the risk premium of 3.2% for new investments in FttH and 1.2% for new investments in FttC, noting that the premium would only compensate for non- systematic risk, because systematic risk is already captured by the beta parameter. See Agcom Decision n. 348/19/CONS, Annex 6, par. 12. Premia for non-systematic risk have been applied in Spain, France and Lithuania.

¹⁰ See, *e.g.*, Ofcom, "Wholesale Local Access Market Review" (March 2018), Annex A20. pp. 133-136. See also, Cambridge Economic Policy Associates, "Cost of capital for regulated fibre telecommunications services in New Zealand" (May 2019), Appendix C ("International regulatory precedent").

(0.59), and one for all "Other UK telecoms" services, including fiber (0.73).¹¹ In other words, the UK regulator determined that the systematic risk for fiber was similar to the systematic risk of other telecom services, which include retail and wholesale fixed, mobile and broadband telecommunications, and bundled services.¹²

Similar to what was done by the regulator in the UK, our approach assumes that the systematic risk of fiber is similar to the systematic risk of cable and of the other telecom services offered by alternative telecom and cable operators. We estimate a systematic risk premium for the fiber business by estimating two distinct asset betas, one for incumbents, and one for alternative telecom and cable operators.

III. Selection of Peers

III.A. Potential Peers

To determine our group of 'comparable firms' or 'peers' for KPN and VodafoneZiggo, we start with the list of companies Bloomberg Intelligence classifies as "EU telecom carriers", and the lists of peers considered in a number of recent WACC reports for the telecoms sector.¹³ From this broad list, we exclude non-European companies, and companies that do not provide fixed-telecom services.¹⁴ After applying these criteria, we end up with a list of 32 candidate peers.

¹¹ More specifically, Ofcom determined an asset beta for Openreach's copper access (0.59) as the mid-point between the average asset beta for utilities (0.40) and the asset beta for BT (0.78). The asset beta for other UK telecoms, including fiber access, was set to 0.73 based on the average asset beta for a group of comparable European companies (Telefonica, Deutsche Telecom, Proximus, KPN, Orange, TIM, Iliad, Orange Belgium, Telenor, Tele2, and Swisscom). Ofcom also considered the asset beta of US comparators (AT&T, Verizon and Century Link). Ofcom, Wholesale Local Access Market Review (March 2018), Annex A20.

¹² See Ofcom, Wholesale Local Access Market Review (March 2018), Annex A20.

¹³ More specifically, we have considered the following reports: CEPA, "Cost of capital for regulated fiber telecommunications services in New Zealand: Asset beta, leverage, and credit rating", May 2019; NERA, "Cost of Capital: Beta and Gearing for the 2019 BCMR", October 2018 and April 2019 update; WIK Consult, "Regulatory approaches to risky bottleneck assets: International case studies", February 2016; Harris, Caldwell, Lo Passo, and Bazzucchi, "Review of Approaches to Estimate a Reasonable Rate of Return for Investments in Telecoms Networks in Regulatory Proceedings and Options for EU Harmonization", prepared for DG Connect, July 2016.

¹⁴ We further exclude three companies – TDC, Com Hem, and Kcom – because they were acquired and subsequently delisted during our reference period. In particular: TDC was acquired by the

Table 2 provides the full list of candidate peers considered. We then checked whether the candidate peer:

- Is the historical incumbent, *i.e.* it is the owner of the legacy copper network, in at least one of the countries in which it operates (Table 2, column [B]).
- Operates as an alternative fixed telecom operator competing with the national incumbent in at least one of the countries in which it operates (Table 2, column [C]).
- Operates a cable network in at least one of the countries in which it operates (Table 2, column [D]).
- Offers mobile services in at least one of the countries in which it operates (Table 2, column [E]).
- Operates in multiple countries (Table 2, column [F]).

Based on this information, we further classify each of the candidate peers as either incumbent, alternative telecom operator, or cable operator in (Table 2, column [G]).

investment fund Macquarie and three Danish pension funds in February 2018 (see <https://tdcgroup.com/en/investor-relations/announcement-list/2018/5/tdc-announcement-of-request-for-delisting-of-tdcs-shares-from-nasdaq-copenhagen-3465240>); ComHem was acquired by Tele2 in October 2018 (see <https://www.tele2.com/media/com-hem-press-releases/2018/com-hem-will-be-delisted-and-the-last-day-of-trading-is-1-november-2018>); Kcom was acquired by a subsidiary of Macquarie in June 2019 (see <https://www.kcomgrouppltd.com/about-us/our-business/news-and-media/change-of-company-legal-status-and-name/>).

Table 2: Firms Selected as Potential Peers

	Company	Country	Incumbent	Alternative Telecom Operator		Cable	Mobile	Multiple countries	Brattle classification
				[A]	[B]				
[1]	Altice Europe NV	Netherlands	✓	✓	✓	✓	✓	✓	Incumbent
[2]	Bouygues SA	France		✓		✓			Alternative Telecom Operator
[3]	BT Group PLC	United Kingdom	✓			✓		✓	Incumbent
[4]	Deutsche Telekom AG	Germany	✓			✓	✓	✓	Incumbent
[5]	DNA Oyj	Finland		✓		✓			Cable
[6]	Elisa Oyj	Finland	✓	✓		✓		✓	Incumbent
[7]	Gamma Communications PLC	United Kingdom		✓		✓			Alternative Telecom Operator
[8]	GO PLC	Malta		✓		✓			Alternative Telecom Operator
[9]	Hellenic Telecommunications Organization SA	Greece	✓			✓			Incumbent
[10]	Iliad SA	France		✓		✓		✓	Alternative Telecom Operator
[11]	Koninklijke KPN NV	Netherlands	✓			✓		✓	Incumbent
[12]	Liberty Global PLC	United Kingdom			✓	✓		✓	Cable
[13]	Masmovil Ibercom SA	Spain		✓		✓		✓	Alternative Telecom Operator
[14]	NOS SGPS SA	Portugal			✓	✓			Cable
[15]	Orange Belgium SA	Belgium		✓		✓			Alternative Telecom Operator
[16]	Orange Polska SA	Poland	✓			✓			Incumbent
[17]	Orange SA	France	✓	✓		✓		✓	Incumbent
[18]	Proximus SADP	Belgium	✓			✓			Incumbent
[19]	Sunrise Communications Group AG	Switzerland		✓		✓			Alternative Telecom Operator
[20]	Swisscom AG	Switzerland	✓	✓		✓		✓	Incumbent
[21]	TalkTalk Telecom Group PLC	United Kingdom		✓		✓			Alternative Telecom Operator
[22]	Tele2 AB	Sweden		✓	✓	✓		✓	Cable
[23]	Telecom Italia SpA/Milano	Italy	✓			✓			Incumbent
[24]	Telefonica Deutschland Holding AG	Germany		✓		✓			Alternative Telecom Operator
[25]	Telefonica SA	Spain	✓	✓		✓		✓	Incumbent
[26]	Telekom Austria AG	Austria	✓			✓			Incumbent
[27]	Telenet Group Holding NV	Belgium			✓	✓			Cable
[28]	Telenor ASA	Norway	✓	✓		✓		✓	Incumbent
[29]	Telia Co AB	Sweden	✓	✓		✓		✓	Incumbent
[30]	United Internet AG	Germany		✓		✓			Alternative Telecom Operator
[31]	VEON Ltd	Netherlands		✓		✓		✓	Alternative Telecom Operator
[32]	Vodafone Group PLC	United Kingdom		✓	✓	✓		✓	Cable

Table 2 demonstrates that all candidate peers are “converged” service providers, in that they offer (i) fixed and mobile services, (ii) cable and mobile services, and even (iii) fixed, cable and mobile services in some cases.

