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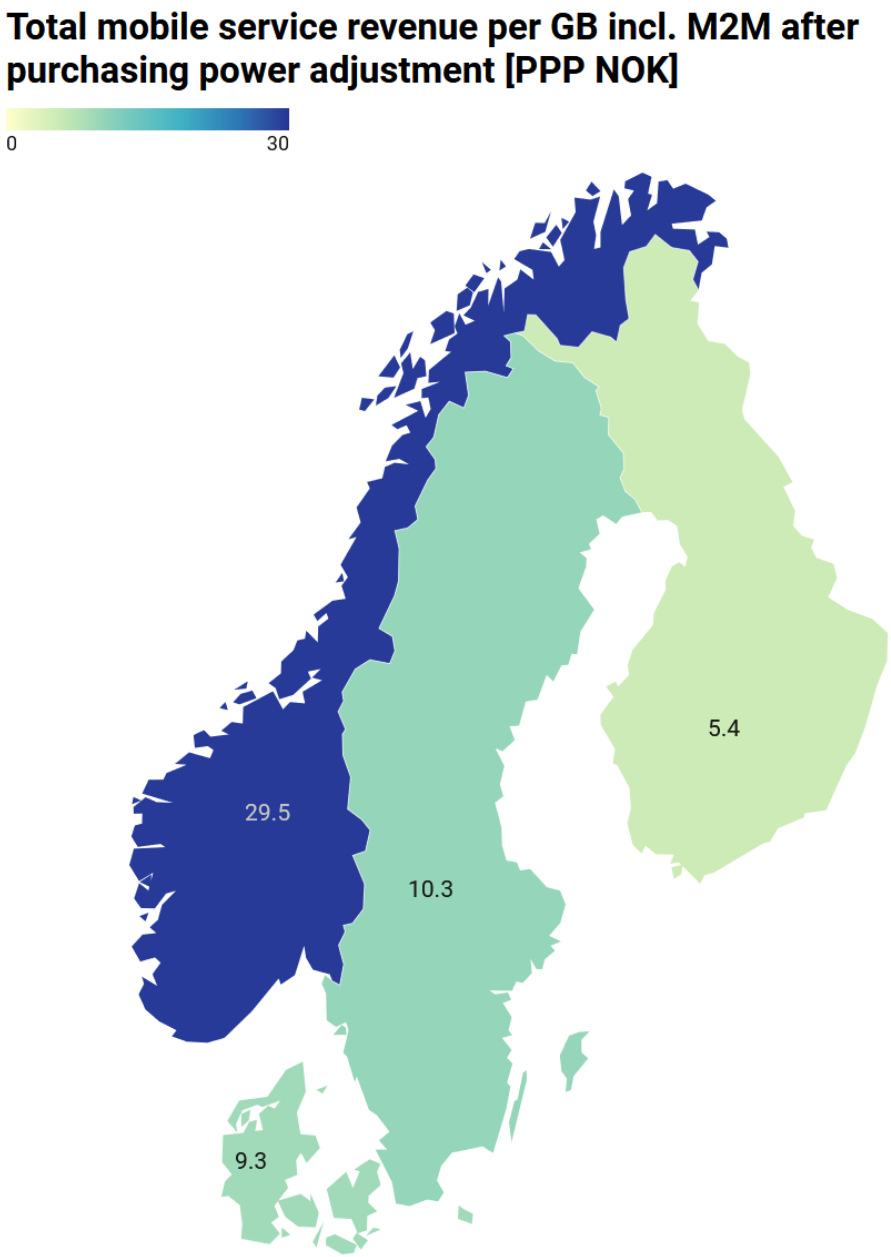
Analysis prepared for Kommunal- og distriktsdepartementet

Assessment of Norwegian mobile revenues in a Nordic context – 2023, September update



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1. Executive summary

This is an update of the previous 2023 analysis version dated 26 June 2023.

The basis for purchasing power partity (PPP) adjustment has been changed to use OECD's PPP conversion rates. The previous version used IMF's GDP per capita in international USD (i.e. PPP) to derive a PPP adjustment – a method that led to larger differences in purchasing power. Whereas the previous version only showed graphs with purchasing power adjustment, this updated version shows graphs both with and without purchasing power adjustment.

The change in methodology has no effect on Norway's numbers, only on the PPP NOK numbers of Denmark, Sweden and Finland. Norway's position *relative* to the other three countries is however influenced when measured in PPP NOK.

Since most of the graphs in this analysis go back to 2020, the two analyses issued in 2020 and 2022 have not been updated. This means that the outcome measured in PPP NOK in the two older analyses should not be compared with this analysis.

This analysis is commissioned by Kommunal- og distriktsdepartementet (KDD). It provides another update of the revenue, usage and pricing parts of the original analysis "Assessment of Norwegian mobile revenues in a Nordic context", dated 22 December 2020[1] and the follow-up analysis "Assessment of Norwegian mobile revenues in a Nordic context – 2022", dated 31 January 2022[2].

A multitude of metrics are used – always compared between the same four Nordic markets: Norway, Denmark, Sweden and Finland. The analysis shows why these markets form a near-perfect peer group.

Regulator data shows that the Norwegian revenue per mobile subscription including M2M – after purchasing power parity adjustment – is higher than the other three countries. When excluding M2M, the Norwegian ARPU is higher than Sweden's. Although no exact comparison can be made to Denmark and Finland, the Norwegian ARPU excluding M2M is higher. The average data usage is however higher in Sweden, Denmark and, especially, Finland.

To give a sense of the current pricing of data-rich plans, the analysis compares 86 plans with unlimited data or a monthly bucket of at least 30 GB. Against the general inflation trend, mobile plan prices have generally decreased in Norway – which is not the case in the other three countries. After having adjusted for purchasing power, Norwegian plans can compete on price with Swedish plans for data buckets up to about 50 GB per month. If comparing unlimited, Norwegian plans can generally compete with Sweden and Finland – but tend to still be a bit pricier. Danish mobile providers – although prices generally were increased – still offer the most affordable data-rich plans in the Nordics.

Yet again, Telenor and Telia Norway have the highest EBITDA margins in the Nordics, so high OPEX isn't behind the higher mobile revenue in their case. Ice, who had the lowest EBITDA margin in 2021, was

[1] The report can be downloaded from https://www.regjeringen.no/no/dokumentarkiv/regjeringen-solberg/aktuelt-regjeringen-solberg/kmd/nyheterKMD/2021/ny-rapport-viser-at-konkurransen-i-mobilmarkedene-ma-bli-bedre/id2843838/

[2] The report can be downloaded from https://www.regjeringen.no/no/aktuelt/norske-mobilpriser-er-fortsatt-hoye-i-nordisk-sammenheng/id2909632/

acquired by Lyse in 2022. Having absorbed Ice, the EBITDA margin of Lyse's telecom business is still relatively high in a Nordic perspective.

Norwegian operators use more on CAPEX than the median Nordic operator. Since the EBITDA-CAPEX (~cash flow) margins of Telia and Telenor Norway are higher than the median, the companies can well afford its current levels of CAPEX. Ice's situation was different in 2021 when Ice had the lowest (and negative) EBITDA-CAPEX margin. Lyse's telecom business could in 2022, including Ice, cover its CAPEX with EBITDA – but the margin is much lower than for Telia and Telenor.

Norway continues to have the lowest mobile data usage in the Nordics. Norway still has the unfavourable (from a consumer point of view) combination of highest revenue yet lowest usage per subscription.

The speeds when using mobile data in Norway is overall still higher than in the other three countries. As mobile speed depends on the traffic load, Norway's low mobile data usage helps on speed. It is also an indication of that Norwegian operators have invested in capacity not fully utilised. With a wider take on mobile network quality – not just speed – the mobile network experience in Norway is still great, but that is true also for Denmark, Sweden and Finland.

The analysis shows that the Norwegian mobile market still is uniquely concentrated although the concentration index HHI decreased further in 2022.

This updated analysis doesn't repeat the full root cause analysis of the original analysis but re-establishes the key finding: After adjustment for purchasing power, the Norwegian mobile revenue per GB is higher than in Denmark, Sweden and Finland and the most likely root cause is the market concentration.

Trends over three analyses

Since this is the third analysis of its kind – December 2020, January 2022 and June 2023 (updated with new PPP methodology in September 2023) – spanning over 2.5 years, we can identify certain **trends** when it comes to Norway's position. Due to the change in PPP methodology, the trends below are based on unadjusted NOK.

- Norway still has the **highest market ARPU both when including and excluding M2M**.
- Norway still has the **lowest mobile data usage** but the strong take-up of FWA in Norway in 2020-2021 combined with that the Norwegian FWA traffic, unlike the other markets, isn't included in the reported traffic makes us increasingly concerned that Norway's average usage is understated.
- **Prices on data-rich plans have come down** in Norway. Since the other markets have not had the same development, Norway is today closer to the other three markets. These price decreases have not yet had any effect on ARPU when excluding M2M, though.
- The leading Norwegian operators Telenor and Telia continue to be in the Nordic top layer when it comes to **EBITDA margin**.
- All Norwegian operators – also Ice/Lyse – continue to invest more of its revenue on **CAPEX** than the median Nordic operator. The approximate cash flow margin (after both OPEX and CAPEX) is however still higher than the Nordic median for Telenor and Telia.
- The **market concentration** is still high in Norway but continues to decrease faster than in the other countries.
- Norwegian mobile networks overall continue to deliver **faster download speeds** than in the other countries, but the difference is smaller than it used to be. The overall **consistency** in the network experience continues to be very high in Norway but this is as true for Denmark, Sweden and Finland.

