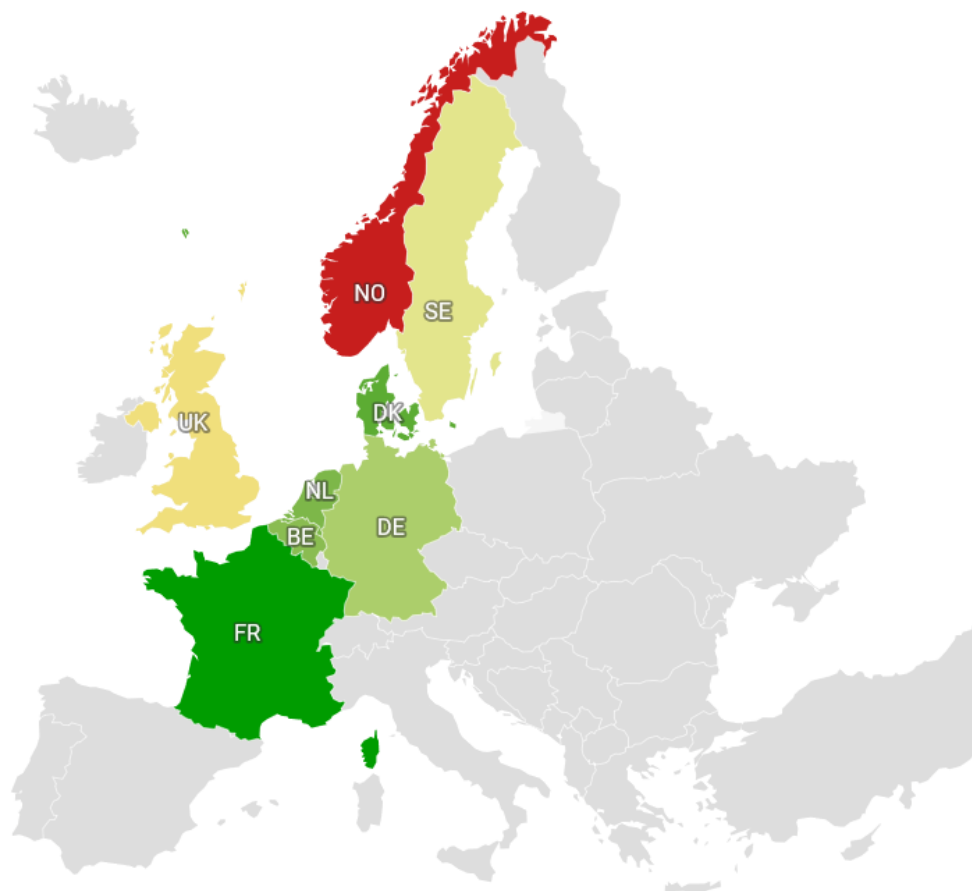


Benchmarking Danish fibre broadband pricing vs. seven other European markets

Total average 2 year fee for new build fibre subscription
[PPP DKK]



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1. Executive summary

This analysis is commissioned by Dansk Energi and compares Danish fibre broadband consumer pricing with that of seven comparable European countries: Sweden, Norway, Germany, the Netherlands, the UK, Belgium and France.

Purchase power adjustment has been done to allow for better comparability of prices across the markets.

The analysis has gathered all fee components – all monthly subscription fees as well as all one-time fees – and uses the **total 2 year fees** as the ultimate comparison. We separate between two cases:

- The **new build** case in which a detached house owner connects to fibre broadband for the first time
- The **existing connection** case in which a new consumer subscribes to fibre broadband in a house that already has an existing fibre connection

New build: After purchase power adjustment, the total 2 year new build fees for Danish fibre broadband are **among the most affordable** in our eight European markets. Only France is generally offering lower total fees.

Existing connection: After purchase power adjustment, the total 2 year existing connection fees for Danish fibre broadband are **among the more affordable** in our eight European markets. Only France is generally offering lower total fees.

These positions were obtained with the following characteristics of the fee composition:

- Danish fibre broadband **subscriptions** are among the most affordable in our eight European markets. Only France is systematically offering lower adjusted subscription prices.
- Danish **one-time fees for new build customers** are as low as in Germany, Belgium, the UK, the Netherlands and France. Two Nordic countries, Sweden and Norway, operate with much higher one-time new build fees than the other six markets.
- Danish **one-time fees for existing connections** are at the higher end of our international spectrum.

Denmark's favourable total 2 year fee position comes although Denmark's **minimum contract duration** of 6 months is approximately 3 months shorter than the average of all offers in our countries. Denmark's 6 months isn't the shortest, though; there are providers offering fibre broadband on non-binding contracts. Our analysis can't prove any cross-market correlation between the minimum contract duration and the fees.

According to Ookla Speedtest data, Denmark has the fixed broadband networks with the **highest average throughput**. Since Denmark generally has low fibre broadband subscription fees, this could have contributed to a willingness to purchase higher speed subscriptions.

This analysis ends with a benchmark of the weighted average cost of capital (**WACC**) as applied by the national regulatory authorities when defining wholesale prices that significant market power (SMP) providers could charge others for accessing their networks. Germany and Denmark have the lowest WACC among the seven countries using it, but in Denmark's case that WACC applies only to legacy (copper) networks. In Denmark, there's a higher WACC for NGA (fibre) networks – at an about-average level. This means that in

relation to the other markets, it is *less interesting* for SMP providers to invest in fixed legacy networks in Denmark – but *as interesting* for SMP providers to invest in fibre networks as in the average country.

2. Background

This analysis is commissioned by Dansk Energi and compares Danish fibre broadband pricing for consumers with that of seven other European countries.

3. Peer group

The following eight **countries** form the peer group in this analysis:

- Denmark
- Sweden
- Norway
- Germany
- Netherlands
- UK
- Belgium
- France

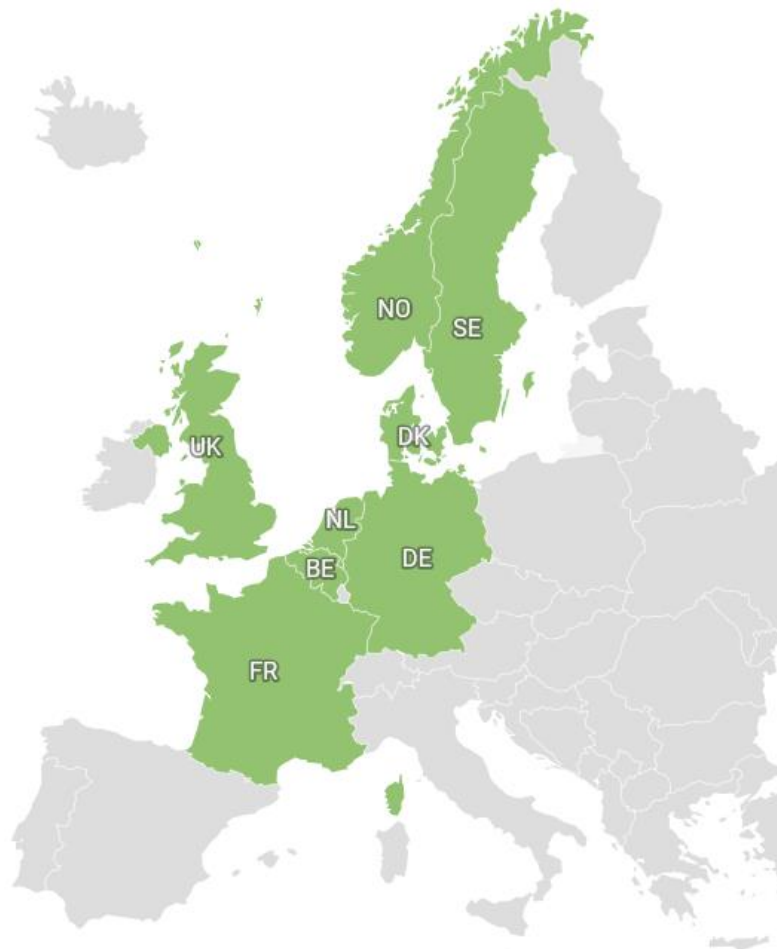


Figure 1. The eight countries covered by this analysis

These countries have been selected based on their geographical location in North and West Europe but also because they represent markets that show similarities with Denmark:

December 2020	Fixed broadband household adoption	Share of fixed broadband with >=30 Mbit/s download throughput	Share of households with fibre availability	Share of fixed broadband subscriptions on fibre	Share of broadband subscriptions being mobile data-only
Denmark ¹	83%	83%	² 72%	39%	31%
Sweden	84%	89%	³ 83%	75%	26%
Norway	89%	n/a	⁴ 74%	60%	12%
Germany	⁵ 87%	71%	⁶ 14%	5%	3%
Netherlands	⁷ 95%	93%	42%	21%	10%
UK	⁸ 99%	⁹ 73%	¹⁰ 21%	4%	15%
Belgium	78%	96%	n/a	2%	3%
France	¹¹ 106%	¹² 48%	43%	34%	10%

The figures in the table above originate from the respective national regulatory authority – but note that some numbers have different age and that not all definitions are identical.

¹ June 2020 as Energistyrelsen has not yet reported data for December 2020

² June 2020 <https://www.mynewsdesk.com/dk/energistyrelsen/pressreleases/flere-danskere-har-adgang-til-hurtigt-bredbaand-3020061>

³ October 2020 <https://www.pts.se/sv/dokument/rapporter/internet/2021/pts-mobiltacknings--och-bredbandskartlaggning-2020-pts-er-202116/>

⁴ June 2020 <https://www.nkom.no/aktuelt/74-prosent-av-norske-husstander-har-tilgang-til-fiberbredb%C3%A5nd>

⁵ Includes B2B subscriptions, thus exaggerating this figure

⁶ <https://www.statista.com/statistics/469139/fibre-optic-connections-households-with-access-germany/>

⁷ Includes B2B subscriptions, thus exaggerating this figure

⁸ Includes SME subscriptions, thus exaggerating this figure

⁹ November 2019

¹⁰ January 2021

¹¹ Includes B2B subscriptions, thus exaggerating this figure

¹² Excludes >30 Mbit/s subscriptions within xDSL

Based on the table above, it is clear that the three countries behind Denmark in fibre availability and adoption are **Germany**, the **UK** and **Belgium**. The incumbent operators in these countries – Telekom, BT/Openreach and Proximus – did for long resist fibre rollout to instead offer faster xDSL variants. These countries are also well served by modernised HFC (cable TV) networks.

The countries closest to Denmark – figures-wise – are **France**, the **Netherlands**, **Norway** and **Sweden**. With regards to fibre adoption, Sweden and Norway are well ahead of the other countries.

Tefficient has documented the currently publicly offered **fibre broadband consumer**¹³ **prices** of the **two largest**¹⁴ **providers** in the eight countries: The incumbent operator plus the largest alternative provider:

- Denmark: YouSee and Norlys (Stofa/Boxer)
- Sweden: Telia and Tele2 (incl. former Com Hem)
- Norway: Telenor and Telia (incl. former Get)
- Germany: Telekom and Vodafone (incl. former Unitymedia)
- Netherlands: KPN and Caiway
- UK: BT and Hyperoptic
- Belgium: Proximus and Orange
- France: Orange and Free

Across these 16 providers, the pricing of **67** different fibre broadband plans has been captured.

Recurring subscription fees as well as one-off fees have been captured.

A lower threshold of **100 Mbit/s** in download throughput has been applied.

All plans – except one from Proximus in Belgium which is limited to 100 GB per month – come with **unlimited data volume**.

All prices have been captured in between 7 and 11 June 2021.

¹³ Many consumers, living in apartments, will typically subscribe to broadband services through a group agreement administered by the landlord or the housing association. These agreements are not public and the pricing of these could therefore not be included in this analysis. Effectively, this means that the analysis primarily captures the pricing of broadband services delivered to consumers living in detached housing.

¹⁴ As to the Netherlands, UK and Belgium, the second largest providers in the overall fixed broadband market – VodafoneZiggo, Virgin Media and Telenet – are not yet offering full fibre broadband, but rely mainly on HFC. Since no true fibre prices are available, Tefficient has replaced these providers with the second largest *fibre* broadband provider of each country. Statistics on size for alternative fibre providers are often hard to get, but Tefficient has assessed that this is Caiway in the Netherlands, Hyperoptic in the UK and Orange in Belgium.

4. Observed data issues

- Some fixed broadband providers are only stating prices after a **specific address** has been inserted. This is done since the pricing may depend on who (the provider or a regional infrastructure partner) is delivering the underlying broadband infrastructure. In some cases, Tefficient has been able to obtain complete price lists, but in other cases **example addresses** have been used to generate prices.
- **New build connection fees** (for new connections into homes) are sometimes more difficult to find than monthly subscription fees. The reason is that they can vary according to region and neighbourhood – but Tefficient also senses that these fees are negotiable in certain countries such as Norway and Sweden – often against a binding contract. All providers not stating connection fees in their price lists have been contacted directly by Tefficient to, at least, give indications of what the connection fees *typically* are.
- In two countries, **pure fibre broadband plans aren't offered** by the studied providers: In **Germany** all fibre broadband plans also come with fixed telephony (a type of double-play or "2p"). In **France** all fibre broadband plans also come with fixed telephony and with TV (triple-play or "3p"). For Proximus in Belgium it is impossible to deselect TV when selecting a fibre broadband plan online. Tefficient contacted Proximus directly via their service center and was given information that allowed us to include the stand-alone fibre broadband prices for Proximus in our analysis. It is unlikely that the average consumer will do this, though.