III.B. Liquidity and M&A activity

Illiquid stocks tend to underestimate the true industry beta.¹⁵ Hence, in order to obtain a reliable beta estimate, we need to check that the stock of the candidate peers are sufficiently liquid.

¹⁵ To understand why this is true, for example, consider a firm with a true beta of 1.0, so that the firm’s true value moves exactly in line with the market. Now suppose that the firm’s shares are traded only every other day. In this case, the firm’s actual share price will only react to news the day after the market reacts. This will give the impression that the firm’s value is not well correlated with the market, and the beta will appear to be less than one. Using weekly returns to calculate beta mitigates this problem, since it is more likely that the firm’s shares will be traded in the week. However, using weekly returns have other disadvantages, such as providing 80% less data points over any given period.

Historically, the ACM methodology applied two criteria. First, the shares of the candidate peers had to be traded on at least 90% of the days in which the relevant market index traded over the reference period (the number of trading days test). Second, the ACM methodology required that the candidate peers had annual revenues of at least € 100 million (the annual revenue requirement), on the basis that firms with larger revenues are likely to have shares that are more liquidly traded. In previous reports for the ACM we performed additional checks that the two criteria would not produce any ‘false positives’.¹⁶ For example, we generally exclude companies involved in substantial M&A activity during the estimation window. M&A activity tends to affect a firm’s share price in a way that is unrelated to the systematic risk of the business. Hence, similar to illiquid stock, the observed beta for a firm with substantial M&A activity will tend to underestimate the true beta for the business. Accordingly, excluding firms involved in ‘substantial’ M&A activity helps ensure a reliable beta estimate.

More recently, in response to a court ruling, which determined that ACM’s criteria were not discriminating enough to select the peers,¹⁷ the ACM commissioned a study to provide a recommendation on the appropriate criteria to select peers for efficient beta estimation. The study determined that the two existing criteria adopted by ACM should be modified, and that a bid-ask spread threshold of 1% should be applied instead as the primary liquidity criterion. The ACM has asked us to follow this recommendation, and to perform additional liquidity tests as ‘sanity checks’ on the results.

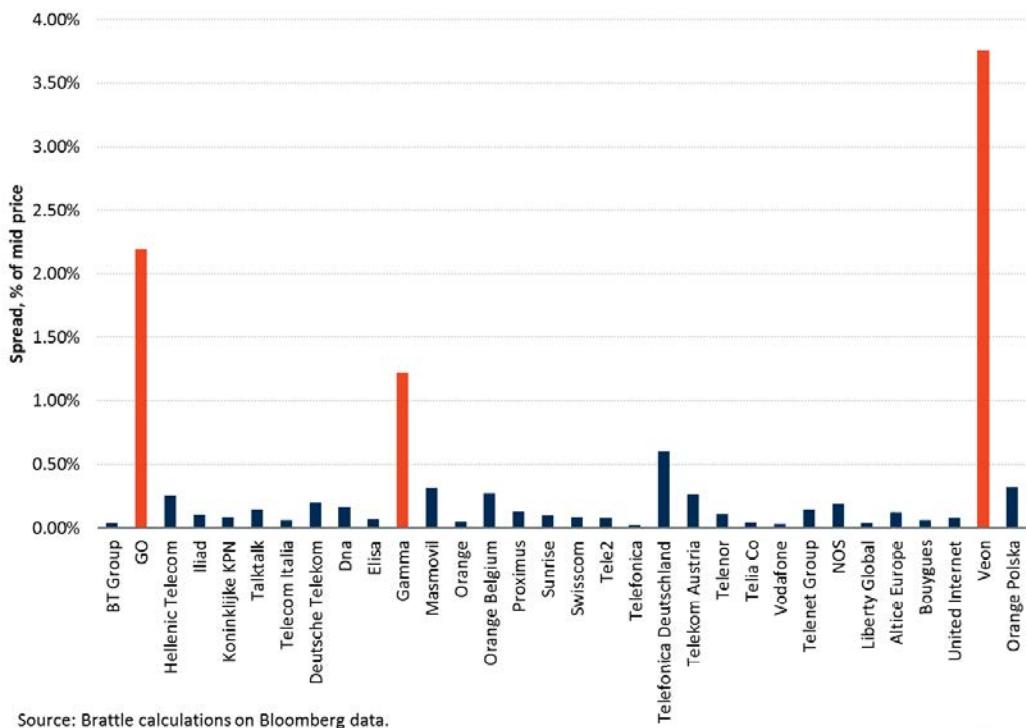
We calculate the average bid-ask spread as a percentage of the stock price over the December 2016–November 2019 reference period.¹⁸ As illustrated in Figure 1, below, the bid ask spread was generally below the 1% threshold for most companies. Only Go PLC (Malta), Gamma Communications PLC (UK), and Veon Ltd (Netherlands) had a bid-ask spread exceeding 1%, and we exclude these companies from our sample.

¹⁶ See, *e.g.*, Dan Harris, Lucrezio Figurelli, Flora Triolo, Massimiliano Cologgi, “The WACC for Drinking Water Companies in the Netherlands”, 9 July 2019.

¹⁷ In particular, the court ruling involved the inclusion of Fluxys in the peer group for the beta on the gas energy network. Fluxys was found to satisfy the historical number of trading days and annual revenue requirements. However, the court determined that a high value of the bid-ask spread demonstrated that Fluxys shares were illiquid.

¹⁸ More specifically, we calculate the daily value of the bid-ask spread as the difference between bid price and ask price at closing divided by the average between the bid price and the ask price. We then calculate the simple average of the daily bid ask spreads over the relevant period.

Figure 1: Bid-Ask spread of the Potential Peers



Source: Brattle calculations on Bloomberg data.

Additionally, we exclude two companies because they were recently involved in substantial M&A activity, which clearly affected their stock prices. Altice Europe NV was involved in a number of transactions over the course of 2018, including the spin-off of Altice USA and Altice Portugal, and the selling of its tower assets in France.¹⁹ These transactions clearly affected the stock price of Altice Europe, therefore depressing beta, as evidenced by the spikes in Altice's stock returns illustrated in Figure 2. Similarly, Telenor acquired DNA in August 2019.²⁰ Following the acquisition, the volatility of DNA's stock returns decreased significantly, as illustrated in Figure 3.

¹⁹ See for example “Altice plans US spin off and Europe revamp”, Financial Times, 9 January 2018. See also “Altice Announces Group Reorganization Altice USA Spin-Off and New Altice Europe Structure”, Altice Press Release dated January 8, 2018.

²⁰ See for more details “Telenor is the majority owner of DNA – this is how the acquisition has progressed” (available at: <https://corporate.dna.fi/investors/shareholders/telenor>).

Figure 2: Altice Europe's Daily Stock Returns (Dec. 2016-Nov. 2019)