2. Background

This analysis is commissioned by Kommunal- og distriktsdepartementet (KDD). It provides another update of the revenue, usage and pricing parts of the original analysis "Assessment of Norwegian mobile revenues in a Nordic context", dated 22 December 2020[3] – written to support Kommunal- og moderniseringsdepartementet's[4] white paper to the Norwegian Parliament covering electronic communications issued 9 April 2021[5] – and the follow-up analysis "Assessment of Norwegian mobile revenues in a Nordic context – 2022", dated 31 January 2022[6].

[3] The report can be downloaded from https://www.regjeringen.no/no/dokumentarkiv/regjeringen-solberg/aktuelt-regjeringen-solberg/kmd/nyheterKMD/2021/ny-rapport-viser-at-konkurransen-i-mobilmarkedene-ma-bli-bedre/id2843838/

[4] The ministry changed name from Kommunal- og moderniseringsdepartementet to Kommunal- og distriktsdepartementet 1 Jan 2022

[5] https://www.regjeringen.no/no/dokumenter/meld.-st.-28-20202021/id2842784/

[6] The report can be downloaded from https://www.regjeringen.no/no/aktuelt/norske-mobilpriser-er-fortsatt-hoye-i-nordisk-sammenheng/id2909632/

3. Peer group

Just like in the previous analyses, the peer group consists of the four Nordic countries **Norway, Denmark, Sweden and Finland**. These four countries form a near-perfect international peer group. All metrics will always[7] be compared between these four countries to allow the reader to understand how one metric may affect another metric.

Below are some high-level indicators to show why Norway, Denmark, Sweden and Finland most often are comparable.

	Norway	Denmark	Sweden	Finland
Mobile				
High smartphone penetration	>90%	>90%	>90%	>90%
High data-only (mbb) penetration incl. FWA	7%	12%	7%	20%
High mobile data traffic [GB per SIM per month]	6,3 excl. FWA	15,4	12,5	32,5
High contract share of mobile subscriber base	93%	98%	87%	94%
Low/medium mobile churn [per year]	15-25%	15-25%	15-25%	15-25%
Subsidy/instalment model in mobile equipment sales	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
World-class mobile network quality	Yes	Yes	Yes	Yes
High 4G population coverage	>99% Except Ice 94% if excl. national roaming	>99%	>99% Except '3' 97%	>99%
Commercial 5G	3 of 3 operators Fast rollout on a mixture of spectrum bands. Telia with 80% population coverage by end of 2022, Telenor 65%, Ice 9%.	4 of 4 operators Early 700 MHz rollout from TDC supplemented by 3.5 GHz to 99% of population by end of 2022, Telia/Telenor 80%, '3' 70%.	4 of 4 operators After delay caused by 3.5 GHz auction, rollout increased in 2022. Telia with 53% population coverage by end of 2022, Tele2/Telenor 21%, '3' n/a.	3 of 3 operators Fast rollout on a mixture of spectrum bands. Elisa with 85% population coverage by end of 2022, DNA 80%, Telia 79%.
Mobile active network sharing	No	Yes TT-Netværket between Telenor & Telia for 2G, 3G, 4G & 5G	Yes SUNAB between Tele2 & Telia for 3G; 3GIS between Telenor & '3' for 3G; Net4Mobility between Tele2 & Telenor for 2G, 4G & 5G	Yes Suomen Yhteisverkko between Telia & DNA for 2G, 3G, 4G & 5G (Northeast half of Finland)

[7] On a few occasions, regulatory data with sufficient break-down isn't available, leaving out that metric for the country in question

Fixed				
High fibre share of fixed broadband base	70%	43%	81%	63%
Medium cable modem share of fixed broadband base	21%	34%	16%	28%
High median download speed [Mbit/s][8]	112 #30 in the world	200 #8 in the world	113 #29 in the world	96 #34 in the world
Fixed-mobile convergent offers	Light =combine, get more	Light =combine, get more	Light =combine, get more	Light =combine, get more

Figure 1. Comparison of some high-level business drivers in Norway, Denmark, Sweden and Finland[9] [source: Tefficient]

Although many market parameters are similar in these four countries, the **purchasing power** differs. Norway has higher purchasing power than the other three Nordic countries.

The input (and for 2022 also output) parameters for the PPP adjustment are shown in Figure 2 below.

	Input: Purchasing power parity (PPP) Total, National currency units per US dollar 2020	**Input: Purchasing power parity (PPP) Total, National currency units per US dollar 2021**	**Input: Purchasing power parity (PPP) Total, National currency units per US dollar 2022**	**Output: Exchange rate adjusted to Norwegian purchasing power level [national currency to PPP NOK] 2022**
Norway	9,879879	9,512157	8,882011	1
Denmark	6,551107	6,589808	6,404699	0,721086587
Sweden	8,668483	8,721548	8,750849	0,985232849
Finland	0,823022	0,82669	0,813035	0,091537266

Figure 2. Comparison of purchasing parity (in international USD) in Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 and the PPP adjusted exchange rates used for 2022 [source: OECD]

An introduction to PPP is given in the box below[10].

[8] Source: Ookla Speedtest April 2023
[9] Subscriber figures are for December 2022, usage figures for the whole year of 2022
[10] From Our World in Data: https://ourworldindata.org/what-are-ppps

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 updated version of the 2023 analysis, all revenue and pricing diagrams are produced in two versions:

- A comparison in NOK *without* adjustment for purchasing power
- A comparison in NOK *with* adjustment for purchasing power

Since purchasing power parity (PPP) is calculated on a generic basket of goods and services – not specifically for mobile services – it should be regarded as indicative. Different institutes, e.g. OECD, IMF and the World Bank report different PPP conversion rates. The rates are sometimes revisited and adjusted meaning that what today is a 2022 value might be changed next year.

4. Observed data issues

Missing revenue data from two countries

Finland's telecom regulator, Traficom, and Denmark's telecom regulator, SDFI, have not yet issued revenue statistics for 2022[11]. Since all operators in Finland and Denmark publicly report mobile service revenues, there is a work-around by summing up these and add a reasonable share for MVNOs and others. Comparison with previous years – for which both datasets are available – show that numbers tend to match well.

Inability to exclude M2M SIMs and revenues in all countries

In the original analysis from 2020, we had an issue with the large number of international M2M SIMs (mainly from Telenor Connexion) being homebased in Sweden. In the 2022 and 2023 versions, there's sufficient historical data on Sweden-only M2M SIMs to exclude the previous "Sweden with also international M2M" category from our graphs, making them less complex and more comparable.

Although a step forward, we would ideally like to exclude M2M entirely from our analysis as it represents a very different segment of the mobile market than the human-focussed volume business. In the regulator reporting of Denmark and Finland, M2M revenues[12] and M2M traffic are however not broken out from the total mobile service revenues and total mobile traffic and can't therefore be excluded.

FWA traffic not reported for Norway

Unlike the other Nordic regulators, Nkom does not include FWA traffic in its reported mobile data traffic[13]. Since an FWA customer in other markets averagely could generate 200-300 GB per month – and since FWA has been successful in Norway in the last years – we believe a reported FWA traffic figure could make the Norwegian mobile data usage more comparable to Sweden and Denmark. But as the traffic isn't reported, it's a known unknown which can't be included in the analysis.

Currency fluctuations

In the previous update, there was an issue with currency fluctuations affecting the comparability. When comparing 2022 with 2021, there hasn't been much fluctuation in the NOK against the Euro (EUR), please compare the 2021 and 2022 periods in Figure 3 below. Since the Danish krone (DKK) is tied to the Euro, the curve looks very similar vs. DKK and hence not displayed here. This means that the comparisons we make to Danish and Finnish ARPU levels in the following two sections aren't much affected by currency fluctuations.

[11] This happened after the original 2023 analysis, dated 26 June 2023, was finalised. In order not to introduce further changes – beyond the PPP methodology – the assumptions made in June on revenue have been kept.
[12] M2M SIM numbers are broken out, though. M2M revenues represented 2.7% of Norwegian mobile revenues and 2.1% of Swedish mobile revenues in 2022 if excluding international M2M revenues. The Swedish figure was 5.4% if including international M2M revenues.
[13] Unlike regulators in Denmark and Finland, Nkom does not report fixed data traffic either