5. Overview of pricing analysis

The following image is used in the analysis to help the reader navigate between the comparisons of different price components:

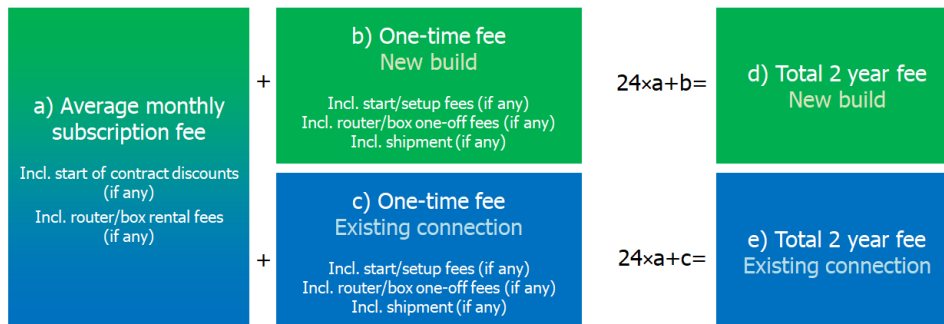


Figure 2. The price comparisons of the analysis outlined

The price component usually highlighted in the sales and marketing messages of the providers is the **monthly subscription fee**. Since different providers use different tactics to lower their monthly subscription fee – including start-of-contract discounts and a separate router or box rental fee – we will in this analysis calculate an *average* monthly subscription fee based on a 24 month subscription period. This price component is called a) in Figure 2 and is the same regardless of if the customer requires a new build or have/take over an existing fibre connection.

In certain countries, Sweden particularly, the **one-time fee for a new build** is significant. We call this price component b) and it will include also other one-time fees that providers might charge – such as router/one-off fees or shipment fees.

With an increasing reach of fibre networks, it will gradually become more common that a detached house already has an existing fibre connection – perhaps installed by the previous owner of the house. We call this price component c) – **one-time fee for an existing connection** – and it tends to be much lower than b) as no fibre installation and no digging are required.

The most complete picture of the pricing is obtained by comparing the *total* fees – subscription and one-time fees – over a certain time period. In this analysis we have calculated the **total fees over a 2 year period**. We call that d) for the new build option and e) for the existing connection option.

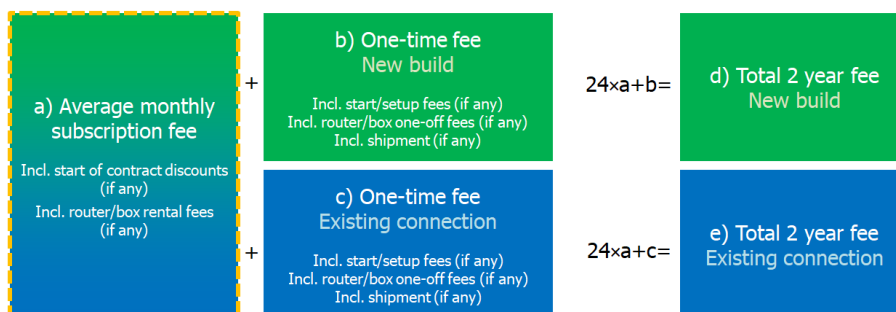
The component currently analysed will be highlighted in the beginning of each pricing section.

In order to introduce the purchasing power parity method, we will make the first pricing comparison (a) twice:

- Actual fees in DKK
- Adjusted fees in PPP DKK – adjusted for general differences in country purchase power

The following pricing comparisons b)-e) will be in PPP DKK only.

6. Average monthly subscription fee



Fibre providers are generally using the monthly subscription prices as “sticker price” and hence trying to keep them as low as possible. A usual practice is to discount the price during a limited time upon start of a contract: We have found providers giving more than 50% discount with discount periods of 6, 12 and 24 months in our studied markets. This type of discounting is common in Sweden, Germany, France, the UK and the Netherlands – but isn’t currently used by the providers covered in Denmark, Norway and Belgium.

The habit to have different fees during different stages of a customer engagement means that it’s a big difference for the price comparison if we compare the prices during first month of an engagement – or later on. To make the comparison as fair as possible, this analysis defines a **comparison period of 24 months**. We have calculated how much it will cost a customer during that time – and based on that calculated an **average monthly subscription fee** – valid for the first 24 months.

Another, less common, way to make monthly “sticker price” low is to charge an additional monthly subscription fee for customers who need a **router**¹⁵. Two providers in our peer group – Vodafone in Germany and Telenor in Norway – have this practice. In this analysis we have included this router rental fee for Vodafone, but not for Telenor. The reason being that Telenor, unlike Vodafone, doesn’t require customers to use their router, only *recommends* it. Most providers in the analysis require their customers to use the router of the provider, but don’t charge a monthly subscription fee for it¹⁶.

All plans – except one from Proximus in Belgium which is limited to 100 GB per month – come with **unlimited data volume**. In all other cases, the defining parameter for the monthly service subscription price is instead the download throughput – measured in **Mbit/s**.

Figure 3 below compares the average monthly subscription fee¹⁷ of all offered consumer fibre broadband subscription plans to the maximum download throughput (if at least 100 Mbit/s) in Danish kroner (DKK)¹⁸.

¹⁵ Or a triple-play box in countries where a pure fibre broadband option isn’t offered. In these cases, none of the providers studied however charge a subscription fee for a box.

¹⁶ Often they charge a shipping fee, though, something this analysis takes into account when comparing the one-time and 2 year fees

¹⁷ Excluding connection one-time fees, equipment one-time fees and other one-time fees (if any). The total costs will be compared later in the analysis. All prices include VAT (valid throughout the analysis).

¹⁸ Using the exchange rates of 8 June 2021: 1 NOK=0,73731 DKK, 1 SEK=0,73854 DKK, 1 GBP=8,64828 DKK and 1 EUR=7,43625 DKK

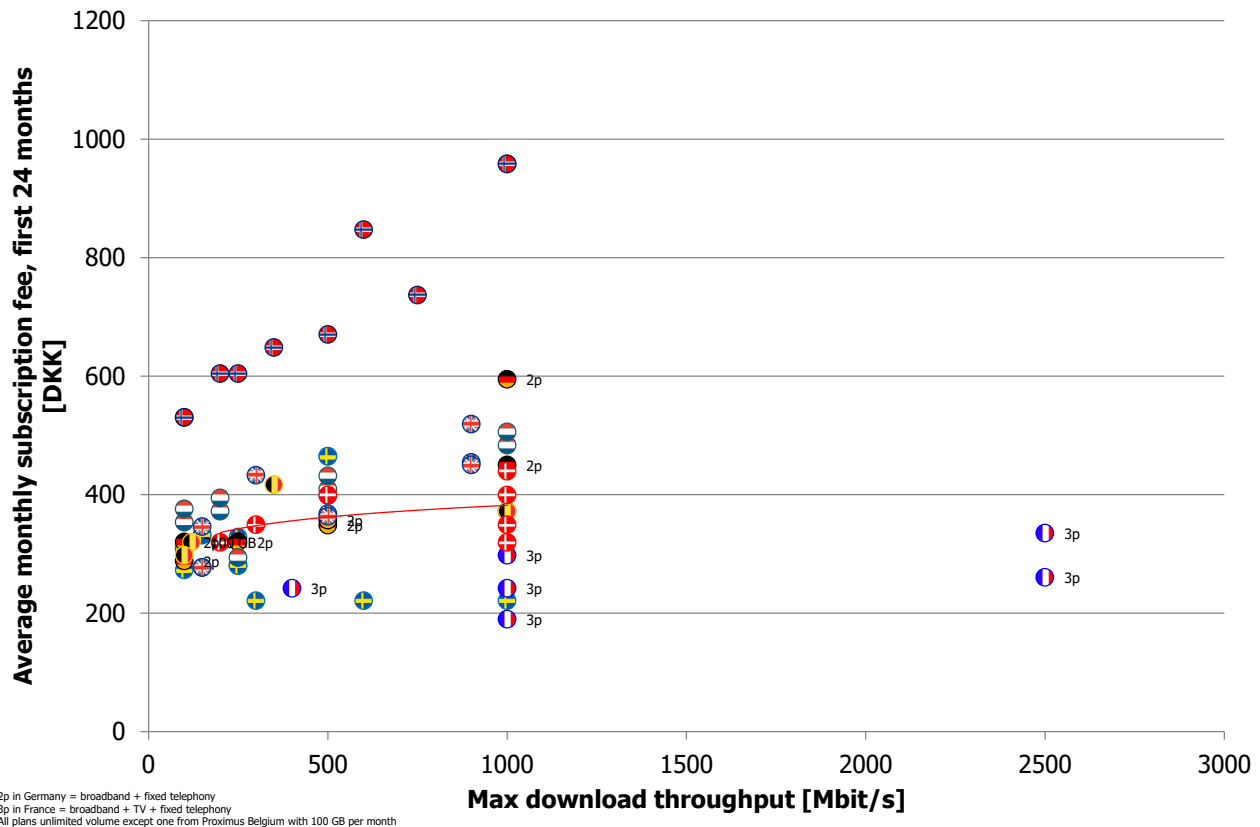


Figure 3. Comparison of the average monthly subscription fee in DKK during the first 24 months to the max download throughput in eight countries, June 2021 [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]

The first thing we can conclude is that there is a significant difference in how much a fibre broadband plan averagely costs per month during the first 24 months: **Norway** is uniquely positioned with monthly subscriptions sometimes twice as costly as in the typical non-Norwegian European market. This is before purchase power adjustment.

As mentioned, pure fibre broadband plans aren't offered by the studied providers in Germany and France. All German fibre broadband plans also come with fixed telephony – these are marked **2p** in our graphs to allow us to remember that there's an additional, non-optional, element included. All French fibre broadband plans also come with fixed telephony and TV. These are marked **3p** in our graphs.

It's too early to conclude on the position of Denmark – we'd like to do purchase power adjustments first – but we just want to point out that the **red** trend line is based on the Danish fibre subscriptions offered – to help identifying Denmark's position.

So let's now apply purchase power adjustments to Figure 3 and see if that changes the positions of the countries. But first a bit on the methodology used. Skip the grey area if you'd like to go directly to the results.

Different countries obviously have different gross domestic products (GDP) per capita. A higher GDP per capita is most often also an indication of a higher purchasing power, but using the *nominal* GDP per capita differences as adjustment doesn't take the differences in price levels into account.

A common way to deal with this is **purchasing power parity (PPP)** conversion. An introduction to PPP is given in the box below¹⁹.

Measuring economic activity in a country is difficult, since ‘the economy’ is a complex system with lots of moving parts. A common way to deal with this is to focus on aggregate indicators, such as total national output: “the monetary value of all goods and services produced within a country (or region) in a specific time period”. That’s what economists call the Gross Domestic Product (GDP).

GDP is measured using prevailing national prices to estimate the value of output. In other words, GDP is calculated using local currency units. This means that in order to make meaningful cross-country comparisons, it is necessary to translate figures into a common currency – i.e. use a consistent ‘unit of measure’.

One option is to simply translate all national figures into one common currency (for instance, US dollars) using exchange rates from currency markets. But because market exchange rates do not always reflect the different price levels between countries, economists often opt for a different alternative. They create a hypothetical currency, called ‘international dollars’, and use this as a common unit of measure. **The idea is that a given amount of international dollars should buy roughly the same amount – and quality – of goods and services in any country.**

The exchange rates used to translate monetary values in local currencies into ‘international dollars’ (int-\$) are the ‘purchasing power parity conversion rates’ (also called PPP conversion factors).

In this analysis we are using the quotas between **purchasing power parity (PPP)** GDP per capita as adjustment when striving to make revenue and prices comparable between countries. Figure 4 shows the differences between the countries. Denmark is having the second highest value.

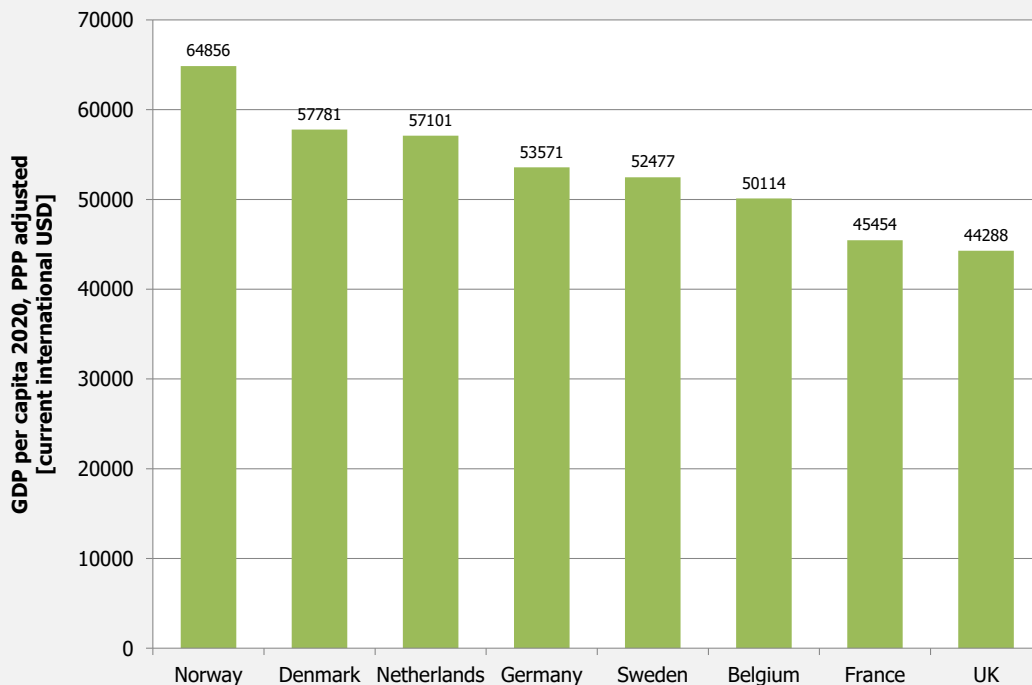


Figure 4. Comparison of purchase parity adjusted GDP per capita of our eight countries. Values are for 2020, but preliminary, published in October 2020 but the latest available at the time of writing [source: IMF]

¹⁹ From Our World in Data: <https://ourworldindata.org/what-are-ppps>

Applying PPP on the fibre broadband pricing is a modelling attempt to make the levels more comparable between the countries. Since PPP is calculated on a *generic* basket of goods and services, it isn't developed specifically for fibre broadband. The outcome after PPP adjustments should therefore be regarded as *indicative*. You could say that the logic of applying PPP on fibre broadband pricing is "with higher general purchasing power, buyers are expected to pay as much more for fibre broadband services as they pay for goods and services in general".