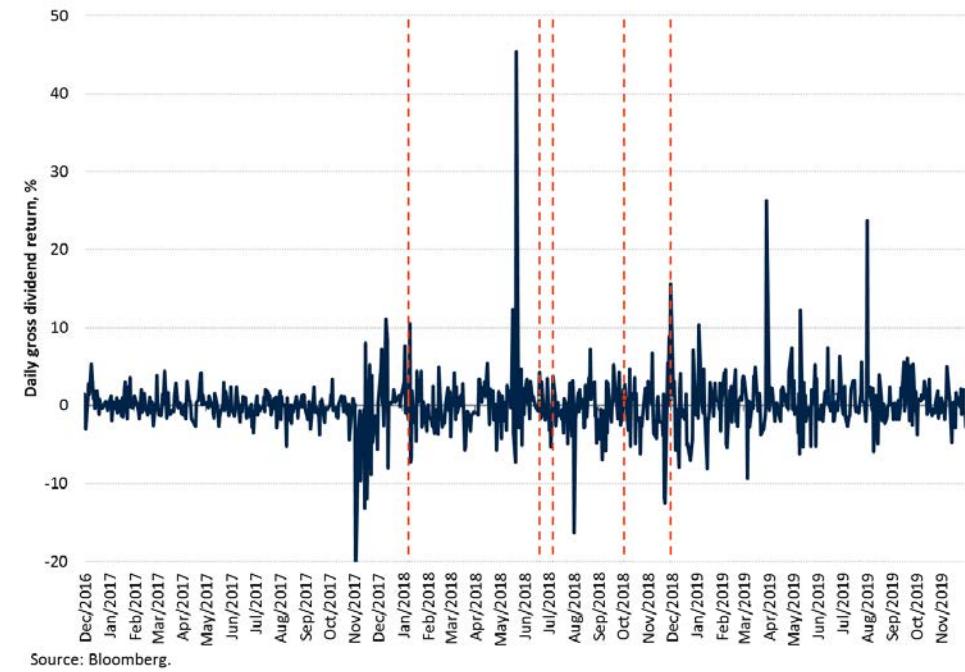
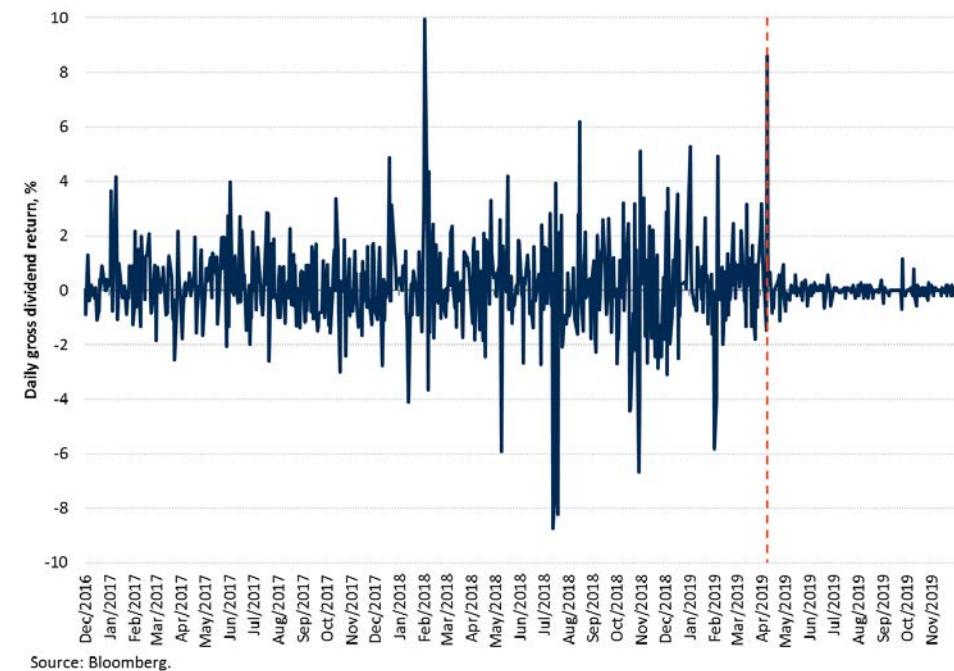


Figure 3: DNA's Daily Stock Returns (Dec. 2016-Nov. 2019)



III.C. The Final Sample of Peers

In Table 3, below, we report our final sample of peers. After applying our 1% bid-ask spread threshold and excluding companies involved in sizeable M&A activity affecting their share

prices, we are left with a total of 14 incumbents, and 13 companies between alternative telecom operators (8) and cable operators (5).

Table 3: Final List of Peers

		Country	Bid-Ask spread	M&A Activity	Final sample
Incumbents					
[1]	BT Group PLC	United Kingdom	✓	✓	✓
[2]	Deutsche Telekom AG	Germany	✓	✓	✓
[3]	Elisa Oyj	Finland	✓	✓	✓
[4]	Hellenic Telecommunications Organization SA	Greece	✓	✓	✓
[5]	Koninklijke KPN NV	Netherlands	✓	✓	✓
[6]	Orange Polska SA	Poland	✓	✓	✓
[7]	Orange SA	France	✓	✓	✓
[8]	Proximus SADP	Belgium	✓	✓	✓
[9]	Swisscom AG	Switzerland	✓	✓	✓
[10]	Telecom Italia SpA/Milano	Italy	✓	✓	✓
[11]	Telefonica SA	Spain	✓	✓	✓
[12]	Telekom Austria AG	Austria	✓	✓	✓
[13]	Telenor ASA	Norway	✓	✓	✓
[14]	Telia Co AB	Sweden	✓	✓	✓
Alternative Telecom Operators					
[1]	Bouygues SA	France	✓	✓	✓
[2]	Iliad SA	France	✓	✓	✓
[3]	Masmovil Ibercom SA	Spain	✓	✓	✓
[4]	Orange Belgium SA	Belgium	✓	✓	✓
[5]	Sunrise Communications Group AG	Switzerland	✓	✓	✓
[6]	TalkTalk Telecom Group PLC	United Kingdom	✓	✓	✓
[7]	Telefonica Deutschland Holding AG	Germany	✓	✓	✓
[8]	United Internet AG	Germany	✓	✓	✓
Cable Operators					
[1]	Liberty Global PLC	United Kingdom	✓	✓	✓
[2]	NOS SGPS SA	Portugal	✓	✓	✓
[3]	Tele2 AB	Sweden	✓	✓	✓
[4]	Telenet Group Holding NV	Belgium	✓	✓	✓
[5]	Vodafone Group PLC	United Kingdom	✓	✓	✓

IV. Beta and Gearing

We estimate the systematic risk for KPN, VodafoneZiggo, and for KPN's fiber business based on a peer group of telecom companies, which are engaged in similar activities and face similar risk as KPN and VodafoneZiggo.

ACM's general WACC methodology specifies a three-year daily sampling period for the beta. Accordingly, we estimate equity betas for the peer group of firms by regressing the daily returns of individual stocks on market returns over the three-year period December 2016 through November 2019.

The relative risk of each peer, as summarised by its beta parameter, must be measured against an index representing the overall market. A hypothetical investor in a Dutch telecom company would likely diversify their portfolio within a single currency zone so as to avoid exchange rate risk. Accordingly, to calculate market returns we use a broad Eurozone index for all companies in the peer group. This is reasonable, because all companies in the peer group are European network operators, and most operate in multiple European countries.²¹

We perform a series of diagnostic tests to assess if the equity beta estimates satisfy the standard conditions underlying ordinary least squares regression. We test for autocorrelation using the Breusch-Godfrey test, but rely on the OLS estimate of the beta parameter even in the presence of autocorrelation.²² We test for the presence of heteroscedasticity using the White's test and use White's-Huber robust standard errors. We have also considered the Dimson adjustment, but the test was not significant for any the companies in the peer group.²³

As well as reflecting the systematic risk of the underlying business, equity betas reflect the risk of debt or financial leverage. As debt is added to the company, the equity will become riskier as more cash from profits goes towards paying debt in each year before dividends can be distributed to equity. With more debt, increases or decreases in a firm's profit will have a larger effect on the value of equity. Hence if two firms engage in exactly the same activity, but one firm has more debt, that firm will have a higher equity beta than the firm with less debt.

²¹ We also considered using national indices for European companies traded outside the Eurozone. In theory, using indices from the relevant country should result in a higher beta estimate than estimating the beta against the Euro Stoxx because it avoids exchange rate movements depressing the betas. However, this was not the case for the comparable companies in the peer group for this estimation period. Using national indices (only for European companies traded outside the Eurozone) would reduce the average asset beta of incumbents from 0.46 (Table 4) to 0.44, and the average asset beta for alternative telecom and cable operators from 0.59 (Table 4) to 0.57. Hence, in this case, calculating betas against the Euro Stoxx index does not depress the beta estimate.