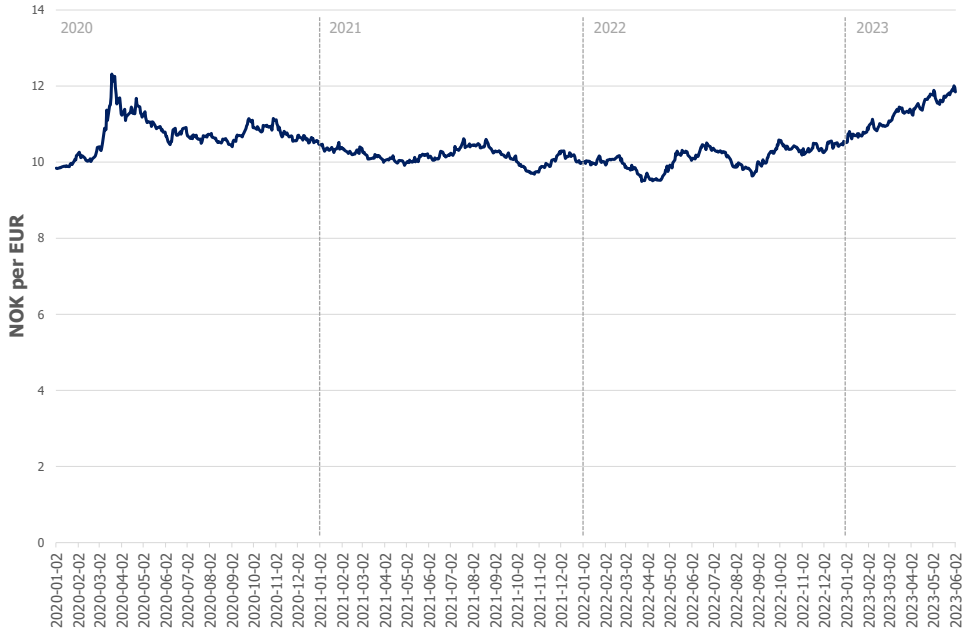

Figure 3. Development of the daily exchange rate between NOK and EUR from 2020 to date [source: ECB]

When we come into 2023, however – which we will in the pricing comparison in section 8 – we should realise that the NOK has weakened much vs. EUR and DKK. The Norwegian krona has also weakened vs. the Swedish krona (SEK) in 2023, see Figure 4. The SEK did have a weak period vs. the Norwegian krona in 2022, though.

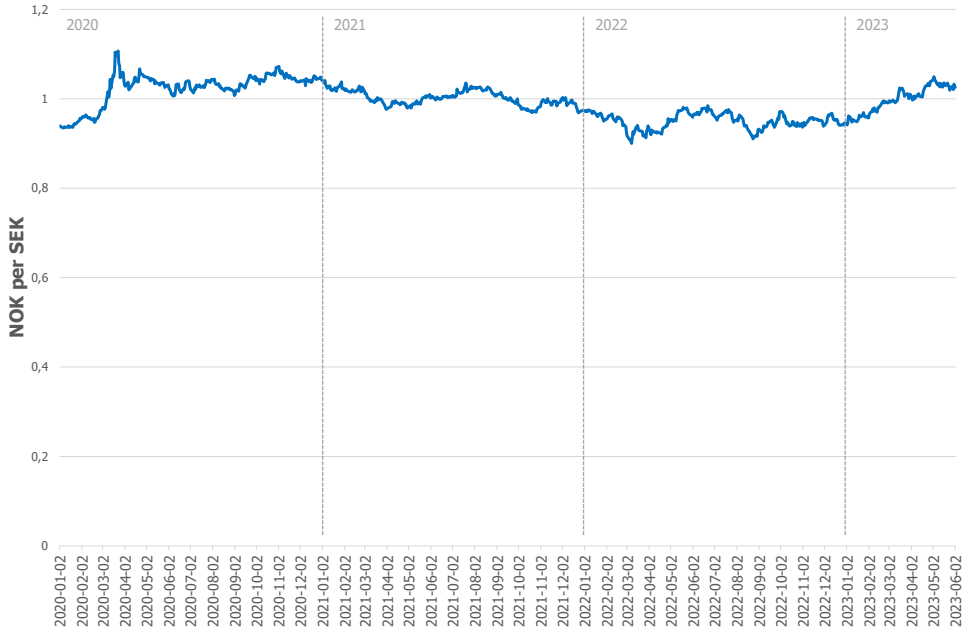

Figure 4. Development of the daily exchange rate between NOK and SEK from 2020 to date [source: ECB]

5. Mobile ARPU per country

We have used regulator data from the four national regulatory agencies Nkom, SDFI, PTS and Traficom to calculate the average service revenue per mobile subscription[14] per month – normally referred to as **ARPU** within the industry. Figure 6 below shows the ARPU in NOK[15] including *all* mobile subscriptions – regular, data-only (mbb) and M2M/IoT subscriptions.

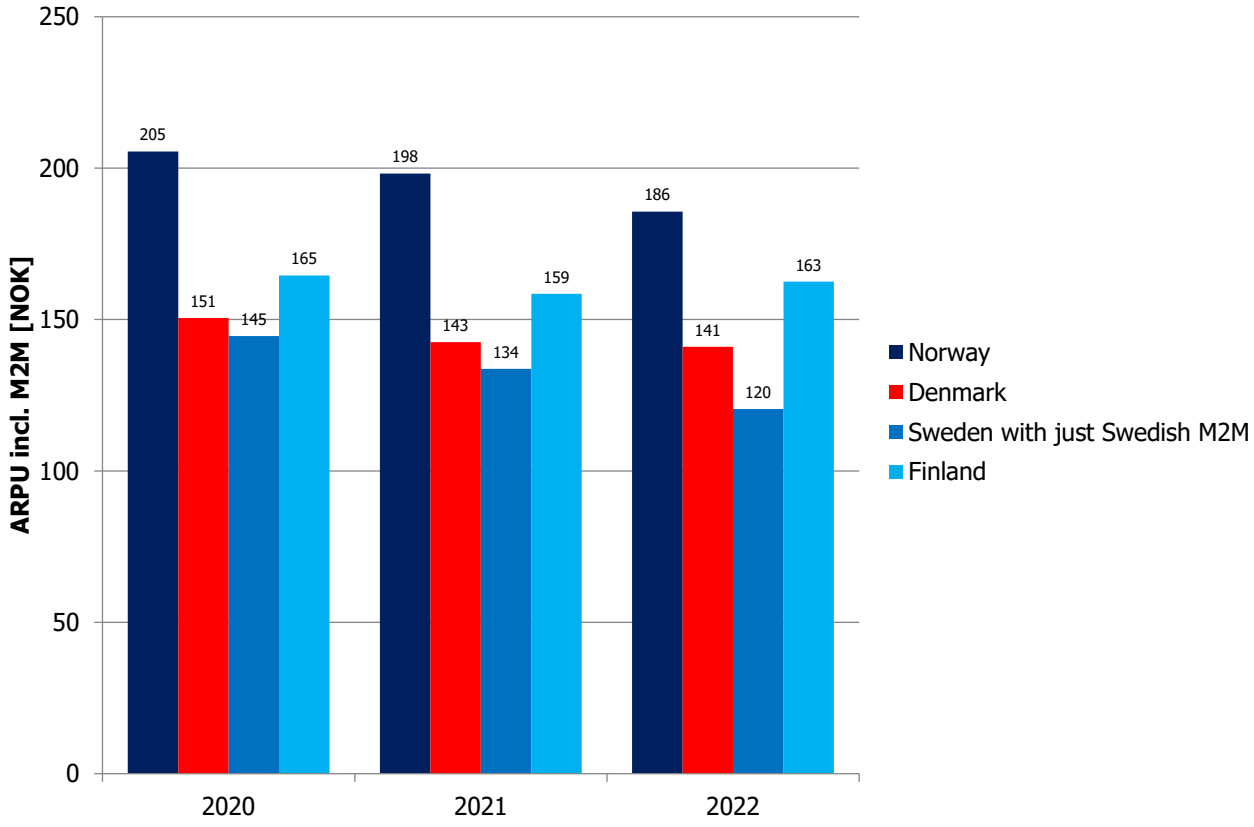

Figure 5. Comparison of mobile ARPU incl. M2M in Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue].

Norway's mobile ARPU was **186 NOK** in 2022, considerably less than in 2021 (198 NOK) and in 2020 (205 NOK). In NOK terms, Finland, Denmark and Sweden had lower ARPU and a similar declining trend – with the exception of Finland from 2021 to 2022.

To compensate for the differences in overall purchasing power, the ARPUs of Denmark, Sweden and Finland have been recalculated into purchasing power parity NOK (PPP NOK), see Figure 6.

[14] Average number of subscriptions in the period calculated as Average(number of subscriptions at the start of the period; number of subscriptions at the end of the period)

[15] Using the average of the daily exchange rate from ECB. For 2022: 0,73640 DKK per NOK, 1,05216 SEK per NOK, 0,09898 EUR per NOK.