With this disclaimer, let's now apply the differences in PPP on the previously shown average monthly subscription fees.

In Figure 5 below we have adjusted the prices of the other countries to the Danish power purchase level. This means that all other country dots moved, but the Danish dots stayed in the same position.

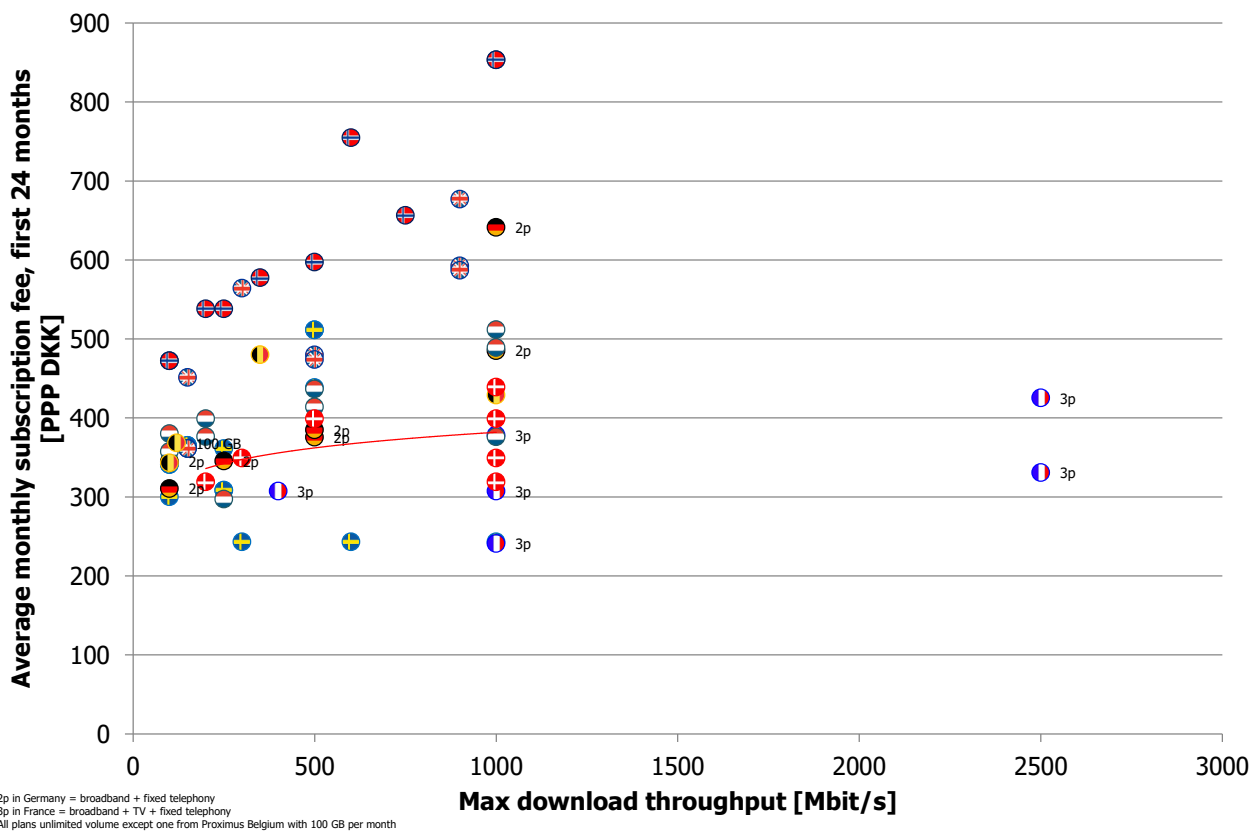


Figure 5. Comparison of the average monthly subscription fee in PPP DKK during the first 24 months to the max download throughput in eight countries, June 2021 [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Compared to the non-adjusted graph, Figure 3, the position of Norway is now less extreme as Norway's high PPP adjusted GDP per capita 'forgives' some of the price differential to the other countries. Norway moved *downwards* in the graph as it's the only country with higher PPP adjusted GDP per capita than Denmark.

All other countries – such as Sweden and France – have lower PPP adjusted GDP per capita than Denmark and have moved *upwards* in the graph as one could expect fibre broadband to be less costly there as the purchasing power is lower.

There is of course some spread in the Danish fibre broadband prices but the red line is a best fit trend line based on the Danish fibre subscriptions offered. The slowest offered²⁰ Danish fibre broadband subscription is 200 Mbit/s and above that speed, Danish fibre subscriptions are among the most affordable after purchasing power adjustment.

French subscriptions – especially when considering that they are triple-play including fixed telephony and TV – are generally the most affordable within our eight markets. [There’s a fact box at the end of section 9 giving some explanation to the position of France]. Selected Swedish and Dutch subscriptions are also very affordable – explained by start-of-contract discounts. Other subscriptions in Sweden and the Netherlands are less affordable.

After purchase power adjustment, Danish fibre broadband subscriptions are among the most affordable in our eight European markets. Only France is systematically offering lower adjusted subscription prices.

One possibly determining factor for the monthly fibre subscription price could be the minimum contract period – or **binding period**. Different providers apply different policies – even within countries.

As to **non-binding contracts** (visualised as 1 month in the following graphs), these are offered by the two largest Norwegian operators, **Telenor** and **Telia**²¹, and by the Belgian providers **Proximus** and **Orange**. In Sweden, **Tele2** offers a choice between non-binding and 12-24 months binding often with a start-of-contract discount if selecting the binding alternative. **Free** in France is only offering non-binding contracts on its most expensive 2500 Mbit/s plans. **Hyperoptic** in the UK is discounting subscriptions during a 12 months binding period, but these subscriptions are actually *more* expensive than the non-binding alternative from month 13 onwards – somewhat of a trap. Finally **KPN** who in the Netherlands gives a 3 EUR discount for contracts with 12 month binding period compared to the non-binding options.

All other providers stipulate a set binding period; in Denmark’s case always 6 months – for other countries 12 or 24 months.

To examine if the minimum contract period is a determining factor for subscription fees, we have separated the plans into four different²² download throughput categories:

- 100-199 Mbit/s
- 200-399 Mbit/s
- 400-600 Mbit/s
- 900 Mbit/s and more

²⁰ Above 100 Mbit/s

²¹ But not by e.g. the smaller Altibox providers not covered by this analysis

²² This means that there’s no category for 600-899 Mbit/s but as there’s only one subscription (750 Mbit/s from Telia Norway) in that category, it isn’t very interesting

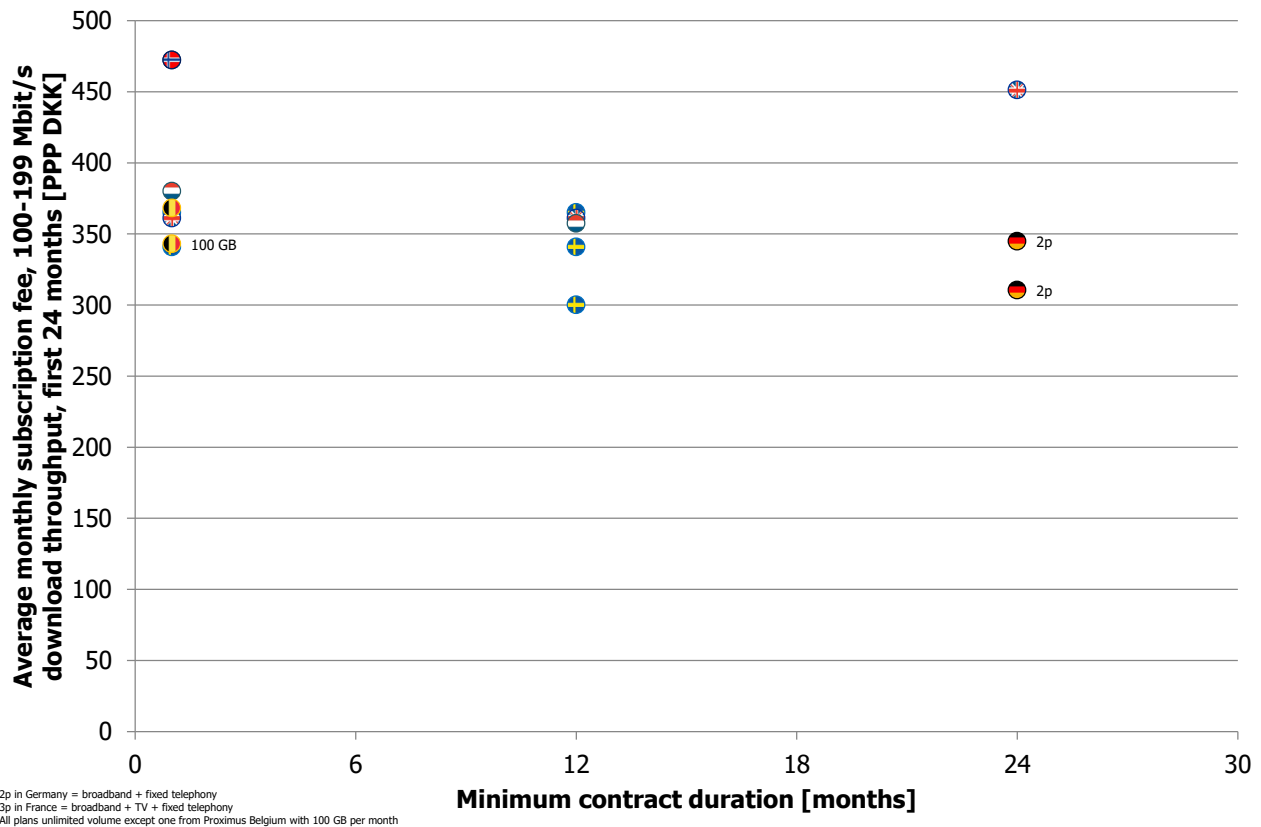


Figure 6. Comparison of the average monthly subscription fee in PPP DKK during the first 24 months to the minimum contract duration in eight countries for the 100-199 Mbit/s download throughput tier [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

From a Danish perspective, our first graph for 100-199 Mbit/s isn't interesting as there are no Danish fibre plans with less than 200 Mbit/s covered by our analysis. But it's hard to see any association between the monthly subscription fee and the minimum contract duration. If so, the German and UK subscriptions with 24 months binding should be cheaper than the subscriptions with 12 months binding.

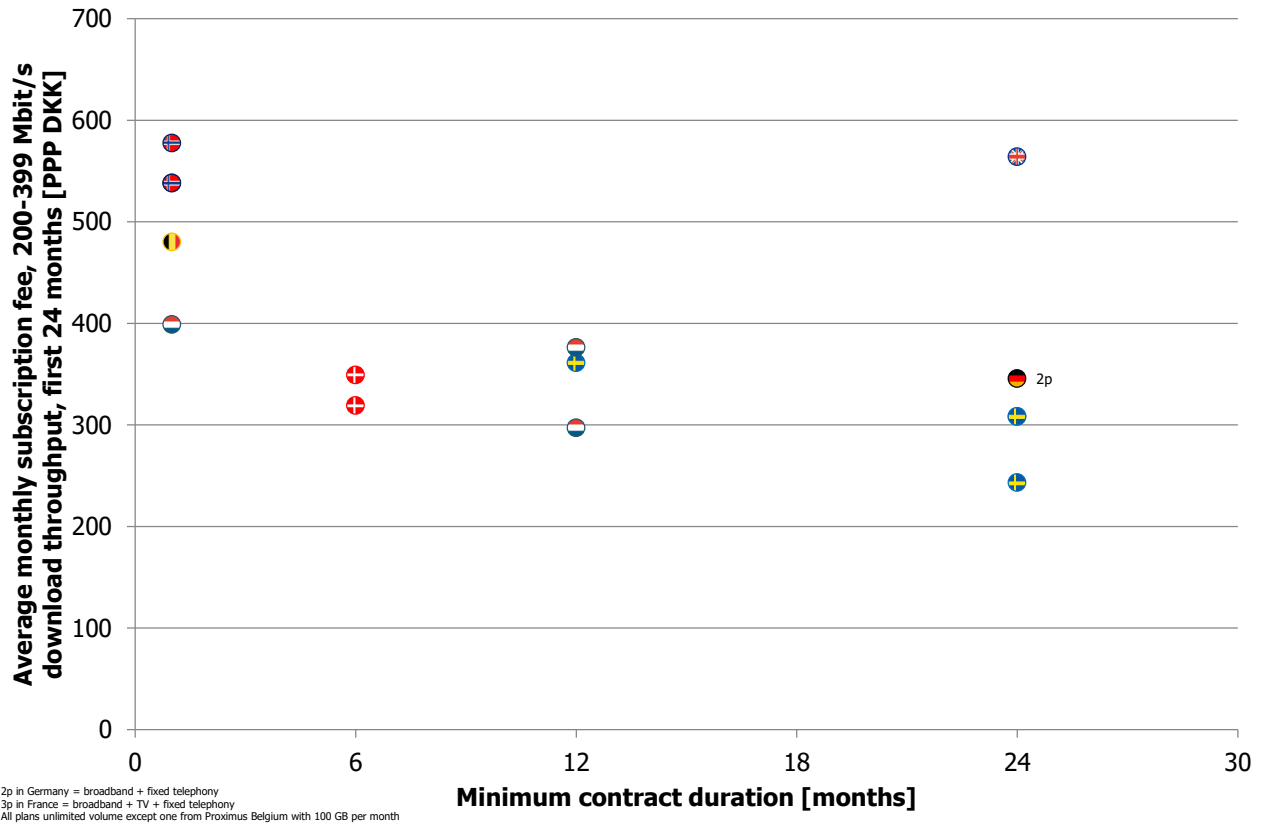


Figure 7. Comparison of the average monthly subscription fee in PPP DKK during the first 24 months to the minimum contract duration in eight countries for the 200-399 Mbit/s download throughput tier [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

In our second speed tier, 200-399 Mbit/s (above), there's Danish representation. As said, Denmark is the only country in our analysis that applies a 6 months binding period. It's logical that Danish subscriptions are cheaper than those offered by providers without a binding contract. But it's then not logical that some subscriptions with 12 or 24 months binding are more expensive than the Danish subscriptions. For this speed tier, there's only some weak support for the hypothesis that longer binding periods lower subscription fees.