²² We test for autocorrelation up to three lags. Note that the OLS estimator of the beta is unbiased (not systematically too high or too low) and consistent (converges to the correct value) even in the presence of autocorrelation.

²³ The Dimson adjustment accounts for the issue that prices may react to market news the day before or the day after the market index reacts. This could occur because of differences in market opening times and trading hours, or differences in the liquidity of the firm's shares relative to the average liquidity of the market. If such an effect is present, a beta estimated using only the correlation between the daily return on the firm's share and the return on the market index on the same day may be biased. Accordingly, the Dimson adjustment regresses a company's daily returns using the market index returns one day before and one day after as additional regressors. The Dimson adjusted beta is the sum of the three coefficients calculated by the regression. If the Dimson adjusted beta estimate is significantly different from the original beta estimate, this suggests that information about the true beta may be lost by considering only the simple regression.

To measure the relative risk of the underlying asset on a like-for-like basis it is necessary to ‘unlever’ the equity betas, imagining that the firm is funded entirely by equity. In line with the ACM general methodology, we unlever the equity betas based on the Modigliani and Miller formula. The resulting beta is referred to as the asset beta.

In Table 4, below, we report the equity and asset betas, and the gearing, for each of the peer companies. Table 4 further reports the average and median asset beta and gearing for incumbents, alternative telecom operators, and cable operator, and for alternative telecom and cable operators combined.

- The asset beta of incumbent operators ranges between 0.28 for Telekom Austria and 0.58 for BT Group, with an average and median asset beta of 0.46 and 0.44, respectively. The average and median gearing (D/E) for this group were 64.6% and 54.1%, respectively.
- The asset beta of alternative telecom operators ranges between 0.35 for Sunrise Communications Group and 1.03 for United Internet, with an average and median asset beta of 0.64 and 0.57, respectively. The average and median gearing (D/E) for this group were 37.9% and 39.0%, respectively.
- The asset beta of cable operators ranges between 0.35 for Liberty Global and 0.82 for Tele2, with an average and median asset beta of 0.53 and 0.47, respectively.
- The average and median asset beta for alternative telecom and cable operators combined are 0.59 and 0.53, respectively. The average and median gearing (D/E) for this group were 50.7% and 47.6%, respectively.

Table 4: Beta and Gearing of Peers

			Equity beta [A]	Gearing (D/E) [B]	Tax rate [C]	Asset beta [D]
Incumbents						
[1]	BT Group PLC	United Kingdom	0.83	51.1%	19.1%	0.58
[2]	Hellenic Telecommunications Organization SA	Greece	0.57	29.1%	28.8%	0.48
[3]	Koninklijke KPN NV	Netherlands	0.58	66.7%	25.0%	0.39
[4]	Telecom Italia SpA/Milano	Italy	1.07	204.8%	24.6%	0.42
[5]	Deutsche Telekom AG	Germany	0.57	74.9%	29.9%	0.38
[6]	Elisa Oyj	Finland	0.49	15.8%	20.0%	0.44
[7]	Orange SA	France	0.65	72.8%	32.6%	0.44
[8]	Orange Polska SA	Poland	0.58	87.9%	19.0%	0.34
[9]	Proximus SADP	Belgium	0.64	24.4%	31.1%	0.55
[10]	Swisscom AG	Switzerland	0.56	29.8%	17.9%	0.45
[11]	Telefonica SA	Spain	0.95	114.9%	25.0%	0.51
[12]	Telekom Austria AG	Austria	0.40	56.6%	25.0%	0.28
[13]	Telenor ASA	Norway	0.66	24.1%	23.3%	0.56
[14]	Telia Co AB	Sweden	0.80	51.6%	21.9%	0.57
[15]	Mean		0.67	64.6%	24.5%	0.46
[16]	Median		0.61	54.1%	24.8%	0.44
Alternative Telecom Operators						
[17]	Iliad SA	France	0.95	28.7%	32.6%	0.80
[18]	TalkTalk Telecom Group PLC	United Kingdom	0.88	55.3%	19.1%	0.61
[19]	Masmovil Ibercom SA	Spain	0.63	49.3%	25.0%	0.46
[20]	Orange Belgium SA	Belgium	0.50	30.3%	31.1%	0.41
[21]	Sunrise Communications Group AG	Switzerland	0.48	47.6%	17.9%	0.35
[22]	Telefonica Deutschland Holding AG	Germany	0.62	22.6%	29.9%	0.53
[23]	Bouygues SA	France	1.20	50.9%	32.6%	0.89
[24]	United Internet AG	Germany	1.17	18.8%	29.9%	1.03
[25]	Mean		0.80	37.9%	27.3%	0.64
[26]	Median		0.76	39.0%	29.9%	0.57
Cable Operators						
[27]	Vodafone Group PLC	United Kingdom	0.92	71.8%	19.1%	0.58
[28]	Telenet Group Holding NV	Belgium	0.64	81.3%	31.1%	0.41
[29]	NOS SGPS SA	Portugal	0.61	37.4%	21.0%	0.47
[30]	Tele2 AB	Sweden	0.97	23.3%	21.9%	0.82
[31]	Liberty Global PLC	United Kingdom	0.75	141.8%	19.1%	0.35
[32]	Mean		0.78	71.1%	22.4%	0.53
[33]	Median		0.75	71.8%	21.0%	0.47
[34]	Mean for Alternative Telecom and Cable Operators			50.7%		0.59
[35]	Median for Alternative Telecom and Cable Operators			47.6%		0.53

Notes and sources:

[A]: Brattle calculations on Bloomberg data.

[B]: Calculated from Bloomberg data. Average values from Q4 2016 to Q3 2019.

[C]: KPMG. Average values from Q4 2016 to Q3 2019.

[D]: [A]/(1+(1-[C])x[B]).

As explained above, incumbent operators are the closest comparable group for KPN. Accordingly, we select the average asset beta (0.46) and gearing (64.6%) of incumbent operators to estimate KPN's cost of equity. Similarly, we select the average asset beta (0.59) and gearing (50.7%) of alternative telecom and cable operators to estimate VodafoneZiggo's cost of equity.

Finally, we select the average asset beta (0.59) of alternative telecom and cable operators to estimate the beta for KPN's fiber business. An asset beta of 0.59 for KPN's fiber business implies an uplift over KPN's beta of 0.14.²⁴

V. The Risk-Free Rate (RFR)

ACM's methodology calculates the risk-free rate as the average yield on 10-year government bonds over the last three years in the Netherlands and in Germany. Figure 4 illustrates the yields on 10-year government bonds over the past three years in the Netherlands and in Germany. Over our three-year reference period, the nominal government bond yields have remained at historical lows, fluctuating above zero until the end of 2018, when they started falling steadily, entering into negative territory around June of 2019, and remaining negative through the end of our reference period, being November 2019.²⁵

Over the three-year period ending in November 2019, yields were 0.36% on average in the Netherlands, and 0.22% on average in Germany. Taking the average between the two gives us a risk-free rate of 0.29%.²⁶

²⁴ In Section IX.B, we calculate the size of the fiber premium, and discuss why the fiber premium might have changed since our last report on this issue in 2015.

²⁵ The significant recent drop in government bond yields is largely attributable to the ECB's decision to relaunch its quantitative easing (QE) program. In December 2018, the ECB had announced that it would end its €30 billion a month bond-buying scheme, though it would continue to reinvest the proceeds of maturing bonds purchased through the program (see "ECB ends €2.5tn Eurozone QE stimulus programme," BBC, December 13 2018). However, only a few months later, the ECB announced that it would introduce a new package of measures, including a renewed QE program from October 2019 (see "European Central Bank paves way for fresh stimulus package", Financial Times, July 25 2019).

²⁶ As sensitivity, we calculate that applying a lower bound of zero to the yield of government bonds increases the risk-free rate by only 0.06%.