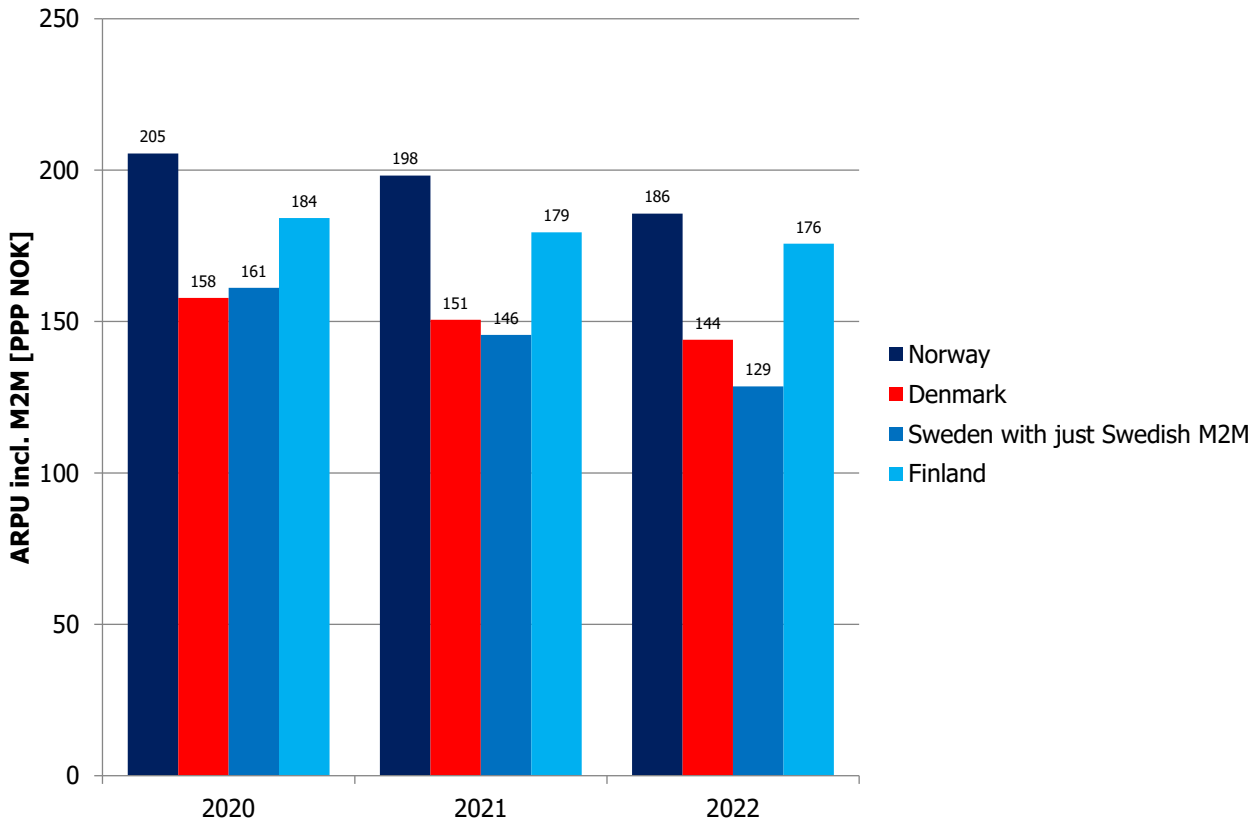

Figure 6. Comparison of PPP mobile ARPU incl. M2M in Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, OECD, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue].

The PPP adjustment does not affect Norway, but lifts the positions of Denmark, Sweden and Finland since the purchasing power is lower than in Norway. Also in PPP terms, Norway had a higher mobile ARPU than Finland, Denmark and Sweden but the differences are smaller compared to the pure NOK comparison – especially compared to Finland.

The Norwegian revenue per mobile subscription including M2M is, also after compensation for differences in purchasing power, higher than the other three countries.

The ARPU levels are generally falling in the Nordics when measured in purchasing power parity-adjusted NOK.

Figure 8 compares the mobile ARPU **excluding M2M**. For Denmark and Finland, this is indicative as M2M revenues aren't reported and hence can't be excluded. Norway's ARPU level of **281 NOK** in 2022 has increased slightly since 2020 and 2021. Although no exact comparison can be made to Denmark and Finland, the Norwegian ARPU excluding M2M is higher.

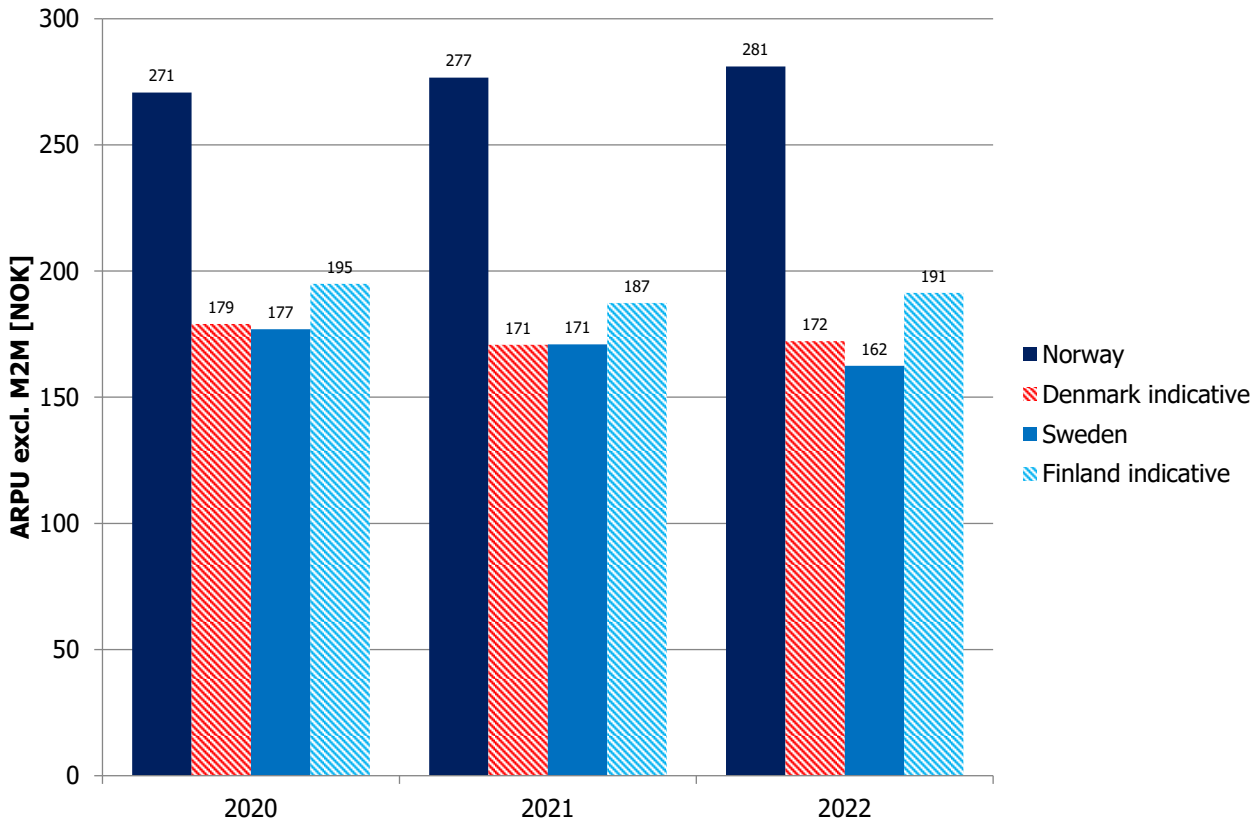

Figure 7. Comparison of mobile ARPU excl. M2M in Norway, Denmark, Sweden and Finland 2020, 2021 and 2022. The Danish and Finnish regulators do not break out M2M revenues so ARPU excl. M2M is including M2M revenues for Denmark and Finland [source: Nkom, SDFI, PTS, Traficom, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue].

Figure 8 compares the PPP mobile ARPU **excluding M2M**. Norway's ARPU level of **281 PPP NOK** in 2022 has increased slightly since 2020 and 2021 and is significantly higher than the level of Sweden – 174 PPP NOK in 2022. Although no exact comparison can be made to Denmark and Finland, the Norwegian ARPU excluding M2M is higher.