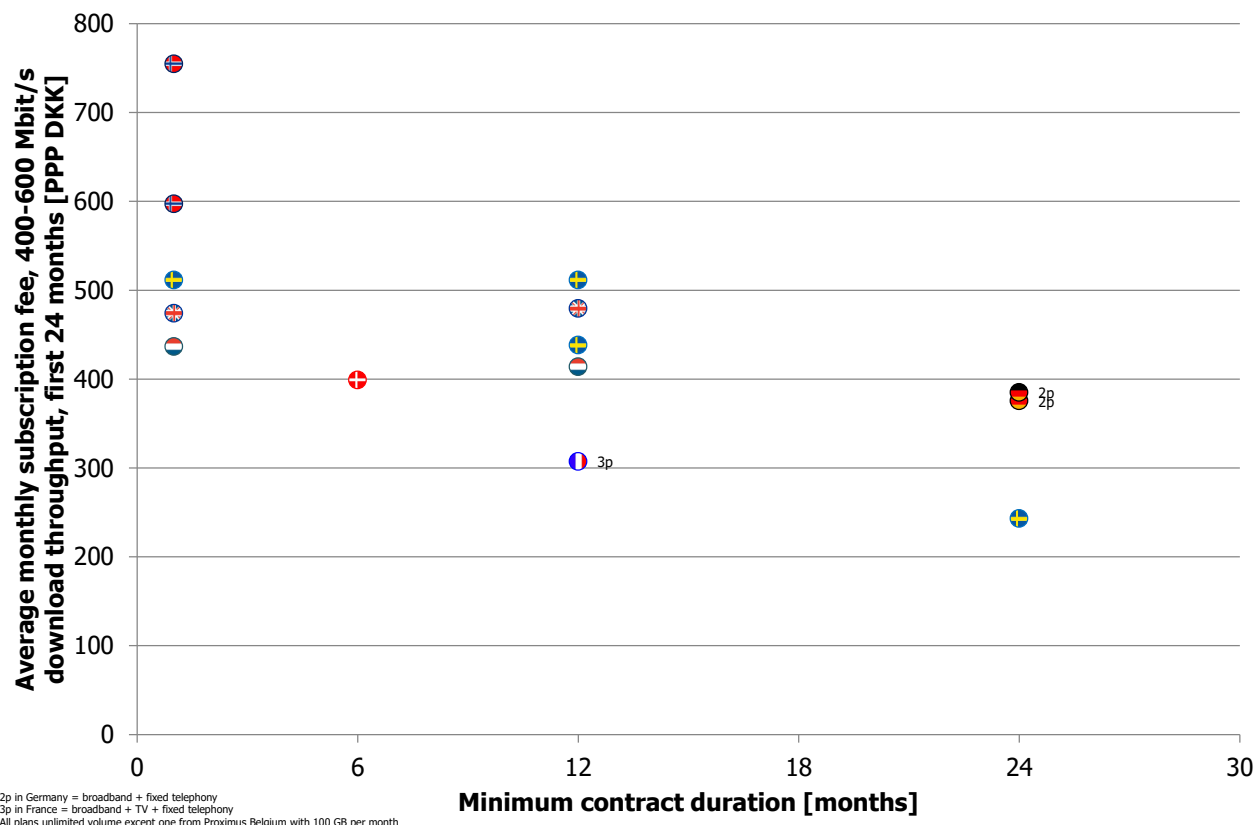


Figure 8. Comparison of the average monthly subscription fee in PPP DKK during the first 24 months to the minimum contract duration in eight countries for the 400-600 Mbit/s download throughput tier [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

In the 400-600 Mbit/s speed tier above, we start to see what we expected: That longer binding periods correlate with a generally lower subscription fee. Denmark's position is in the lower band given its 6 month minimum contract duration.

Finally the 900+ Mbit/s graph:

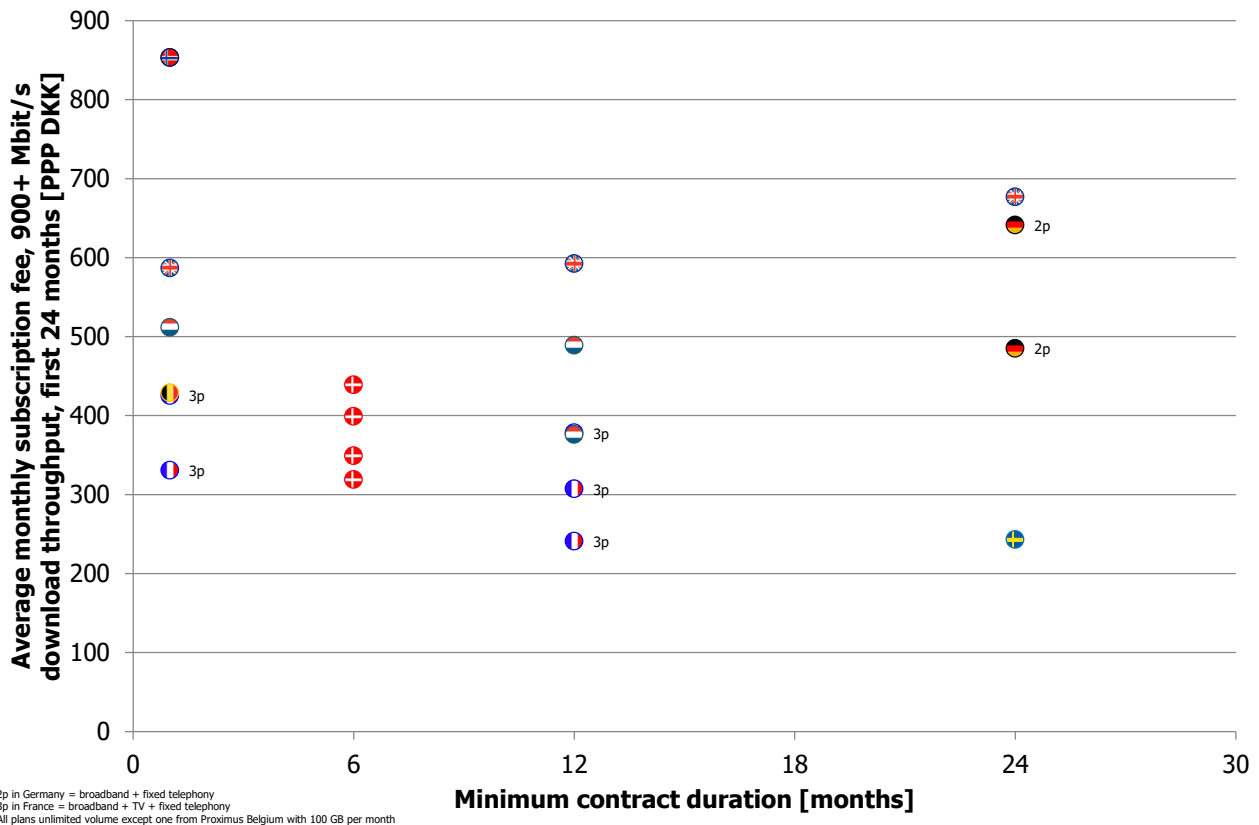
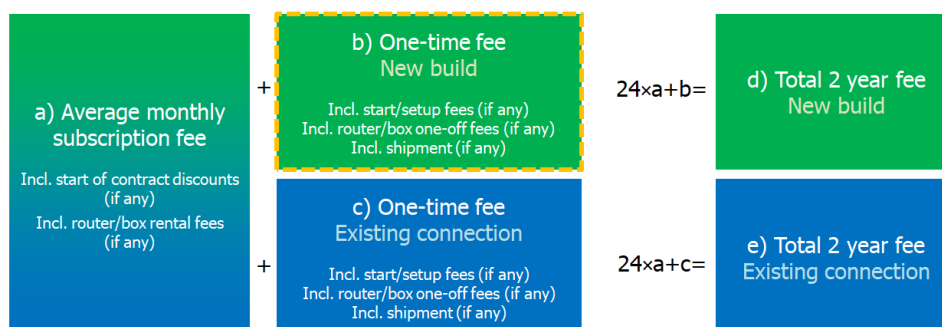


Figure 9. Comparison of the average monthly subscription fee in PPP DKK during the first 24 months to the minimum contract duration in eight countries for the 900 Mbit/s or more download throughput tier [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Figure 9 is again a bit difficult to conclude on. For this top speed tier, there's only some support for the hypothesis that longer binding periods lower subscription fees. If you wish, you can easily find examples of the opposite. What's clear though is that Denmark sometimes has lower subscription fees than some subscriptions with 12 or 24 months minimum contract duration.

There's only vague evidence for that longer contract binding periods result in lower subscription fees for fibre broadband subscribers. No other country than Denmark uses a binding period of 6 months. Denmark is often positioned in the lower end of our comparison charts although Denmark's binding period often, but not always, is shorter.

7. One-time fee – new build



As mentioned, new build one-time fees (for new connections into homes) are more difficult to find and track than monthly subscription fees. One reason is that they can vary according to region and neighbourhood. In all our countries, broadband providers can balance the requirement to rollout a fibre network of their own with **commercial agreements to offer internet services over partner networks**. So called open fibre networks are common in Sweden whereas agreements in other countries as e.g. France historically have been more bilateral between companies. Initiatives towards an open fibre concept are however currently taken in e.g. Denmark, the Netherlands, the UK and Germany.

When tracking the pricing of operators, you might also – on top of this – get a sense that the information on the new build one-time fees sometimes deliberately is kept out of the public domain. This is particularly true for Sweden and Norway. They seem to be used during negotiations to convince new customers to accept e.g. binding contracts or a subscription to a higher throughput tier.

In the cases where connection fees weren't found online, most providers did provide range or example indications on request. The graph below presents the information obtained.

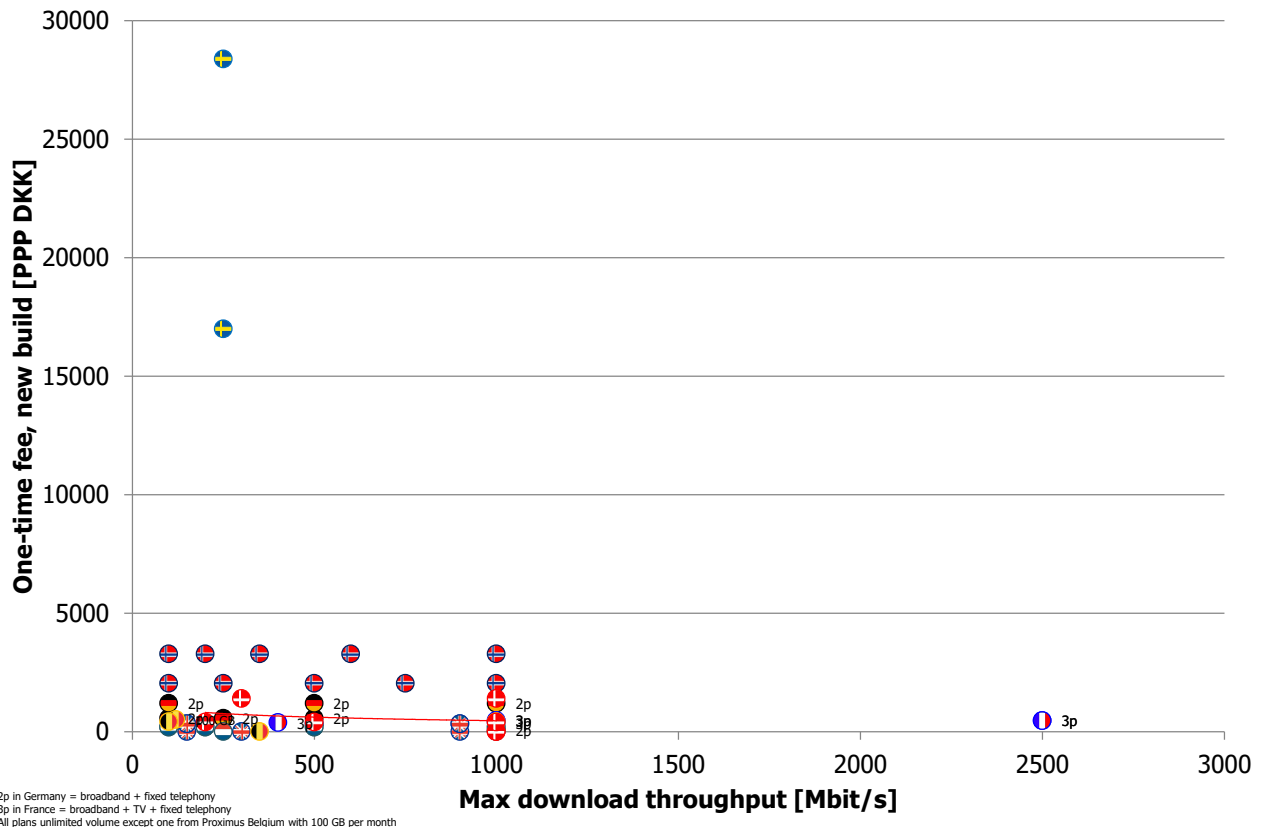


Figure 10. Comparison between one-time fees in PPP DKK for new fibre broadband into a detached home to the max download throughput in eight countries [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Before looking at the position of different countries, let's first conclude that the one-time fees *don't* depend on the download throughput tier selected by a consumer – providers generally apply the same one-time fee regardless of which speed a consumer is intending to subscribe to.