Figure 4: Dutch and German 10-Year Government Bond Yields (Dec. 2016–Nov. 2019)



VI. The Equity Risk Premium (ERP)

ACM's general methodology specifies that the ERP should be based on a historical time-series of the excess return of stocks over long-term bonds for the Eurozone economies. Specifically, ACM has determined to use the simple average of the long-term arithmetic and geometric ERP for the Eurozone as the anchor for the ERP estimate. The ERP for individual countries in the Eurozone should be weighted using the current capitalization of each country's stock market.²⁷ The methodology reflects an estimate of the ERP in the very long run, and notably excludes countries outside of the Eurozone. This is reasonable, because a Dutch investor is more likely to be diversified over the same currency zone, rather than to incur additional currency risks by diversifying within Europe but outside of the Eurozone.

Table 5, below, illustrates the realised ERP derived from one of the most widely used sources for long-run excess returns, being the data published by Dimson, Marsh and Staunton (DMS)

²⁷ Weighting based on the current market-capitalization reflects the idea that a typical investor would invest a larger share of his portfolio in countries with more investment opportunities.

for individual European countries taken from the February 2019 DMS report, which is the most recent report published by DMS available at the time we started our analysis.²⁸ This report contains ERP estimates using data up to and including 2018. Table 5 shows the simple and weighted averages of the ERP for the Eurozone countries for which DMS have data. We find that the simple average between the arithmetic and geometric ERP for the period 1900 to 2018 inclusive was 5.49% for the Eurozone. Using each country's stock market capitalization to weight the averages across the Eurozone, we derive an ERP of 4.95%.²⁹

Table 5: Historic Equity Risk Premium Relative to Bonds (1900 – 2018)

	Eurozone	Risk premiums related to bonds, 1900 - 2018			Country Cap (2018) USD mln [C]	
		Geometric mean	Arithmetic mean	Average		
		% [A]	% [B]	% Average [A], [B]		
Austria	[1]	1	2.70	21.10	11.90	122,356
Belgium	[2]	1	2.10	4.10	3.10	340,001
Denmark	[3]		3.30	4.90	4.10	388,059
Finland	[4]	1	5.10	8.60	6.85	240,126
France	[5]	1	3.00	5.30	4.15	2,195,157
Germany	[6]	1	4.80	8.20	6.50	1,953,108
Ireland	[7]	1	2.50	4.50	3.50	98,110
Italy	[8]	1	3.10	6.40	4.75	578,041
Norway	[9]		2.50	5.40	3.95	287,789
The Netherlands	[10]	1	3.20	5.50	4.35	479,091
Portugal	[11]	1	5.10	9.20	7.15	61,906
Spain	[12]	1	1.60	3.60	2.60	646,757
Sweden	[13]		3.00	5.20	4.10	685,034
Switzerland	[14]		2.10	3.60	2.85	1,468,465
United Kingdom	[15]		3.50	4.90	4.20	3,075,777
Average Eurozone	[16]		3.32	7.65	5.49	
Value-weighted average Eurozone	[17]		3.45	6.46	4.95	

Notes and sources:

[A][1]-[15], [B][1]-[15]: Credit Suisse Global Investment Returns Sourcebook 2019, Table 9.

[16]: Average [1], [2], [4], [5], [6], [7], [8], [10], [11], [12].

[17]: Average [1], [2], [4], [5], [6], [7], [8], [10], [11], [12], weighted by [C].

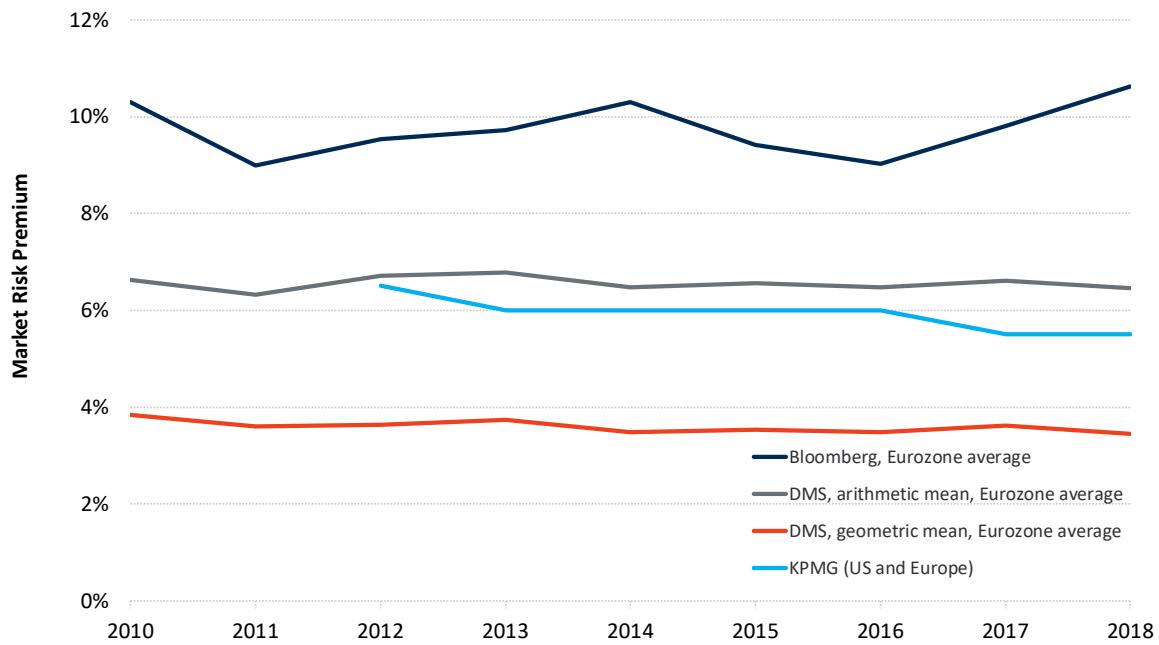
ACM's general methodology also requires to consider evidence from the dividend growth model (DGM) – that are based on dividend forecasts – as a sanity check on the estimate based on historical data. In Figure 5, below, we compare the DMS estimates of the arithmetic and geometric means of the historical ERP for the Eurozone to the forward looking estimates of the ERP based on Bloomberg's and KPMG's DGMs.³⁰

²⁸ Credit Suisse Global Investment Returns Sourcebook, Table 9.

²⁹ Note that in calculating the Eurozone averages, at the request of ACM, we include Austria, for which DMS reports a value of the arithmetic mean of 21.1%. Excluding Austria would reduce the value weighted Eurozone average of the arithmetic mean from 6.46% to 6.19%, and the average between the value-weighted arithmetic and geometric means from 4.95% to 4.82%.

³⁰ KPMG provides a DGM-based estimate of the ERP for Europe based on the implied equity returns of European indices. See "Equity Market Risk Premium - Research Summary", KPMG, 31 December 2018.

Figure 5: Eurozone Equity Risk Premiums, by Year



Source: Bloomberg, various DMS reports, KPMG Netherlands and Brattle calculations. Markets included in the KPMG estimate are ASX, FTSE, Stoxx 600 and S&P 500.

As shown in Figure 5, both historical DMS estimates and DGM estimates have been relatively stable over the last five years. Low returns in recent years, however, have negatively affected the arithmetic and geometric means for the Eurozone. For example, the arithmetic mean of the historical ERP decreased from 6.61% in 2017 to 6.46% in 2018, while the geometric mean decreased from 3.61% in 2017 to 3.45% in 2018. Overall, the average between the arithmetic and geometric means decreased from 5.11% in 2017 to 4.95% in 2018. Similarly, KPMG's estimate of the ERP remained unchanged between 2017 and 2018 at 5.5%. On the other hand, Bloomberg DGM estimate of the ERP increased from 9.8% in 2017 to 10.6% in 2018.