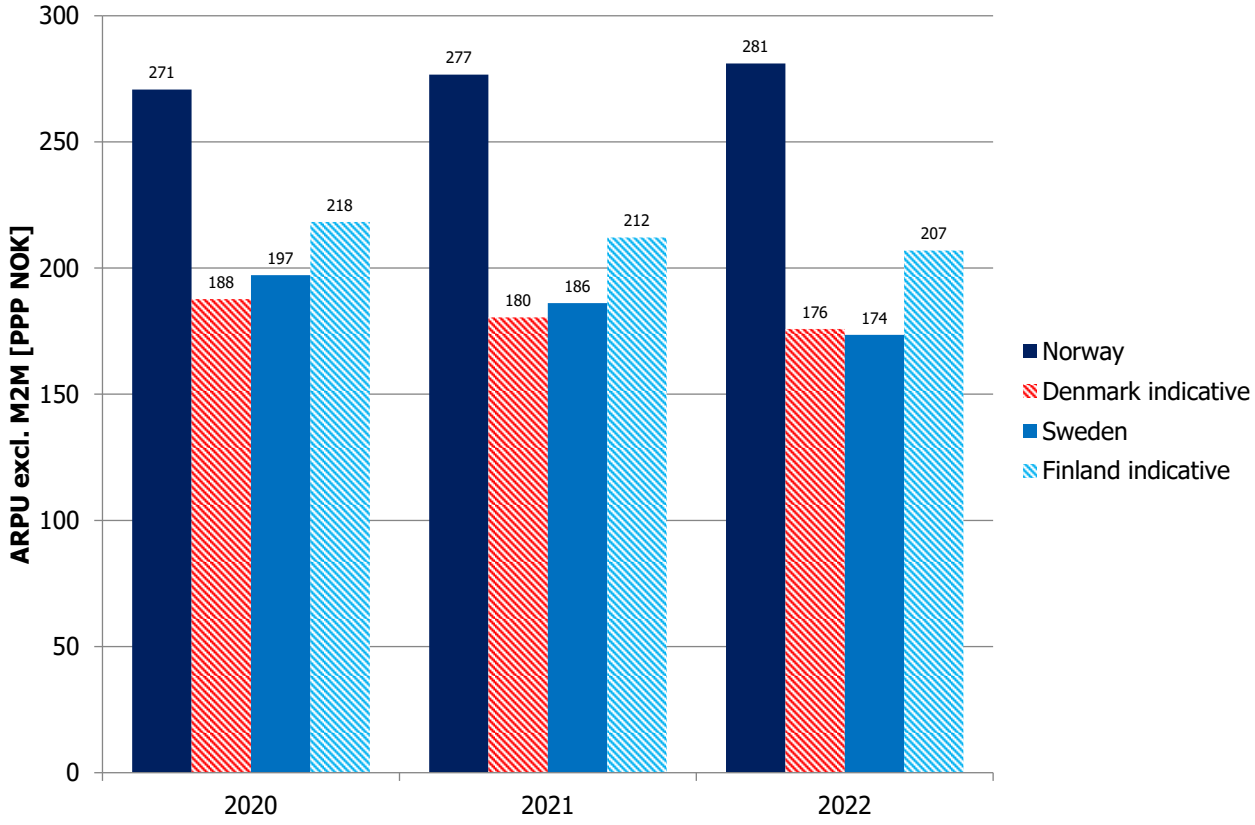

Figure 8. Comparison of PPP mobile ARPU excl. M2M in Norway, Denmark, Sweden and Finland 2020, 2021 and 2022. The Danish and Finnish regulators do not break out M2M revenues so ARPU excl. M2M is including M2M revenues for Denmark and Finland [source: Nkom, SDFI, PTS, Traficom, OECD, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue].

The Norwegian revenue per mobile subscription excluding M2M is, also after compensation for differences in purchasing power, significantly higher than Sweden's. Although no exact comparison can be made to Denmark and Finland, the Norwegian ARPU excluding M2M is higher.

6. Comparison between mobile ARPU and mobile data usage per country

The previous section showed that the Norwegian ARPU, also after purchasing power parity adjustment, is higher than Denmark, Sweden and Finland. In this section we compare the ARPU levels with the mobile data usage to give an idea of how much data mobile subscribers consume for that ARPU. It's an attempt to assess the value for money[16].

Figure 9 compares the mobile data usage per subscription including M2M between our four countries. Finland is the world leader[17] in average mobile data usage and totally dominates over the other Nordic countries with an average of 32.3 GB used per subscription per month in 2022.

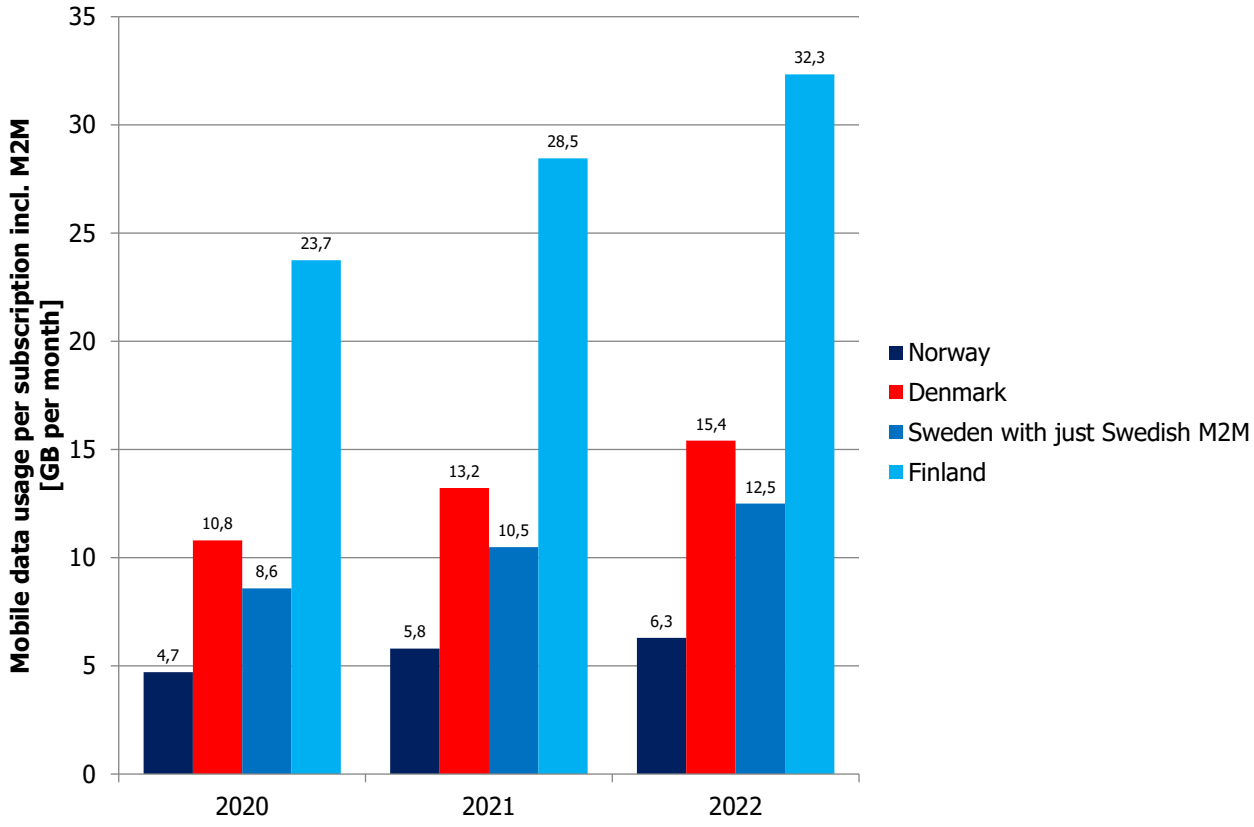

Figure 9. Average mobile data usage per mobile subscription including M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, compiled by Tefficient].

The average mobile data usage of Norway was 6.3 GB per subscription per month in 2022 – significantly lower than Finland obviously, but also much lower than Sweden and Denmark. In this context it is important to remind that Nkom – unlike the other Nordic regulators – does not include FWA traffic in its reported

[16] Although mobile data isn't the only mobile service, most mobile plans sold in the Nordics come with unlimited call minutes and SMS/MMS – in contrast to mobile data which outside of Finland most often is limited. This could suggest that operators and their customers assign more value to mobile data.

[17] https://tefficient.com/high-data-usage-countries-do-better-on-arpu-development-than-low-usage-countries/

mobile data traffic. Since an FWA customer in other markets averagely could generate 200-300 GB per month – and since FWA has been successful in Norway in the last years – we believe a reported FWA traffic figure could make the Norwegian mobile data usage more comparable to Sweden and Denmark.

Figure 10 below compares the mobile data usage per subscription *excluding* M2M[18]. Finland is still the world leader in average mobile data usage and totally dominates over the other Nordic countries with an average of 38.1 GB used per subscription per month in 2022.

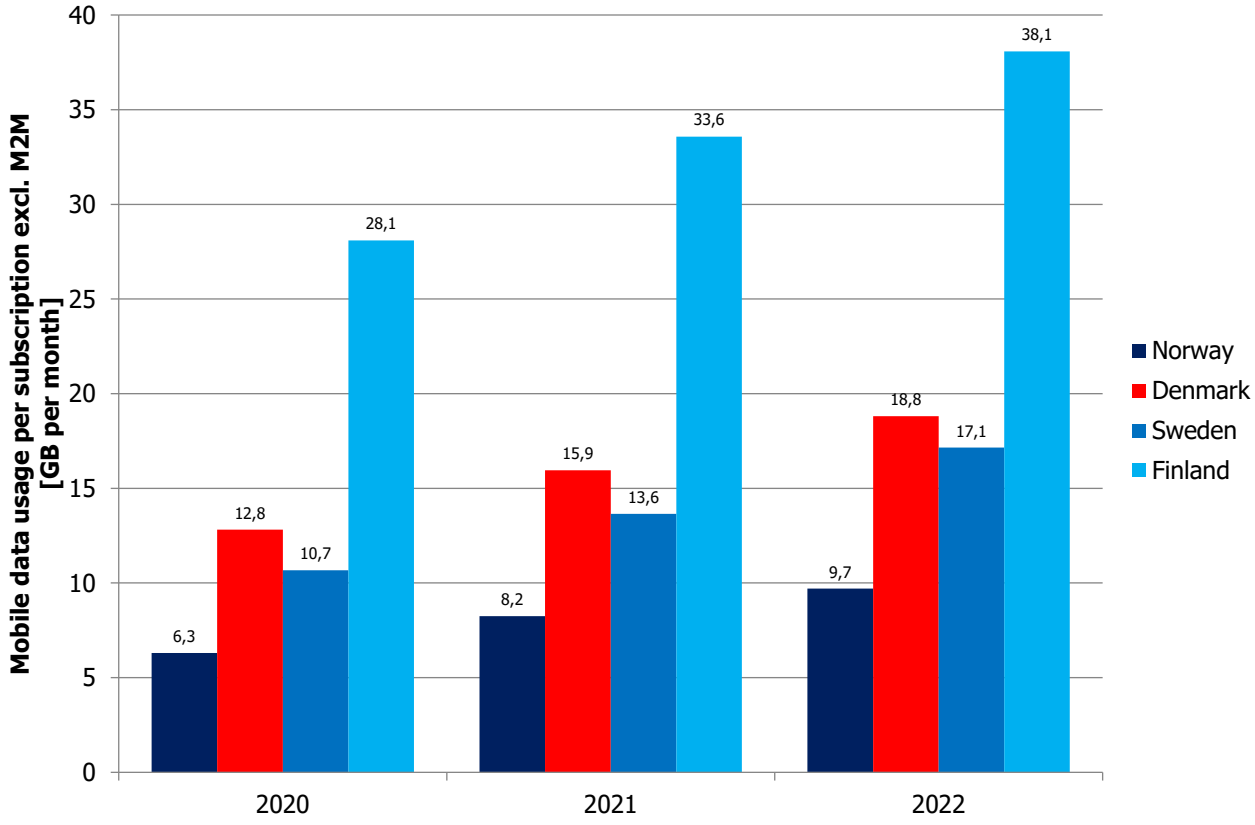

Figure 10. Average mobile data usage per mobile subscription excluding M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, compiled by Tefficient].