Looking at the country positions, **Sweden** stands out in Figure 10 with one-time fees of 17,000 to 28,000 PPP DKK. The two values represent the same provider, Telia, but two different example addresses and shows just how different the one-time fees could be in Sweden depending on area and underlying network ownership. The high fees are perhaps also a consequence of Sweden's high fibre availability: 75% of the fixed broadband base already subscribed to fibre in December 2020; higher than any other market analysed here. When the Swedish fibre broadband push started more than ten years ago, the one-time fees were lower. Perhaps are the high fees of today a reflection of that the unconnected parts of Sweden aren't that attractive to build?

Regardless of these explanations, Sweden is an extreme outlier in Figure 10. To improve readability we have taken Sweden out of the comparison in Figure 11 below.

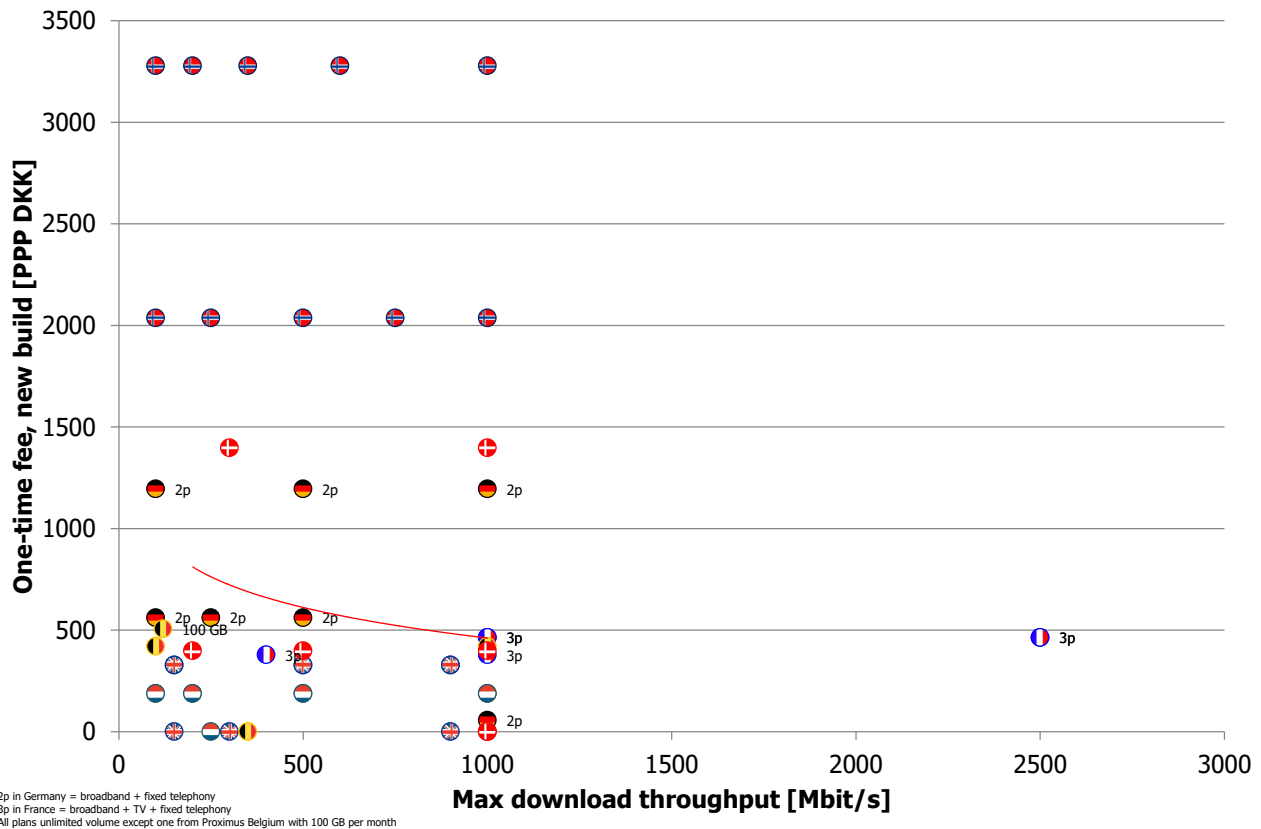


Figure 11. Comparison between one-time fees in PPP DKK for new fibre broadband into a detached home to the max download throughput in seven countries – Sweden excluded [source: providers’ webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Norway has significantly lower one-time fees than Sweden, but still higher than all other markets. Together with Germany, Belgium, the UK, the Netherlands and France, Denmark has low one-time fees. YouSee’s one-time fee is 1397 DKK – 999 DKK for installation (up to 30 meters) plus 299 DKK for setup plus 99 DKK for the shipping of the router. The one-time fees of Norlys’ Stofa and Boxer offers are lower – 398 DKK²³ and 0 DKK respectively.

After purchase power adjustment, Danish one-time fees for new build customers are as low as in Germany, Belgium, the UK, the Netherlands and France. Two Nordic countries, Sweden and Norway, operate with much higher one-time new build fees than the other six markets.

Generally speaking there should not be any substantial difference in the cost for a provider to connect a detached house to its fibre network between our studied markets. So how come some providers charge tens of thousands of PPP DKK – while others do not charge any one-time fees? A hypothesis is that providers operating with long **binding periods** in their consumer contracts are keener to subsidise the one-time fees – while those without binding periods need to recover their investments upfront.

Figure 12 compares the one-time fees with the minimum contract duration.

²³ Includes 99 DKK in shipping fee which is charged only in some Stofa areas

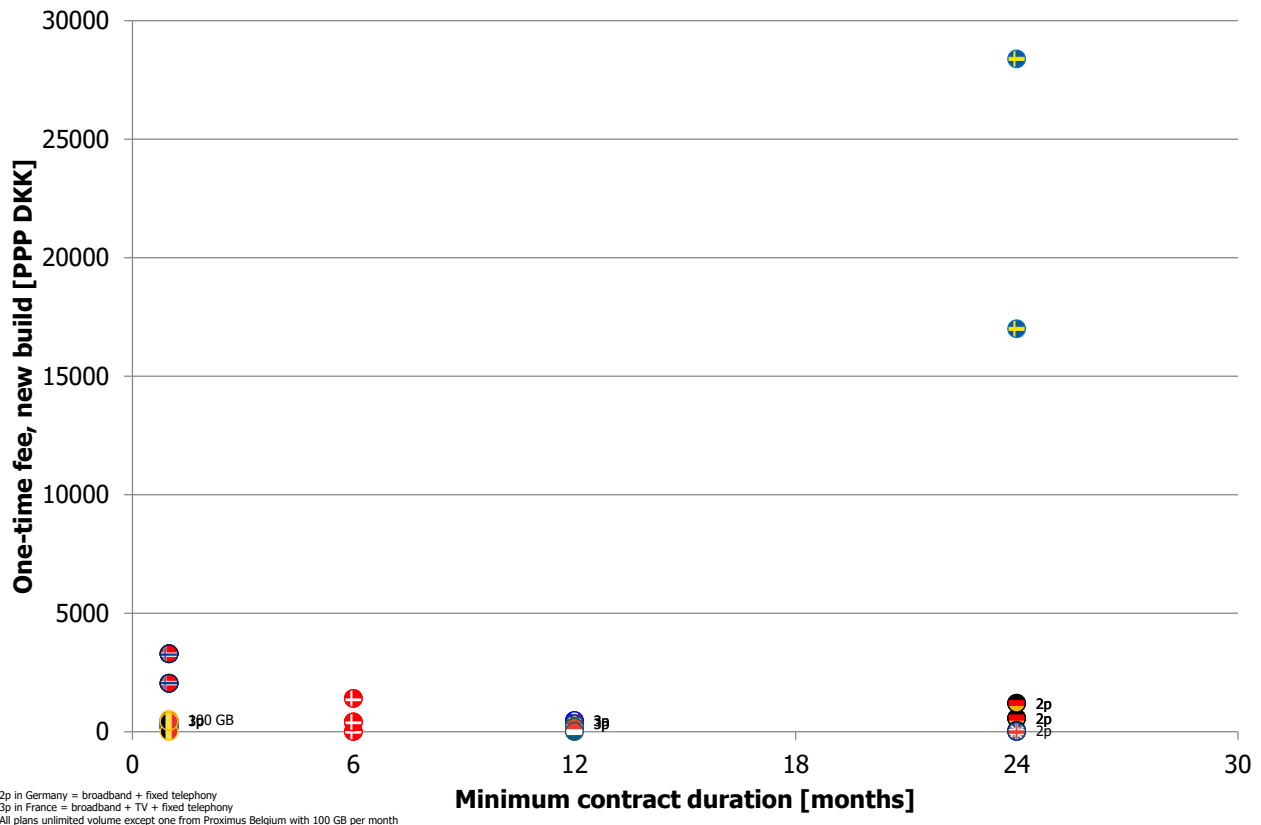


Figure 12. Comparison between one-time fees in PPP DKK for new fibre broadband into a detached home among providers to the minimum contract duration in eight countries [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

The high one-time fees in Sweden obviously have nothing to do with a relaxed binding period; in contrast these high one-time fees come with the longest minimum contract duration: 24 months.

Since it is difficult to distinguish between the non-Swedish operators in Figure 12, we have excluded Sweden in the graph below.

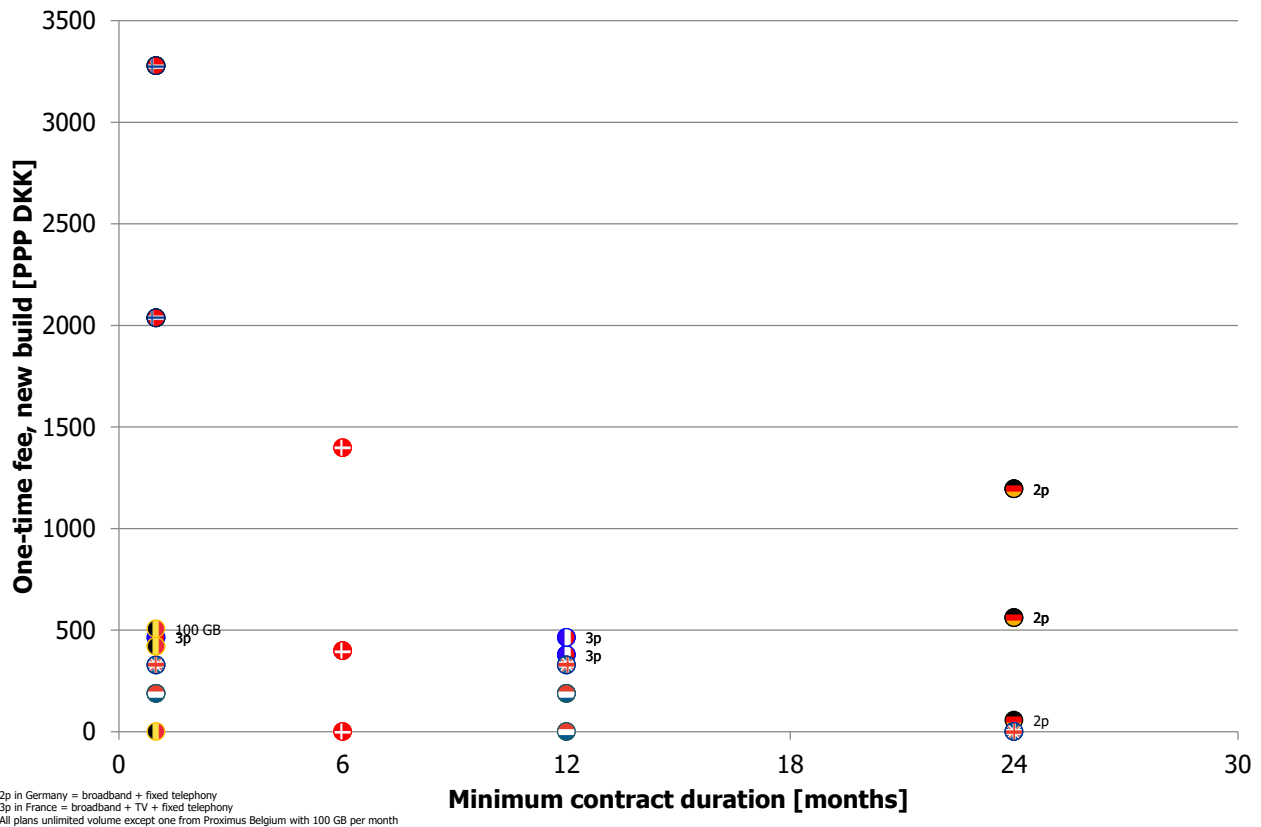


Figure 13. Comparison between one-time fees in PPP DKK for new fibre broadband into a detached home to the minimum contract duration in seven countries – Sweden excluded [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Without Sweden, the graph is to some extent (up to 12 months) supporting the hypothesis that longer minimum contract duration lowers the one-time fee for the consumers. Norway's relatively high one-time fees e.g. come without a requirement to stay for longer than one month. On the other hand, Germany could have quite high one-time fees even though contracts have binding periods of 24 months.

Among our eight countries, it is only **Denmark** that applies a 6 month binding period.

The average binding period for all of our analysed countries and offers from the providers is **9.3 months**.

Denmark's minimum contract duration of 6 months is approximately 3 months shorter than the average of our countries. From our analysis it is hard to see that the minimum contract duration has any association with the one-time fees for new builds. Sweden e.g. has the highest one-time fees and the longest binding period.