Based on the available evidence, ACM has asked us to apply the weighted average DMS ERP for the Eurozone equal to 4.95% in the WACC calculation.

VII. The Cost of Debt

In previous decisions, the ACM estimated the WACC using KPN's actual or 'embedded' cost of debt.³¹ Applying the same methodology to VodafoneZiggo is not possible, because VodafoneZiggo has no outstanding bonds, and because the debt of VodafoneZiggo's parent companies may not adequately reflect the cost of debt of VodafoneZiggo. Accordingly, the ACM has asked us estimate KPN's and VodafoneZiggo's cost of debt for the current regulatory period based on the 'staircase model', which is the methodology used by the ACM for calculating the cost of debt of energy networks.³²

The staircase model assumes that network operators finance their existing investment with ten-year loans, and refinance 10% of their invested capital every year. Accordingly, the model calculates the embedded cost of debt of a hypothetical loan portfolio, 10% of which was issued in every one of the past 10 years.

To calculate the cost of debt we have considered both the yield on Euro-denominated telecom bonds of 9-11 years to maturity,³³ and an index of 10-year generic industry bonds with a rating of BBB- to BBB+. A rating of BBB- to BBB+ is consistent with the credit rating of KPN-issued and Vodafone-issued bonds, and with the typical credit rating of telecom bonds more generally.³⁴ In Table 6, below, we summarize our calculation. For each one of the past 10 years, the table reports the yields on the index of generic industry bonds and on comparable bonds. Overall, the yield on the index appear to be higher than the yield on comparable telecom bonds. The average yield of the index was 2.56% over the past 10 years, whereas the average yield of the comparable bonds was 2.34%.

³¹ In the Brattle 2013 Report and in the Brattle 2015 Report we calculated KPN's cost of debt as the weighted average coupon rate of all Euro-denominated KPN bonds outstanding as of the measurement date.

³² See ACM/DE/2016/205071, Appendix 2.

³³ We consider Euro-denominated, at-maturity bonds issued by wireline and wireless telecom carriers according to Bloomberg. Overall, our sample includes a total of 53 bonds issued by European telecom carriers including BT, Deutsche Telekom, Eutelsat, KPN, Orange, Proximus, Ses, Swisscom, Telefonica, Telenor, Telia, and Vodafone.

³⁴ KPN's and Vodafone's bonds have a composite rating of BBB- and BBB, respectively. All other comparable bonds considered in the analysis have a rating of BBB- to BBB+, with the exception of a few bonds from Telenor (A-), Proximus (A) and Swisscom (A).

Table 6: Summary of Yields on Comparable Debt

Yields		
	Index BBB+/- Comparable bonds	
	[A] See note	[B] See note
Dec-09/Nov-10	4.35%	3.90%
Dec-10/Nov-11	5.04%	4.23%
Dec-11/Nov-12	3.57%	3.03%
Dec-12/Nov-13	2.93%	2.86%
Dec-13/Nov-14	2.27%	2.31%
Dec-14/Nov-15	1.53%	1.39%
Dec-15/Nov-16	1.13%	1.26%
Dec-16/Nov-17	1.42%	1.45%
Dec-17/Nov-18	1.75%	1.69%
Dec-18/Nov-19	1.65%	1.24%
10 year average	2.56%	2.34%

Notes:

[A], [B]: Brattle elaborations on Bloomberg data.

In principle, the yield on comparable telecom bonds should be similar to the yield on an index of similar maturity and rating. However, the observed difference may be driven by the limited number of bonds included in the sample in each period. On average, only between seven and eight bonds from our sample have a maturity of 9-11 years in any given month. Furthermore, the yields of bonds considered in any given month have high variability, likely reflecting company specific factors that are not captured by the debt rating.³⁵ Accordingly, we conservatively rely on the yield on the index of generic industry bonds (2.56%) to estimate the cost of debt of KPN and VodafoneZiggo.

In Table 7, below, we summarise our calculation of the cost of debt for KPN and VodafoneZiggo. By adding 15 basis points to account for the cost of issuing debt to the yield on comparable debt (2.56%), we obtain a cost of debt of 2.71%.

³⁵ We calculate that the average difference between the minimum and maximum average monthly yields of the comparable bonds considered was about 80 basis points over the past 10 years.

Table 7: Pre-tax Cost of Debt

				10 years average (Dec-Nov) [A]
Comparable Debt Yield (Index BBB +/-)	[1]	See note		2.56%
Non-interest fees	[2]	Assumed		0.15%
Pre-tax cost of debt	[3]	[1]+[2]		2.71%

Notes:

[1]: Sum of 10Y average risk free rate and debt spreads calculated using an index of BBB-/+ rated bonds. See Table 6.

The ACM has also asked us to assess whether the use of a 10-year reference period and of the staircase model is appropriate to estimate the cost of debt of KPN and VodafoneZiggo.

Similar to energy networks, telecoms networks have long-lived assets, which are typically financed by issuing long-term bonds.³⁶ An analysis of KPN's and Vodafone's active bonds confirms this observation. We calculate that the average maturity at issuance of the Euro-denominated bonds of KPN and Vodafone is about 11 years.

However, telecoms operators have the opportunity to refinance their debt when interest rates go down. Accordingly, the use of a 10-year reference period may be too generous when interest rates have fallen/are falling. The opposite is not necessarily true. If interest rates increase, the network operator could benefit from keeping its old debt until maturity, though eventually it will need to refinance its expiring debt at the new higher rates. Accordingly, use of a shorter reference period – *e.g.*, the three-year reference period that the ACM applies in other regulated sectors – may more accurately reflect the efficient cost of debt, because it would balance two regulatory goals, namely (i) the recognition of an operator's actual cost of debt, and (ii) the need to incentivize efficient financing.

In practice, however, the use of the staircase model to calculate the cost of debt for the current regulatory period has two key advantages. First, it is consistent with the methodology already applied by the ACM for energy networks. Second, it would involve only a small departure from the methodology applied for estimating the cost of debt of KPN in the past. Therefore, we recommend the ACM to apply the staircase model for the current regulatory period and

³⁶ Telecom network assets, however, are likely to be shorter lived than energy networks assets, because of faster technological change. Accordingly, at least in theory, the debt of energy networks may have longer maturity.

evaluate, upon a reasoned determination, whether to switch to a three-year reference period in the next regulatory period.

VIII. Tax and Inflation

The ACM requires to estimate the WACC of KPN and VodafoneZiggo in real pre-tax terms, by converting the nominal after-tax WACC to a real pre-tax WACC using the applicable tax rate and an estimate of inflation.

We understand that the current corporate tax rate will be lowered to 21.7% in 2021. Accordingly, we calculate the applicable tax rate for the three year regulatory period October 2018-September 2021 as a weighted average of the current and future rate, assigning a weight of 9/36 (January-September 2021) to the future corporate tax rate of 21.7%, and a weight of 27/36 (October 2018-December 2020) to the current corporate tax rate of 25%. This results in an applicable tax rate of 24.18%.

The methodology requires to calculate inflation as the average of both historic and forecast rates of inflation in the Netherlands and Germany. As a measure of both historical and forecast inflation we use the Harmonised Index of Consumer Prices, which is a consumer price index calculated according to a harmonized European methodology.³⁷

The methodology requires to calculate historical inflation over a three-year reference period. Over the three-year period December 2016-November 2019, average inflation was about 1.36% in Germany and 1.87% in the Netherlands, resulting in an average historical inflation of 1.62%. In theory, forecast inflation should be calculated over the length of the current regulatory period, being October 2018-September 2021. In practice, however, we are estimating the WACC as of the end of 2019. Accordingly, we calculate forecast inflation over the remaining two years of the regulatory period. Inflation forecasts for the Netherlands and Germany in 2020

³⁷ We have also considered applying the CPI, as measured by the national central banks in the Netherlands and Germany. However, the national central banks in the Netherlands and Germany, as well as the European Commission and the ECB only provide forecasts for the HICP. Accordingly, in order to apply a common measure for both historical and forecast inflation we have chosen to rely on the HICP. This is conservative, because historical CPI in the Netherlands and Germany was about 9 basis points higher than the HICP over the past three years.

and 2021 are provided by the European Commission.³⁸ The average inflation forecast for 2020–2021 is 1.45% for the Netherlands and 1.30% for Germany, resulting in an average forecast inflation of 1.38%. Table 8 summarises.