When excluding M2M, the average mobile data usage of Norway was 9.7 GB per subscription per month in 2022 – again significantly lower than Finland, but also much lower than Sweden and Denmark.

In 2019 and 2020 (narrowly), Norway had the slowest growth in mobile data usage of the four countries, leading to that the gap in mobile data usage increased further. 2021 represented a trend shift: The mobile data usage growth in Norway was now the fastest among the four countries. In 2022, the growth rate in the mobile data usage in Norway was however declining and Sweden and Denmark (narrowly) overtook Norway.

[18] Denmark and Finland aren't separating out the M2M data traffic (Norway and Sweden do) but from the Norwegian and Swedish data it's clear that the M2M data traffic is very small compared to the overall data traffic – 1.0% in Norway and 0.4% in Sweden in 2022. We have therefore assumed that the M2M traffic in Denmark and Finland is zero rather than excluding the countries from this metric.

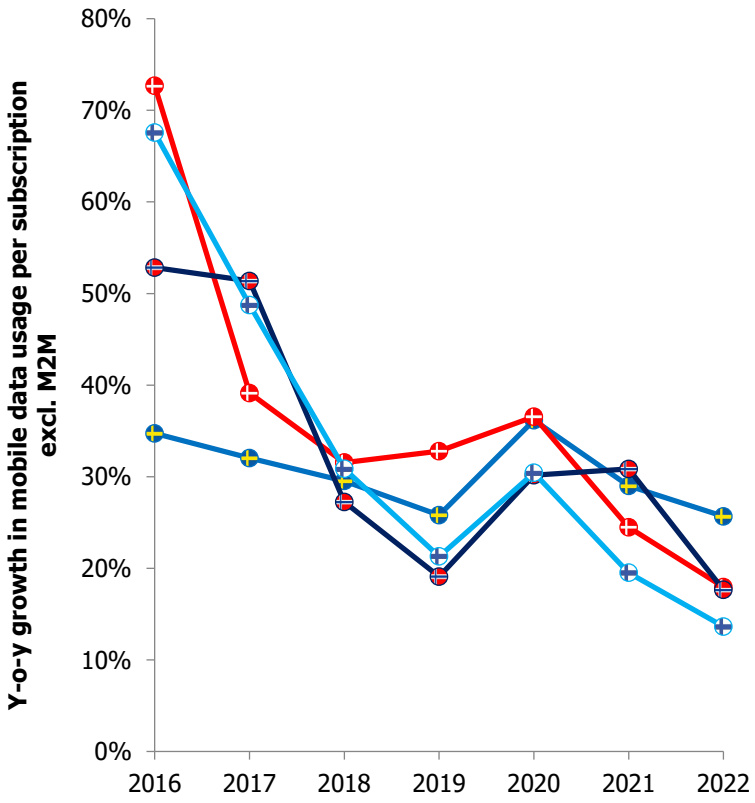

Figure 11. Y-o-y development in mobile data usage per mobile subscription excluding M2M for Norway, Denmark, Sweden and Finland 2016-2022 [source: Nkom, SDFI, PTS, Traficom, compiled by Tefficient].

Could Norway's low mobile data usage and slow historical growth have something to do with the cost of mobile data? To assess this, we have calculated the **total mobile service revenue per consumed GB**[19].

[19] The reason why we use the total mobile service revenue, not just the mobile service revenue associated with mobile data, is the way mobile plans are packaged today – with a typically unlimited number of minutes and SMS/MMS messages and a limited or unlimited number of GBs. With this, there is no way to separate the total service revenue into voice, messaging and data.

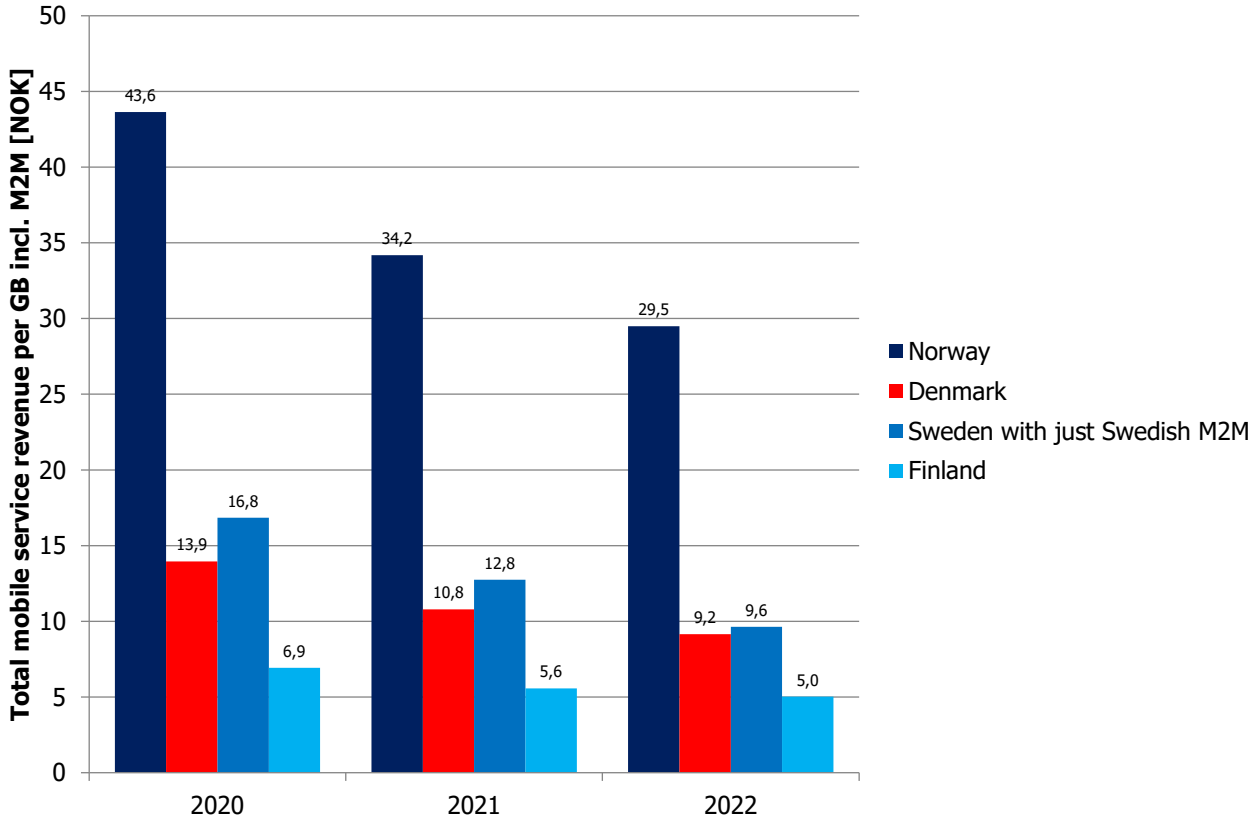

Figure 12. Total mobile service revenue in NOK per consumed GB including M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue, compiled by Tefficient].

Figure 12 shows the figures in pure NOK if including M2M. The revenue per GB in Norway is 29.5 NOK – 3.2 times higher than in Denmark, 3.1 times higher than in Sweden and 5.9 times higher than in Finland. Two factors are behind this: 1) The higher ARPU in Norway compared to Denmark and Sweden, see section 5, 2) The lower mobile data usage in Norway, see this section[20].

[20] This comparison between revenue and traffic is not affected by the fact that Nkom does not report FWA traffic since the FWA revenues aren't included either in this calculation for Norway. In the other three countries, FWA traffic and FWA revenues are both included.