The one-time fees for new build connections are obviously very important in countries with low fibre penetration. Among our markets that's true for Germany, the UK and Belgium. In the other markets – and specifically in Sweden and Norway – a significant share of the fixed broadband base is already on fibre. Figures for December 2020 from the table in section 3:

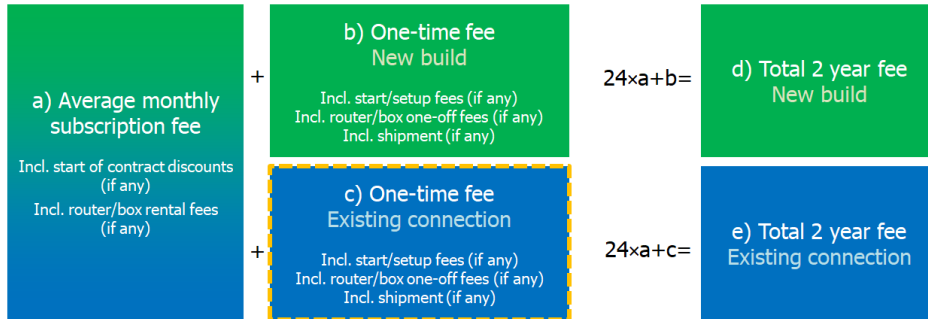
- Denmark 39%²⁴
- Sweden 75%
- Norway 60%
- France 34%
- Netherlands 21%

This is the share of the total (B2C+B2B) fixed broadband base that *subscribes* to fibre²⁵. A larger share of that base *could have* fibre as the availability obviously exceeds the customer base.

²⁴ Energistyrelsen has at the time of writing not reported figures for December 2020

²⁵ In reality though, many of these fibre subscriptions are delivered to apartments; the take-up in detached homes is lower since the homepass (how many homes that could get fibre would they like to) generally, due to the cost to build networks, is much lower in detached housing areas than in apartment housing areas.

8. One-time fee – existing connection



For the growing share of people lucky enough to move into a house in which fibre already is available, we in this section compare the one-time fees that comes with an *existing connection*. As no digging is required, we should of course expect to see lower one-time fees.

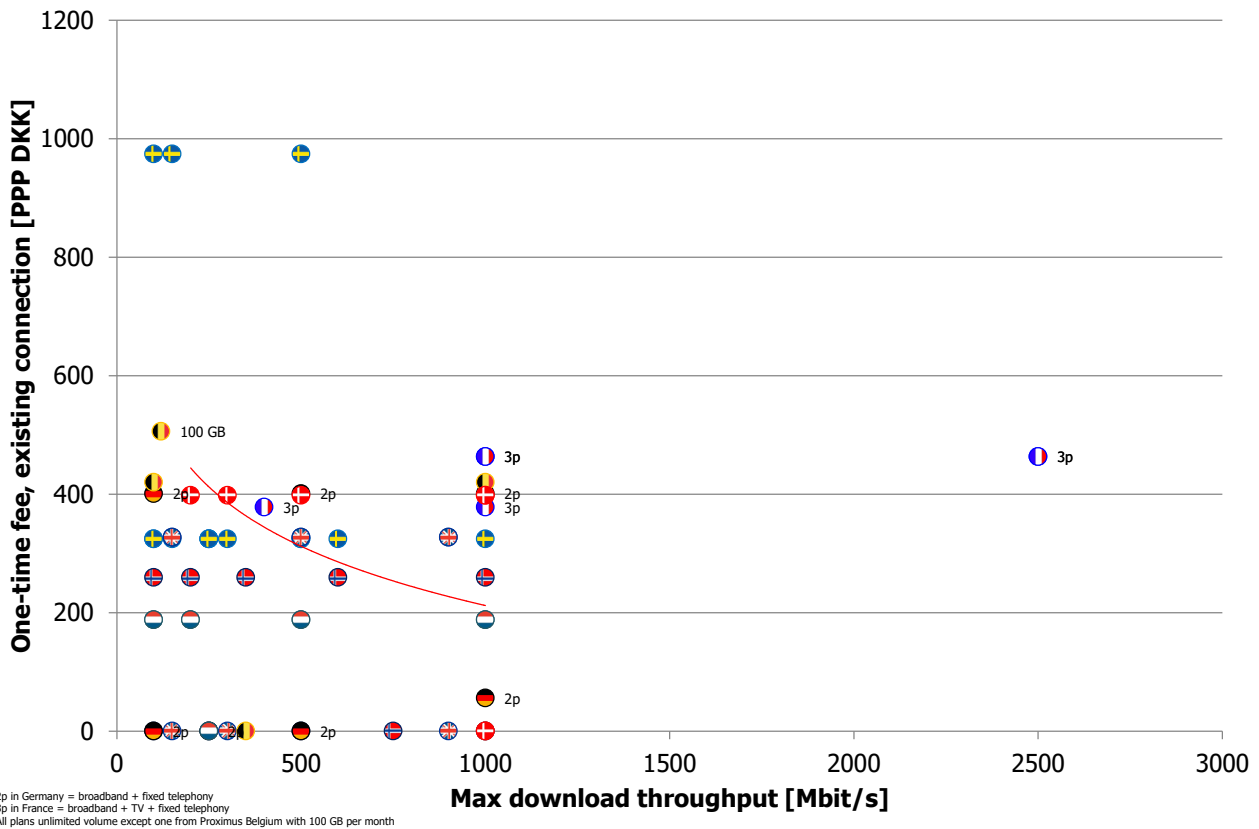


Figure 14. Comparison between one-time fees in PPP DKK for a new fibre customer on an existing connection to the max download throughput in eight countries [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Figure 14 above is also showing much lower one-time fees when reconnecting an existing connection to a new subscriber – the average is around 300 PPP DKK. Some Swedish options come with much higher one-off fees; these are for Tele2 that charges 799 SEK (590 DKK) as a one-time fee for a router in case the customer selects a non-binding option.

There are several providers – across markets – that do not charge any one-time fees when taking up a fibre broadband subscription on an existing connection.

In Denmark, the most common is that a new fibre subscriber pays 299 DKK in set-up fee (“oprettelse”) plus another 99 DKK for the shipping of the router – in total 398 DKK. Compared to most other markets, that is in the more expensive range.

After purchase power adjustment, Danish one-time fees for existing connections are at the higher end of our international spectrum. Over a longer time period, these one-time fees are however not significant.

We will soon calculate the total 2 year fees to see if this one-time fee for an existing connection has a negative impact on the total. But first an analysis of the possible effect minimum contract periods (binding periods) has on the one-time fees for existing connections:

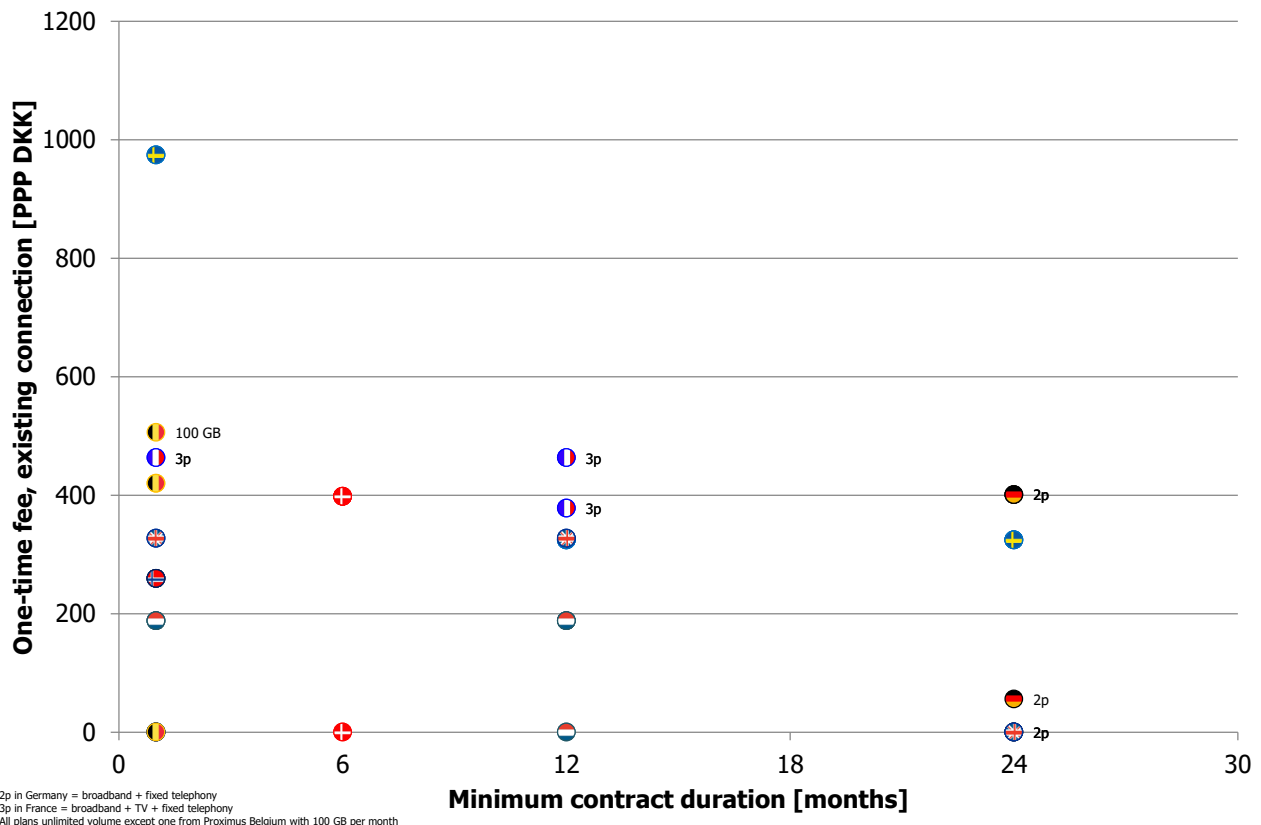


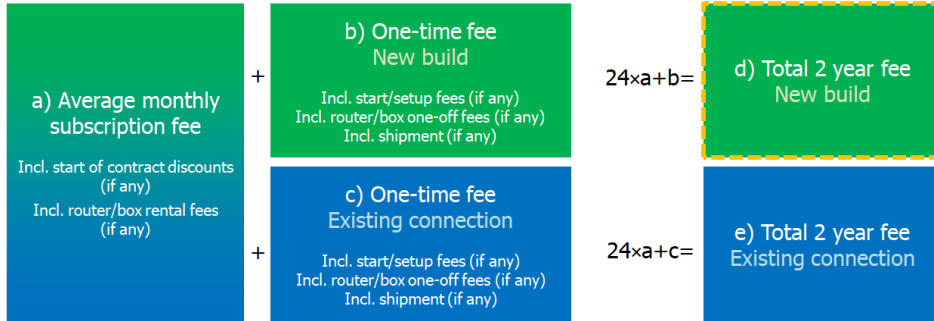
Figure 15. Comparison between one-time fees in PPP DKK for a new fibre customer on an existing connection to the minimum contract duration in eight countries [source: providers’ webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Figure 15 suggests that the one-time fees for an existing connection can be a bit lower with a longer minimum contract period. The differences are small, though.

Among our eight countries, it is only **Denmark** that applies a 6 month binding period. As said previously, the average binding period for all of our analysed countries and providers is **9.3 months**.

Denmark's minimum contract duration of 6 months is approximately 3 months shorter than the average of our countries. From our analysis it is hard to see that the minimum contract duration has any major impact on the one-time fees for existing connections.

9. Total 2 year fee – new build



With focus on connecting the unconnected, we are now adding the new build one-time fees to the monthly subscription fees during 24 months to get the *total* fee for a customer that decides to install fibre into a detached home and then subscribe to a broadband service for 24 months.

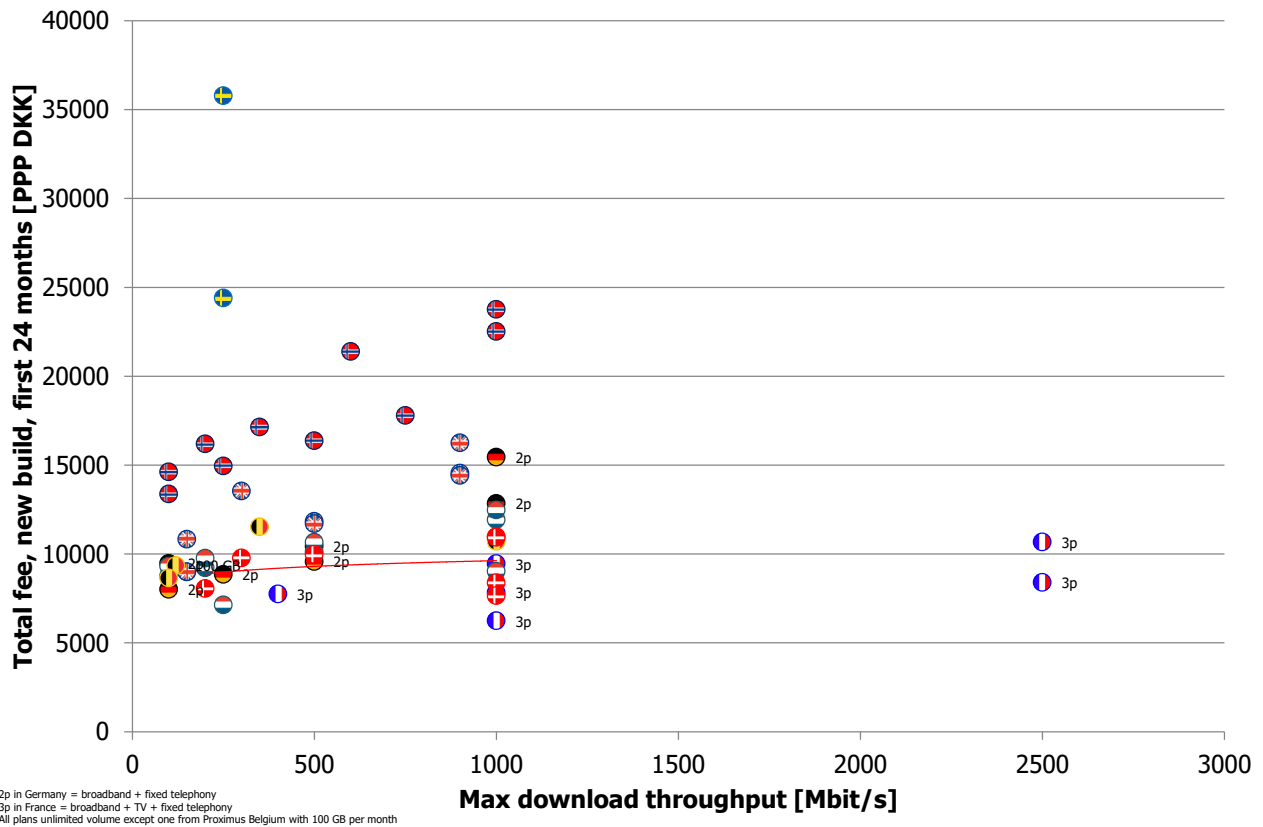


Figure 16. Comparison of the total new build fee in PPP DKK during the first 24 months to the max download throughput in eight countries [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Figure 16 shows how the very high new build one-time fees in **Sweden** affect the total cost for the first 24 months period.