Table 8: Inflation

		Historical Inflation Dec 2016 - Nov 2019	Forecast Inflation 2020 - 2021	Average
		[A]	[B]	[C]
Netherlands	[1]	See note	1.87%	1.45%
Germany	[2]	See note	1.36%	1.30%
Average	[3]	Average [1], [2]	1.62%	1.38% 1.50%

Notes:

[A][1]: Average compound inflation between Dec 2016 and Nov 2019 from De Nederlandsche Bank.

[A][2]: Average compound inflation between Dec 2016 and Nov 2019 from Deutsche Bundesbank.

[B][1][2]: Average inflation forecast for 2020 and 2021 from the European Commission.

Taking the average between historical and forecast inflation we derive at an estimate of inflation of 1.50%, which we use to convert the nominal WACC of KPN and VodafoneZiggo into a real WACC.

IX. Conclusion

IX.A. The WACC for KPN, VodafoneZiggo, and for KPN's Fiber Business

In Table 9, below, we calculate the WACC for KPN (column [A]), VodafoneZiggo (column [C]), and for KPN's fiber business (column [B]). We apply the individual parameters discussed above and an applicable tax rate of 24.18% for the regulatory period October 2018–September 2021.

³⁸ We have also considered alternative forecasts of HICP inflation in the Netherlands and Germany, including forecasts by the national central banks, the OECD and the IMF, generally forecasting higher values. Conservatively, we have chosen to rely on the lower European Commission estimates.

- For KPN, we estimate a nominal post-tax cost of equity of 3.65%, a nominal post-tax WACC of 3.03%, and a real pre-tax WACC of 2.46%.
- For VodafoneZiggo, we estimate a nominal post-tax cost of equity of 4.37%, a nominal post-tax WACC of 3.59%, and a real pre-tax WACC of 3.19%.
- For KPN's fiber business, we estimate a nominal post-tax cost of equity of 4.68%, a nominal post-tax WACC of 3.65%, and a real pre-tax WACC of 3.27%.

Table 9: WACC Calculation Summary

		KPN [A]	KPN's Fiber Business [B]	Vodafone Ziggo [C]	Fiber Premium [D] [B]-[A]
Gearing (D/A)	[1]	[2]/(1+[2])	39%	39%	34%
Gearing (D/E)	[2]	See note	64.62%	64.62%	50.70%
Tax rate	[3]	See note	24.18%	24.18%	24.18%
Risk free rate	[4]	See note	0.29%	0.29%	0.29%
Asset beta	[5]	See note	0.46	0.59	0.59
Equity beta	[6]	[5]x(1+(1-[3])x[2])	0.68	0.88	0.82
Equity Risk Premium	[7]	Table 2	4.95%	4.95%	4.95%
After-tax cost of equity	[8]	[4]+[6]x[7]	3.65%	4.68%	4.37%
Premium for fiber	[9]	[8][B] - [8][A]		1.03%	1.03%
Pre-tax cost of debt	[10]	Table 7	2.71%	2.71%	2.71%
Nominal after-tax WACC	[11]	((1-[1])x[8])+([1]x(1-[3])x[10])	3.03%	3.65%	3.59%
Nominal pre-tax WACC	[12]	[11]/(1-[3])	3.99%	4.81%	4.73%
Inflation	[13]	Table 8	1.50%	1.50%	1.50%
Real pre-tax WACC	[14]	(1+[12])/((1+[13])-1)	2.46%	3.27%	3.19%
					0.81%

Notes and sources:

[2][A][B]: Average gearing of incumbents. See Table 4.

[2][C]: Average gearing of alternative telecom and cable operators. See Table 4.

[3]: Weighted average of current and future corporate tax rate, assigning a weight of 9/36 (January-September 2021) to the future rate of 21.7% and a weight of 27/36 (October 2018-December 2020) to the current rate of 25%.

[4]: Average German and Dutch 10Y Government Bond yield over the period 12/01/2016 - 11/30/2019.

[5][A]: Average asset beta of incumbents. See Table 4.

[5][B][C]: Average asset beta of alternative telecom and cable operators. See Table 4.

Table 9 further calculates the size of the fiber premium (column [D]), defined as the additional return required by KPN for its fiber business. Overall, applying a beta of 0.59 to KPN's fiber business results in a premium of 1.03% to the cost of equity and 0.81% to the real pre-tax WACC. We discuss reasons why the premium has decreased since 2015 in the following section.

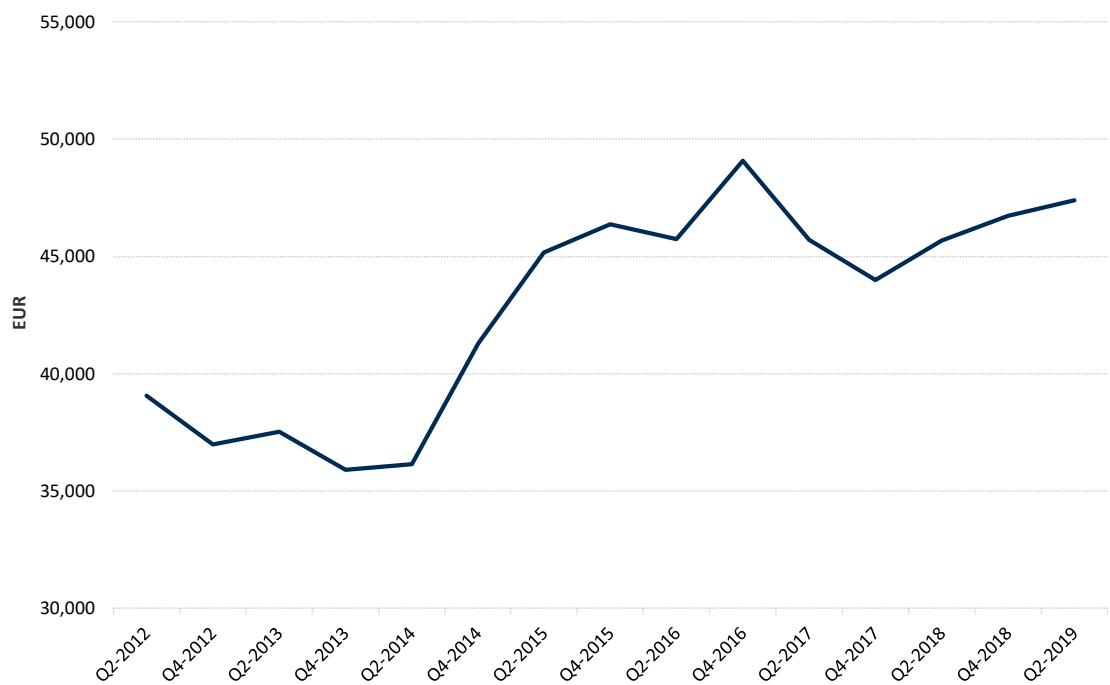
IX.B. The Decrease in the Fiber Premium

Our proposed fiber premium of 0.81% over KPN's real pre-tax WACC is lower than the 2% premium we proposed in 2015. An analysis of recent market developments in the Netherlands

clearly supports a decrease in the size of the fiber premium relative to 2015, as reflected by both (1) a reduction in demand-side risk, and (2) a reduction in the costs of deploying fiber.