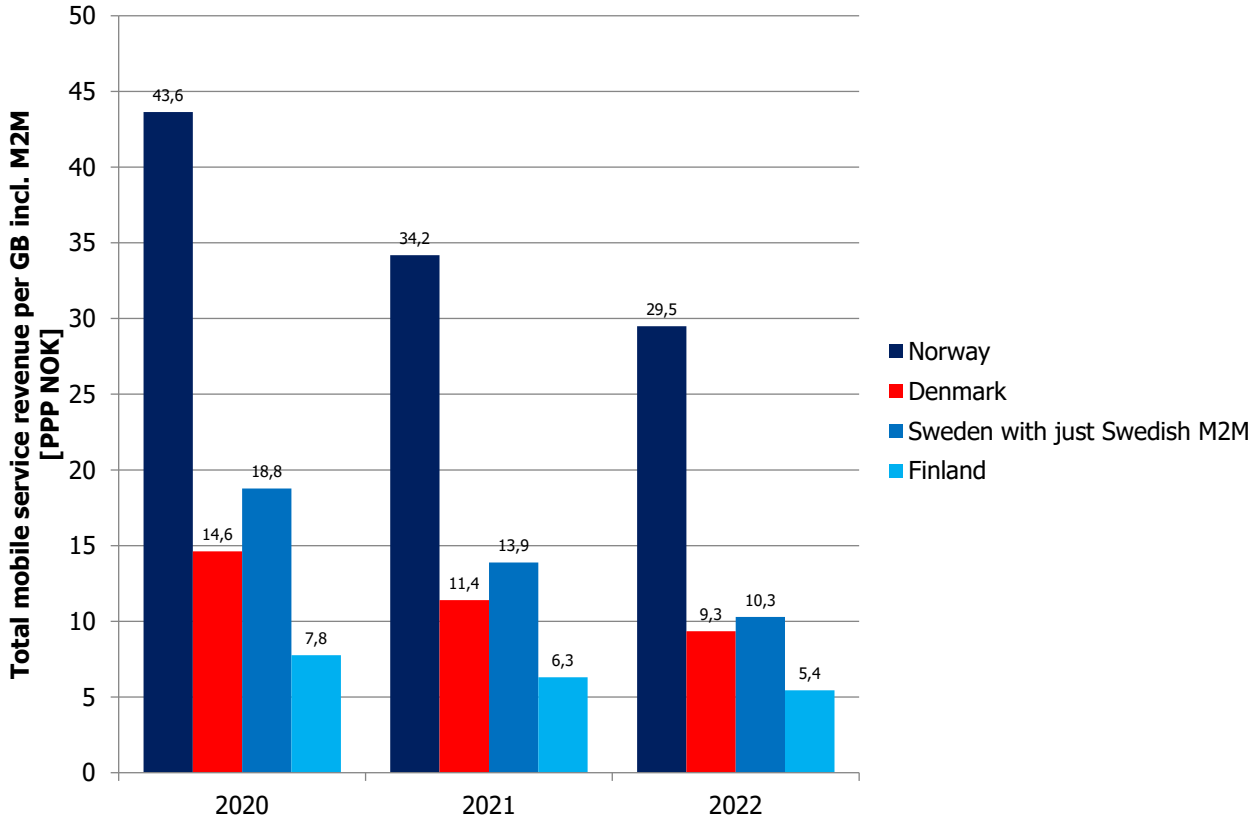

Figure 13. Total mobile service revenue in PPP NOK per consumed GB including M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, OECD, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue, compiled by Tefficient].

Figure 13 shows the figures in PPP NOK if including M2M. The PPP adjusted revenue per GB in Norway is now 3.2 times higher than in Denmark, 2.9 times higher than in Sweden and 5.4 times higher than in Finland. Again, two factors are behind this: 1) The higher PPP ARPU in Norway compared to Denmark and Sweden, see section 5, 2) The lower mobile data usage in Norway, see this section[21].

Excluding the M2M SIMs from the calculation doesn't change the graphs much.

[21] This comparison between revenue and traffic is not affected by the fact that Nkom does not report FWA traffic since the FWA revenues aren't included either in this calculation for Norway. In the other three countries, FWA traffic and FWA revenues are both included.

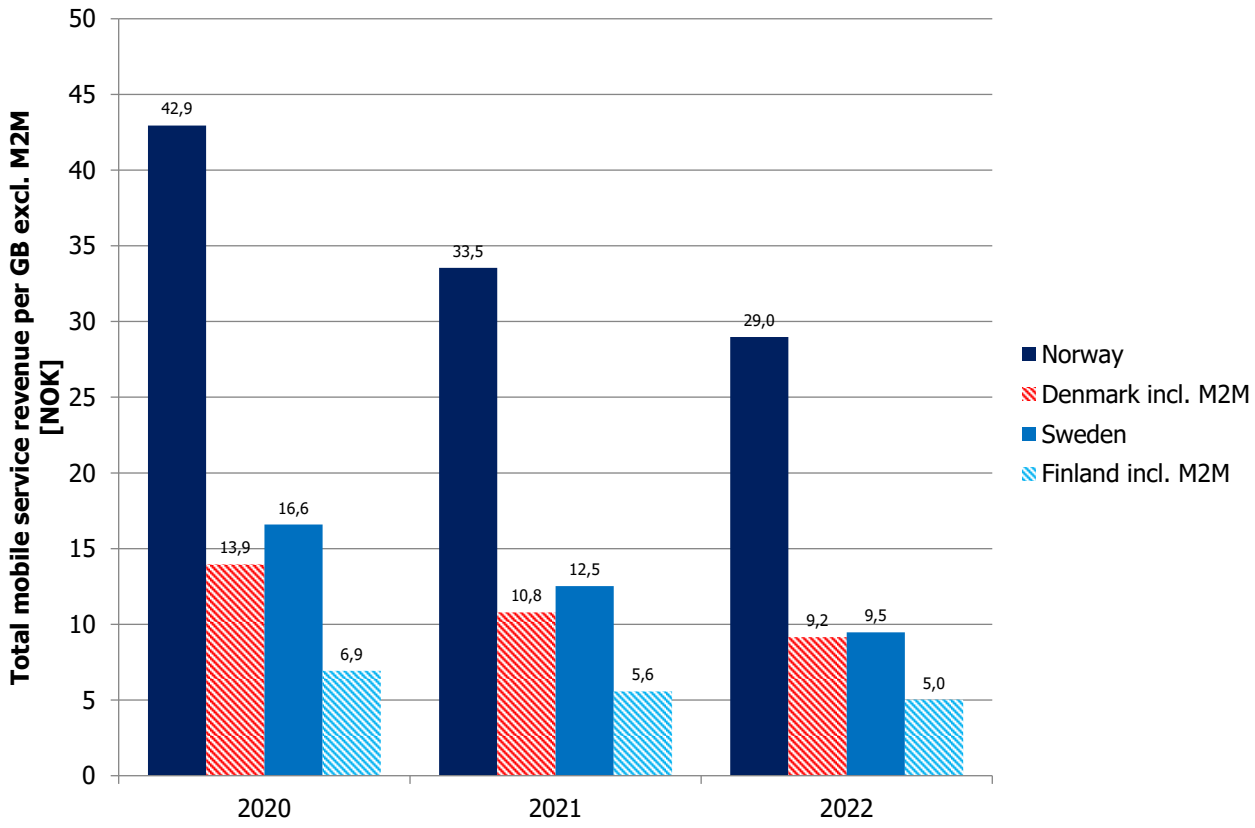

Figure 14. Total mobile service revenue in NOK per consumed GB excluding M2M for Norway and Sweden 2020, 2021 and 2022. The Danish and Finnish regulators do not break out M2M revenues or M2M traffic so revenue excl. M2M can't be calculated for Denmark and Finland [source: Nkom, SDFI, PTS, Traficom, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue, compiled by Tefficient].

The revenue per GB in Norway is 29.0 NOK – 3.1 times higher than in Sweden. Excluding M2M doesn't change that factor. Low usage and high revenue per GB seem to go hand in hand. But before we conclude, let's look at the graph in PPP NOK, Figure 15.