Let us again exclude Sweden from the chart to increase the visibility where total fees are lower.

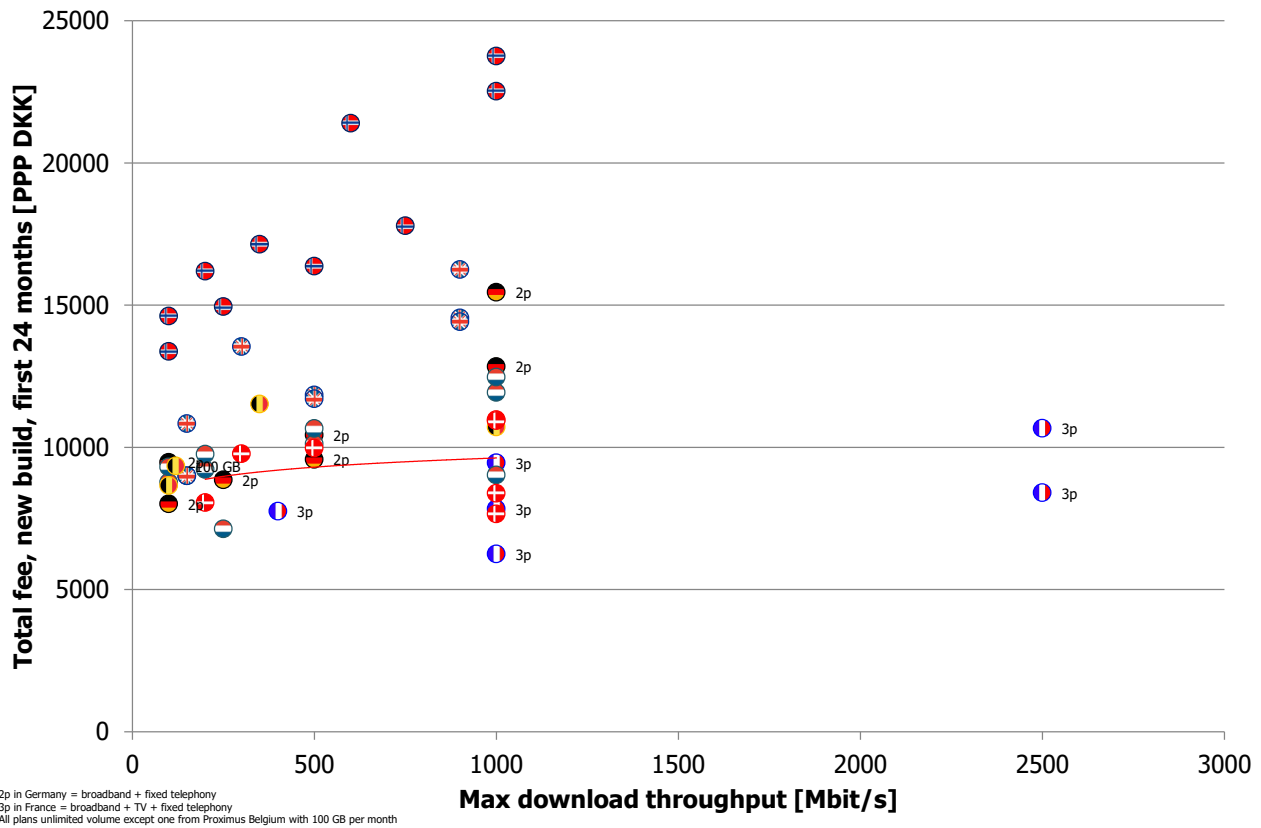


Figure 17. Comparison of the total new build fee in PPP DKK during the first 24 months to the max download throughput in seven countries – Sweden excluded [source: providers’ webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

Norway doesn’t have as high one-time fees as Sweden, but quite expensive monthly subscriptions – which leads to **Norway** becoming the second most expensive market for new build fibre customers during a two year period. The **UK** can be seen as the third most expensive. The remaining countries are more cluttered with **Denmark** positioned in the lower end of the scale. The only other market generally operating with lower total 2 year fees than Denmark is **France**. The position of France is extreme if also considering that the French providers deliver a full triple-play service – including large TV packages – for that money.

After purchase power adjustment, the total 2 year new build fees for Danish fibre broadband are among the most affordable in our eight European markets. Only France is generally offering lower total fees.

Below a fact box on **France** to give some background to why the French fibre (or in their case rather triple-play) fees generally are so low²⁶.

²⁶ Partly based on <https://www.arcep.fr/cartes-et-donnees/nos-publications-chiffrees/observatoire-des-marches-des-communications-electroniques-en-france/marche-des-communications-electroniques-en-france-annee-2019-resultats-definitifs.html> and <https://www.arcep.fr/demarches-et-services/collectivites/le-plan-france-tres-haut-debit-pfthd.html>

France is one of the most competitive telecom markets in Europe with four fully fledged national integrated operators – Orange, SFR, Bouygues and Free – offering both fixed and mobile services on their own networks.

Even since **Free** – today the second largest fixed broadband provider in France – launched its first ‘Freebox’ triple-play offer in 2002 for 29.99 EUR per month, the French market has been very price-centric. The competition followed Free into these low price points.

Free’s disruption continued when the company launched mobile services in 2012: The 19.99 EUR per month for an essentially unlimited proposition was much lower than current market pricing – and Free also offered a limited mobile subscription for just 2 EUR per month. That subscription was even free for those with a Freebox. In six years, Free reached close to 14 million mobile subscribers.

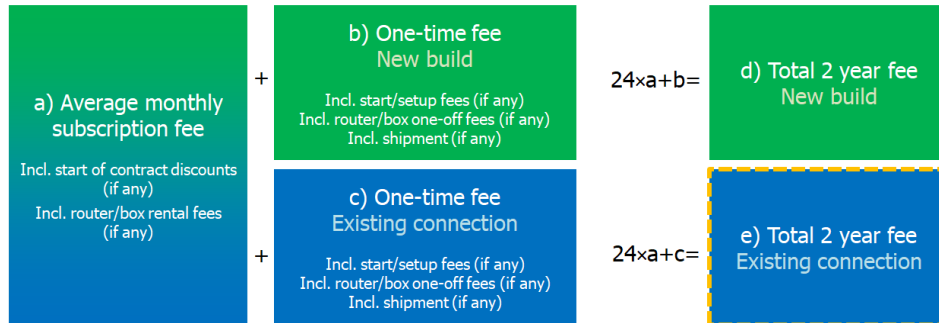
Member of the French telecom industry has many times mentioned that the market is in need of consolidation. Attempts to merge SFR and Bouygues – and Orange and Bouygues – have however failed. All providers are today reporting good profitability.

With Nordic standards, France was relatively late into fibre, but the network rollout has accelerated a lot and the fibre subscription base follows upwards. Consequently, investment levels in fixed networks have increased rapidly – when the investments in mobile have declined.

Although the French providers have built parallel fibre networks to some extent, they have had the freedom to engage in bilateral sharing agreements in areas of common interest. These agreements are not always between the same two providers; all providers mix with different partners in different areas.

As often in France, the government is involved in what happens: In 2013, the government launched the “France Très Haut Débit” plan with up to 3 BEUR of government subsidy to support fast broadband development in all of France.

10. Total 2 year fee – existing connection



Finally, the total 2 year fee for a customer moving into a house with an **existing connection**. As mentioned in the end of section 7, a growing share of homes is already connected. The previous section made sense for the unconnected homes only – this section is for the connected homes.

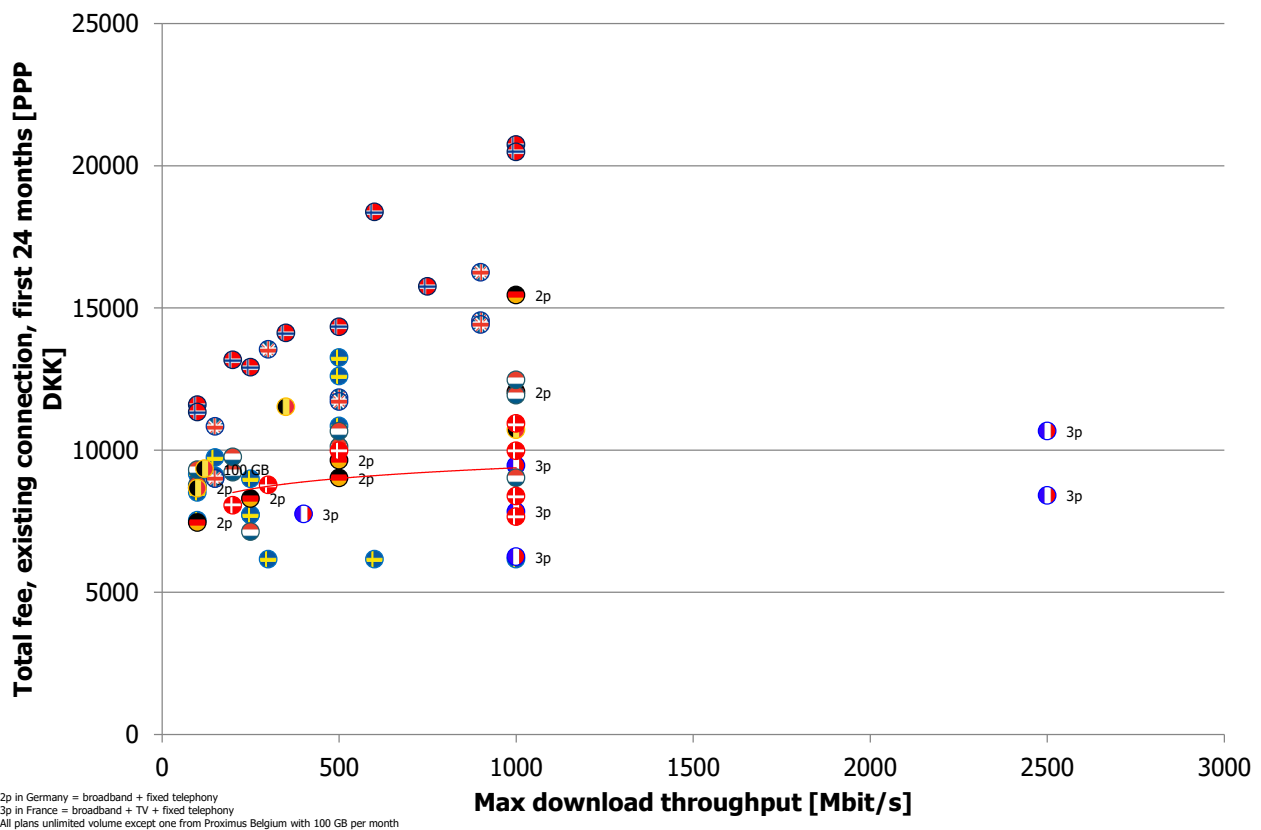


Figure 18. Comparison of the total fee for an existing connection in PPP DKK during the 24 months to the max download throughput in eight countries [source: providers' webpages and pricelists complemented by direct emails to providers when necessary]. The PPP values for 2020 are preliminary [source: IMF].

With an existing connection, **Norwegian** total 2 year fees tend to be the highest among our markets. The **UK** could be seen as the second most expensive although a few Belgian, German and Swedish options mix

in among the UK's markers. **Sweden** is widely spread as Tele2 discounts certain options – with long binding periods – at the expense of others with shorter or no binding.

In section 8, we concluded that the Danish one-time fees for existing connections were at the high end. In spite of this, Figure 18 shows that Danish total fees are quite reasonable in an international context. France is again the toughest competitor price-wise – but there are also a few Swedish and a few occasional Dutch and German options that can compete with Denmark.

After purchase power adjustment, the total 2 year existing connection fees for Danish fibre broadband are among the more affordable in our eight European markets. Only France is generally offering lower total fees.

11. Fixed broadband: Actual throughput

We have now analysed pricing in depth and seen if it relates to binding policies. Let's now take look at the actual throughput that fixed broadband customers in our countries averagely get. Note that this is wider than just fibre broadband – also DSL technologies and hybrid fibre coax (HFC) broadband are included. Since fixed broadband almost exclusively is priced based on throughput, the average throughput is the result of two factors:

- What the broadband connections technically deliver
- How much the customers have been willing to pay for their connections

A hypothesis could be that the cheaper fibre broadband that exists in a market, the better the average throughput would be as more households could afford it.

For comparable data, we turn to Ookla Speedtest. Ookla uses crowdsourced data based on tests actively done by broadband users. The drawback is that we don't know how representative these tests are. In addition, the throughput measured by these tests is affected by the throughput tier paid for by the customers.