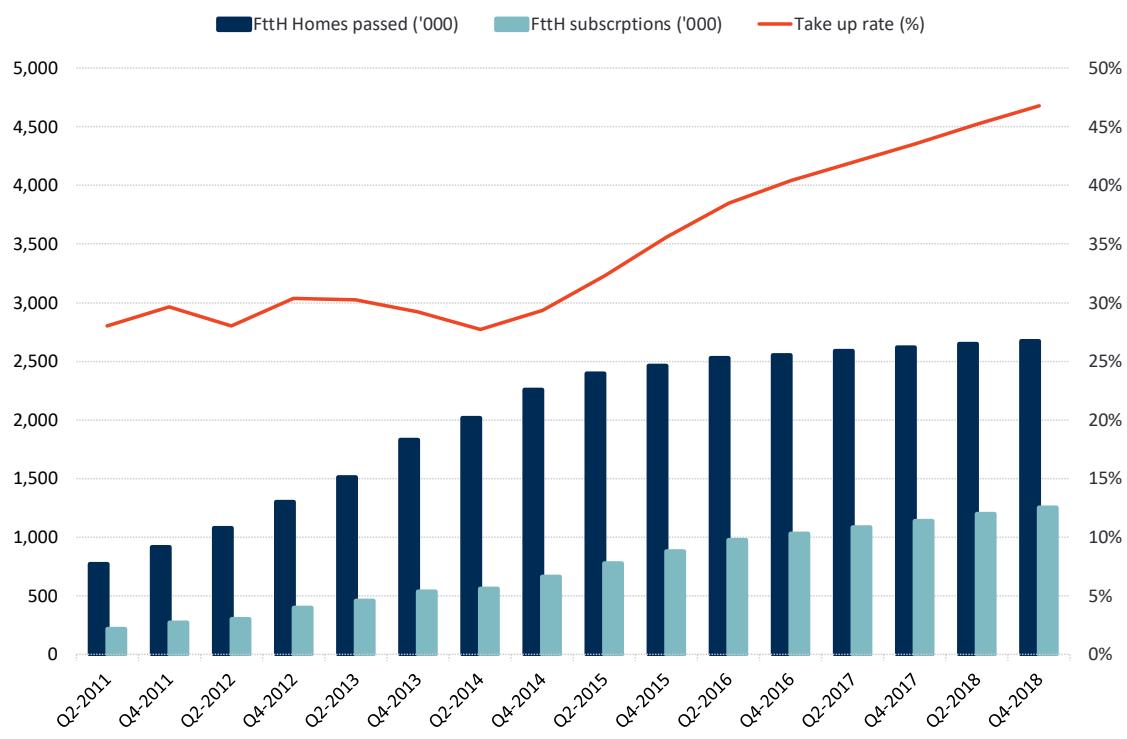
As illustrated in the following charts, despite some fluctuations in real GDP per capita (Figure 6), fiber-to-the-home (“FttH”) subscriptions at speeds greater than 30 Mbps have steadily increased over the past few years (Figure 7), going from about 0.34 million in 2012 to about 1.23 million in 2018 (+260%). Importantly, the take up rate, being the share of FttH subscribers divided by the number of homes passed – has increased significantly, from about 30% in 2012, to over 45% in 2018.

Figure 6: Real GDP per Capita in the Netherlands



Source: OECD Quarterly National Accounts.

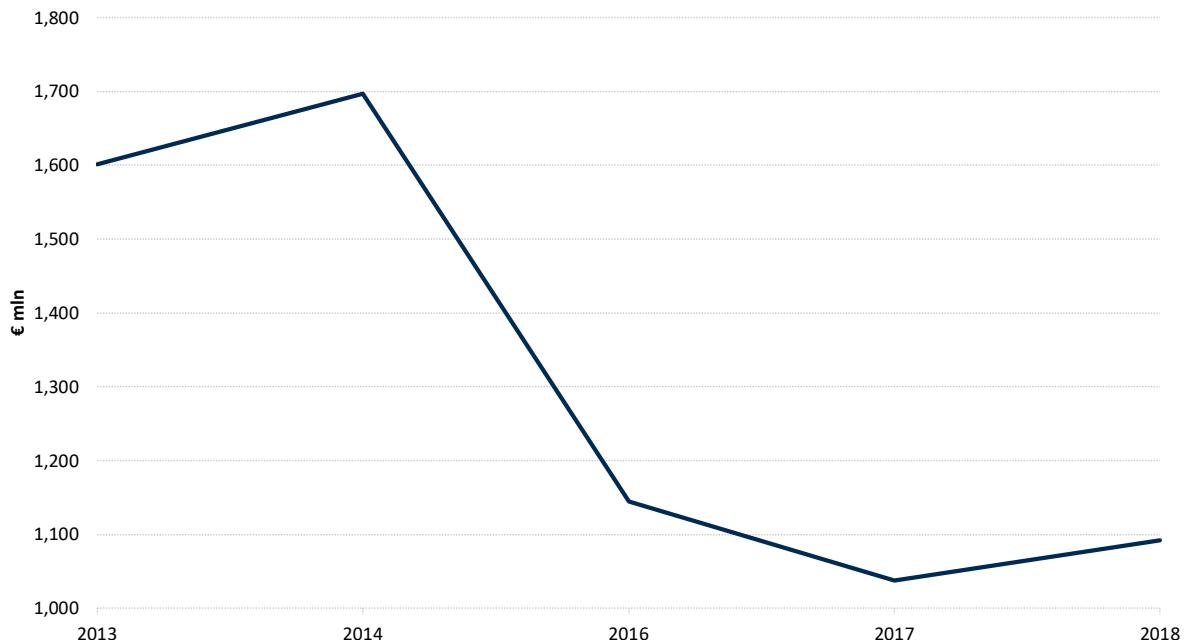
Figure 7: FttH Broadband Penetration and Subscriptions in the Netherlands



Source: ACM Telecommonitor reports.

Over the same period, annual investments on the fixed network have decreased, from about € 1.6 billion in 2012 to about € 1.0 billion in 2018 (Figure 8).

Figure 8: Annual Investments on the Fixed Network in the Netherlands



Source: ACM Telecommonitor reports.

According to KPN's presentations to investors, KPN's plans for the period 2019-2021 involve an acceleration of fiber roll-out, with the stated goal of adding 1 million homes passed by the end of 2021.³⁹ However, the acceleration of fiber roll-out does not translate into higher capex spending. According to KPN, capex spending over the 2019-2021 period is expected to remain stable, at about € 1.1 billion per year.⁴⁰ Importantly, investments in fiber have become more profitable as a result of both a reduction in the cost of deploying fiber, and “the strong commercial benefits” reflected in the higher take-up rate, consumer spend, and customer retention of fiber relative to copper.⁴¹

In conclusion, recent market developments clearly suggest that there has been a significant reduction of the systematic risks involved in investments in fiber over the last few years. Higher fiber penetration and, most importantly, higher take-up of fiber broadband subscriptions clearly suggest that fiber is no longer considered as a premium product, but more of a commodity. Therefore, there is no reason to believe that demand for fiber will be more sensitive to changes in economic conditions than demand for copper or other telecom services. Similarly, there has been a significant reduction in the costs of deploying fiber, which implies that the level of investments and operating leverage required to build out fiber has significantly reduced. Taken together, the significant reduction in demand-side risk and in the costs of deploying fiber both support a significant reduction in the fiber premium relative to the 2% premium we proposed in 2015.

³⁹ KPN, “Strategy 2019-2021: Summary Presentation”, November 2018, within “Investor Presentation, Oct-Dec 2019” (available at: https://ir.kpn.com/download/companies/koninkpnvv/Presentations/KPN_Oct-Dec_2019_Investor_Presentation.pdf).

⁴⁰ *Ibid*, p.19.

⁴¹ *Ibid*, p.10.



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