With these words of caution, let's compare the latest available average download throughput in our eight countries:

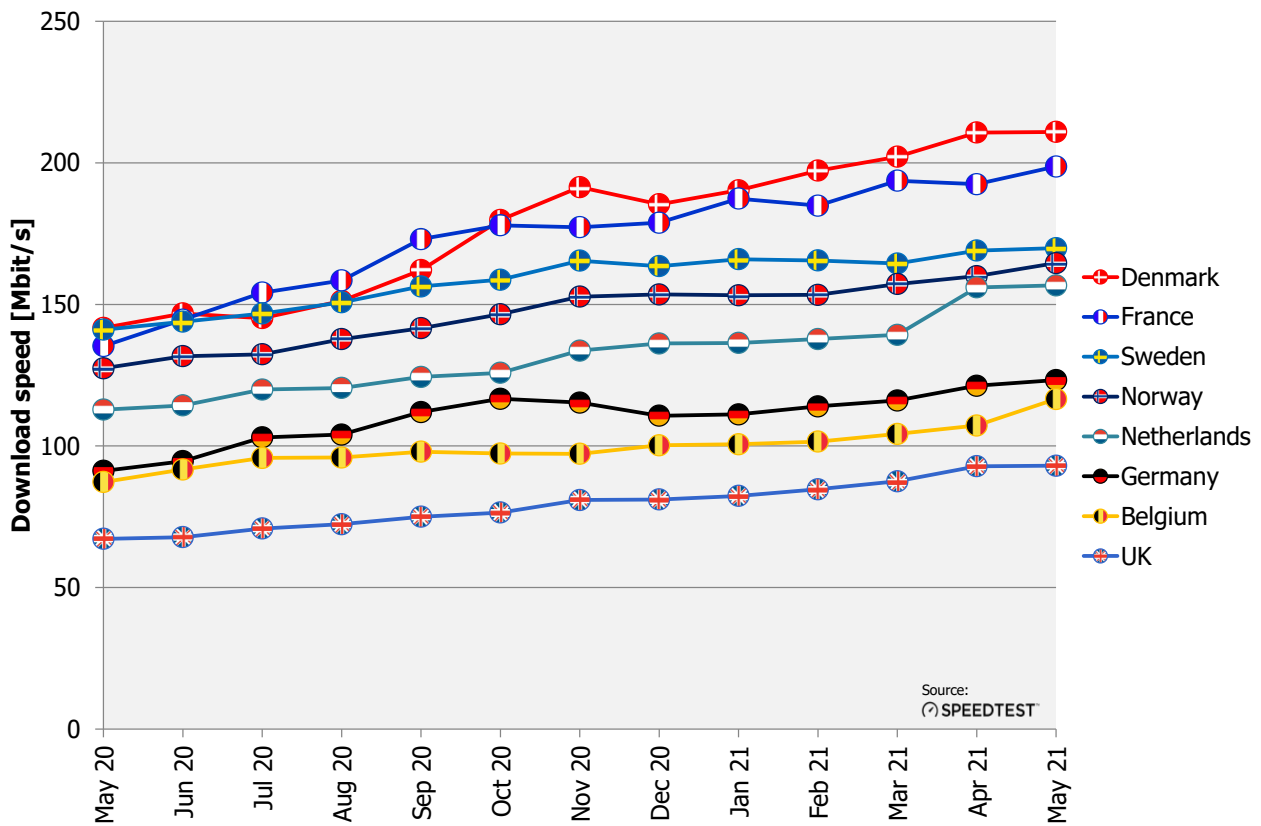


Figure 19. Average fixed broadband download speed for per month May 2020-May 2021 per country [source: Ookla Speedtest]

Perhaps surprisingly – Denmark doesn't have the highest share of fibre connections – it's **Denmark** where fixed broadband users have the highest average download throughput. A plausible explanation is that high download speeds – as shown in this analysis – are quite affordable in Denmark also for other technologies such as HFC. France trails Denmark – and as we've seen, France has consistently been the cheapest market of our eight. There's simply not a cost reason not to buy fast broadband.

The three countries with the lowest share of fixed broadband base in fibre also have the lowest average speeds: Germany, Belgium and the UK.

Denmark has the fixed broadband networks with the highest average throughput according to Ookla Speedtest data. As Denmark generally has low fibre broadband subscription fees, this could have contributed to a willingness to purchase higher speed subscriptions.

12. Benchmark of WACC used by NRAs in fibre wholesale regulation

Before summarising this analysis, let's make an analysis of the **weighted average cost of capital** (WACC) rates used by the respective national regulatory authorities when regulating providers with a significant market position (SMP) in the national wholesale market.

The WACC is calculated in a consistent way in the EU, since [BEREC](#), short for the Body of European Regulators for Electronic Communications, annually issues a report on how WACC parameters should be calculated when used in EU's electronic communications market.

But first a small fact box on WACC²⁷.

High WACC is a signal of **higher risk**. Investors tend to require an additional return to neutralise the additional risk.

A broadband provider with a significant market power (SMP) – most often the traditional telecom incumbent – is typically required to provide capacity or services to providers without significant market power. In most cases such wholesale prices are regulated by the national regulatory authority (NRA). They have to balance two conflicting requirements: The SMP provider obviously wants the wholesale prices to be as high as possible, allowing a good return of their investments. High wholesale prices could lead to a higher investment level – something which could be good for the economy of the country – if the SMP provider indeed invests some of what it gets from its wholesale business into the network. Non-SMP providers obviously want the wholesale prices to be as low as possible, allowing them a better profitability. But if the wholesale prices are too low, there's no incentive for the non-SMP provider to build up networks on their own – and the SMP provider might also not be interested in investing in its network if the returns aren't better.

This is where WACC comes in. If the NRA stipulates prices based on a high WACC, it rewards the SMP provider for the risk it takes – the higher the WACC, the higher the risk reward. This will make it interesting for the SMP provider to invest, but it could also result in unjustified profits in the eyes of the NRA and consumers. A high WACC might lead to higher consumer prices. If, in contrast, WACC is set to a low rate, the NRA indicates that it doesn't see much risk in an SMP provider's business and that the level of return hence could be low. This discourages the SMP provider – but might make non-SMP providers happy.

So is high WACC good or bad? Well, it's very dependent on who you are.

The trend in the NRAs' WACC rate is that it is in decline. This could be an indication of that the NRAs are focused on consumer pricing – or simply a reflection of macroeconomics with a general trend towards lower cost of capital.

For this analysis, Tefficient has researched the active WACCs from the respective NRA in the eight countries:

- Denmark: Erhvervsstyrelsen
- Sweden: PTS
- Norway: Nkom
- Germany: Bundesnetzagentur
- UK: Ofcom
- France: ARCEP
- Belgium: BIPT

²⁷ Partly based on <https://www.investopedia.com/ask/answers/013015/what-does-high-weighted-average-cost-capital-wacc-signify.asp>

- Netherlands: ACM

The active nominal²⁸ WACCs before taxes are found in Figure 20 below.

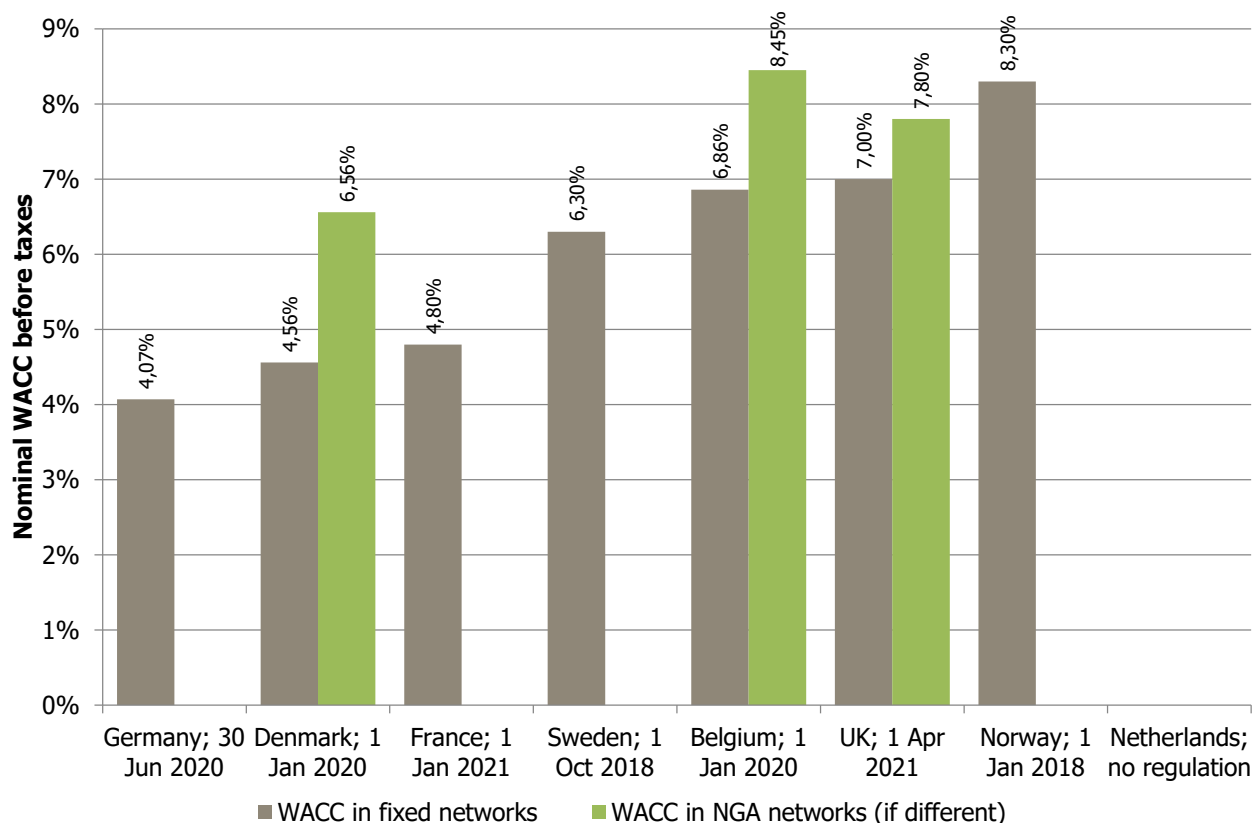


Figure 20. Active nominal WACC before taxes in fixed networks and in NGA networks (if any) in our eight countries [source: respective NRA].

Three countries operate with **two different WACCs: Denmark, Belgium and the UK**. In these countries, a higher WACC is applied in next generation access (NGA) networks – meaning fibre networks. The NRAs have here seen a larger risk in NGA investments (compared to e.g. traditional copper networks) and hence want to reward the SMP provider(s) with the opportunity of a better return.

In the other countries – Germany, France, Sweden and Norway – the same WACC is applied regardless of fixed network technology.

We need to mention that the **Netherlands is currently without regulation** within the fixed network area. A supreme court decision of 17 March 2020 annulled the NRA ACM's decision²⁹ to open KPN's and

²⁸ Bundesnetzagentur, the German NRA, only publishes real, not nominal, WACC before taxes. The real WACC for 2020 is 3.64%. BEREC did in 2019 recalculate Germany's real WACC into nominal WACC, adding 0.43% to the real WACC to reach the nominal WACC. In the absence of a nominal WACC value for 2020 for Germany's Bundesnetzagentur and from BEREC, we have added the same 0.43% to the real WACC value for Germany also in 2020.

²⁹ <https://www.acm.nl/nl/publicaties/hooqste-rechter-vernietigt-besluit-acm-over-openstellen-netwerken-kpn-en-vodafoneziggo>

VodafoneZiggo's fixed network for other providers – a regulation that started 1 October 2018. The Netherlands does therefore not have any active WACC and not shown in Figure 20³⁰.

The graph above shows from which date the WACC has been active. As the trend is that NRA lowers the WACC, fresher dates obviously provide a safer prediction of future WACC than older dates. According to BEREC, only two countries, Denmark and Germany³¹, have a process where the WACC is revised annually. In the other countries it happens in conjunction with market reviews.

Perhaps because of this annual revision, **Germany and Denmark have the lowest WACC** among our countries. Denmark however applies a higher WACC, 6.56%, specifically for NGA networks. Also **France** has a low WACC. The highest WACC is found in **Norway**, 8.30%, whereas the highest NGA WACC is found in **Belgium**, 8.45%. Also the **UK** has high WACCs.

As the WACC is higher there, it's currently more interesting for SMP providers to invest in fixed networks in Norway, Belgium and the UK – than what it is for SMP providers to invest in fixed networks in Germany, Denmark and France as the WACC is lower there. Denmark is though having higher WACC for NGA networks – at an about-average level.

³⁰ Prior to this court ruling ACM had commissioned Brattle to issue a report calculating the actual WACCs for KPN and VodafoneZiggo, presumably to influence them in setting the WACC. This report concluded that the nominal WACC before taxes was 3.99% for KPN's legacy network, 4.81% for KPN's fibre and 4.72% for VodafoneZiggo (HFC). The fibre calculated fibre premium (based on KPN) was thus 0.82%. If these calculations would have become regulation, the Netherlands would have had WACC in the lower range compared to our other studied markets.

³¹ Germany is hence on the verge of publishing a new WACC active from 30 June 2021

13. Summary and conclusion

The extensive pricing research done for this analysis shows that Danish fibre broadband most often, but not always, is **less expensive** than in the peer group countries. France is the only other country that systematically has lower prices than Denmark.

Denmark's low price position is explained by:

- **Affordable** fibre broadband monthly subscriptions – with only France systematically lower
- **As low** one-time fees for *new builds* as in Germany, Belgium, the UK, the Netherlands and France – and significantly lower than in Sweden and Norway
- One-time fees for *existing connections* **at the high end** of our international spectrum

These characteristics result in Denmark having:

- **Among the most affordable** total 2 year fees for a new build fibre customer
- **Among the more affordable** total 2 year fees for an existing connection fibre customer

All these statements are after purchase power adjustments.

The favourable price position of Denmark comes even though Danish fibre broadband contracts have **minimum contract duration** of 6 months – more than 3 months shorter than the average in our markets.

Denmark is also, according to Ookla Speedtest data, providing the **fastest average download experience** in its fixed broadband networks.

A specific analysis of the weighted average cost of capital (**WACC**) applied by regulators shows that Denmark has a low WACC for fixed legacy networks – discouraging investments by significant market power (SMP) providers – but an about-average WACC for fibre networks.