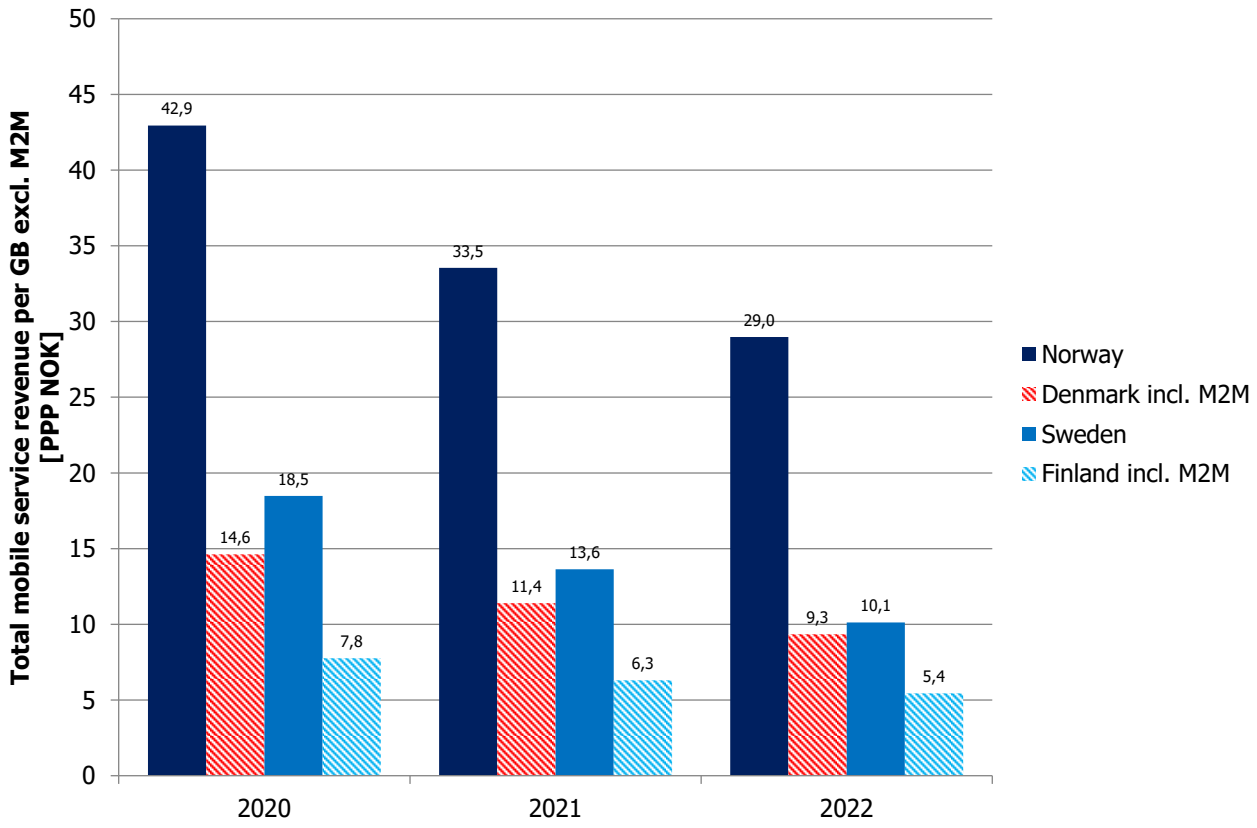

Figure 15. Total mobile service revenue in PPP NOK per consumed GB excluding M2M for Norway and Sweden 2020, 2021 and 2022. The Danish and Finnish regulators do not break out M2M revenues or M2M traffic so revenue excl. M2M can't be calculated for Denmark and Finland [source: Nkom, SDFI, PTS, Traficom, OECD, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue, compiled by Tefficient].

The PPP adjusted revenue per GB in Norway is now 2.9 times higher than in Sweden. Excluding M2M doesn't change that factor. Low usage and high revenue per GB seem to go hand in hand.

The total mobile service revenue per consumed GB is, after compensation for differences in purchasing power, 2.9-5.4 times higher in Norway than in the other Nordic countries. It's likely that the high revenue per GB hampers the Norwegian usage.

The following graphs compare how much mobile subscribers **get for what they pay**. We are simply comparing the ARPU from section 5 with the average mobile data usage from this section. First a pure NOK graph where M2M is included:

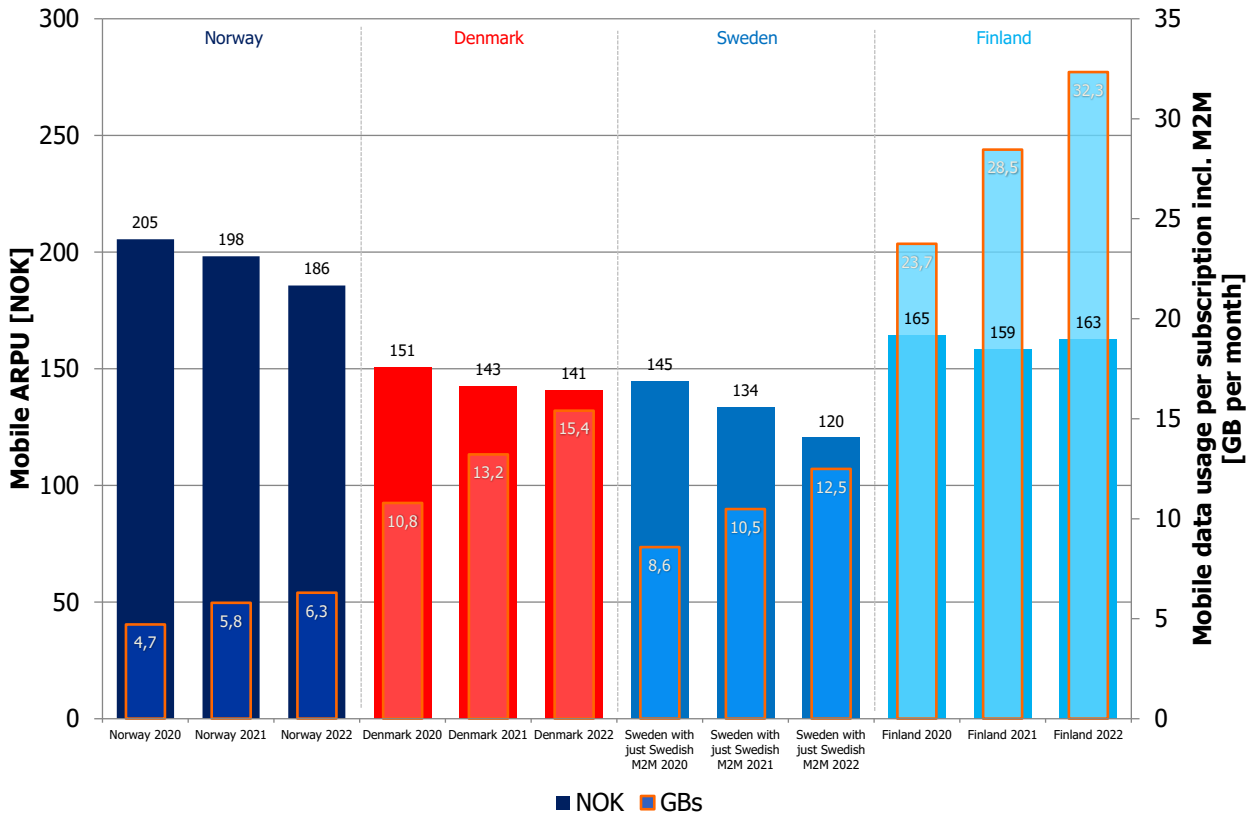

Figure 16. ARPU per mobile subscription including M2M vs. the average mobile data usage per subscription including M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue, compiled by Tefficient].

Norway's ARPU is the highest, but Norway's average mobile data usage is the lowest.

The same graph – just in PPP NOK – follows.

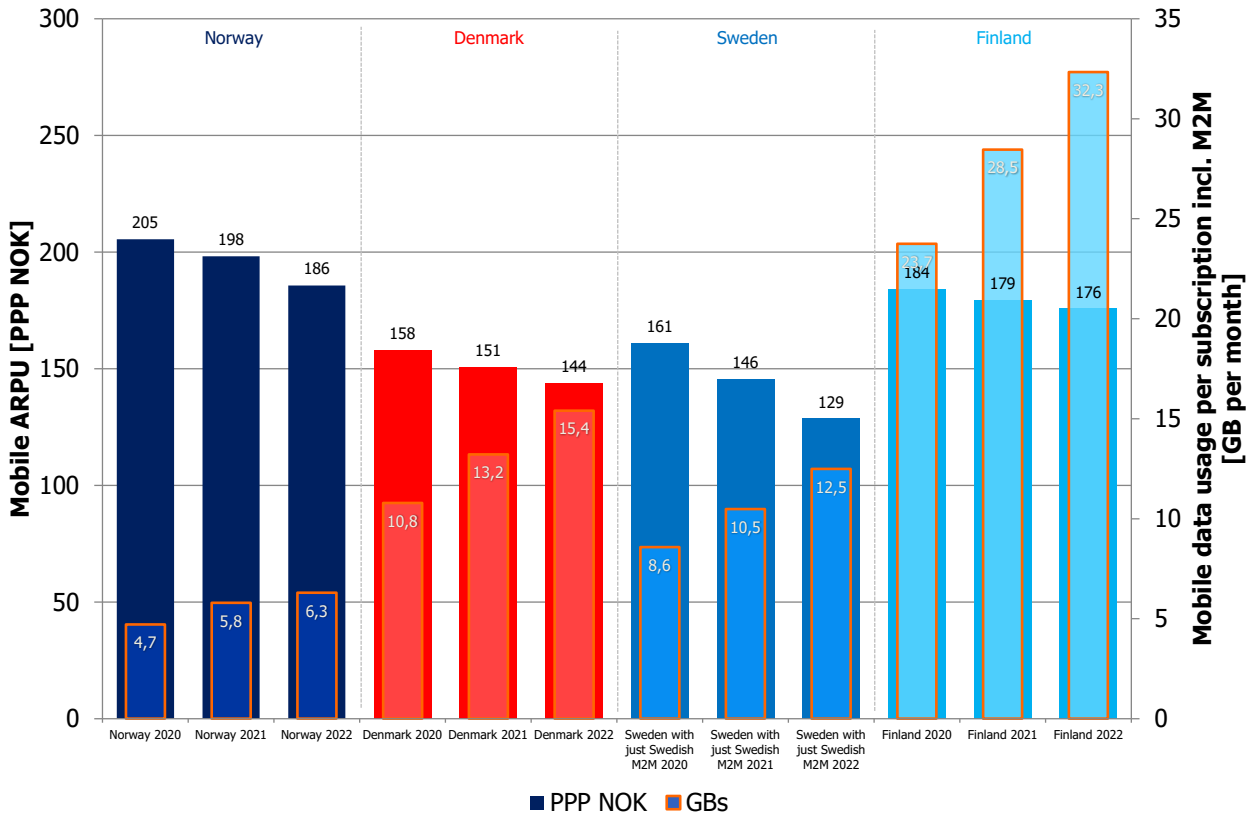

Figure 17. PPP ARPU per mobile subscription including M2M vs. the average mobile data usage per subscription including M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022 [source: Nkom, SDFI, PTS, Traficom, OECD, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue, compiled by Tefficient].

Also after adjustments for differences in purchasing power, Norway's PPP ARPU is the highest although Norway's average mobile data usage is the lowest.

If excluding M2M from Figure 16 we get Figure 18.

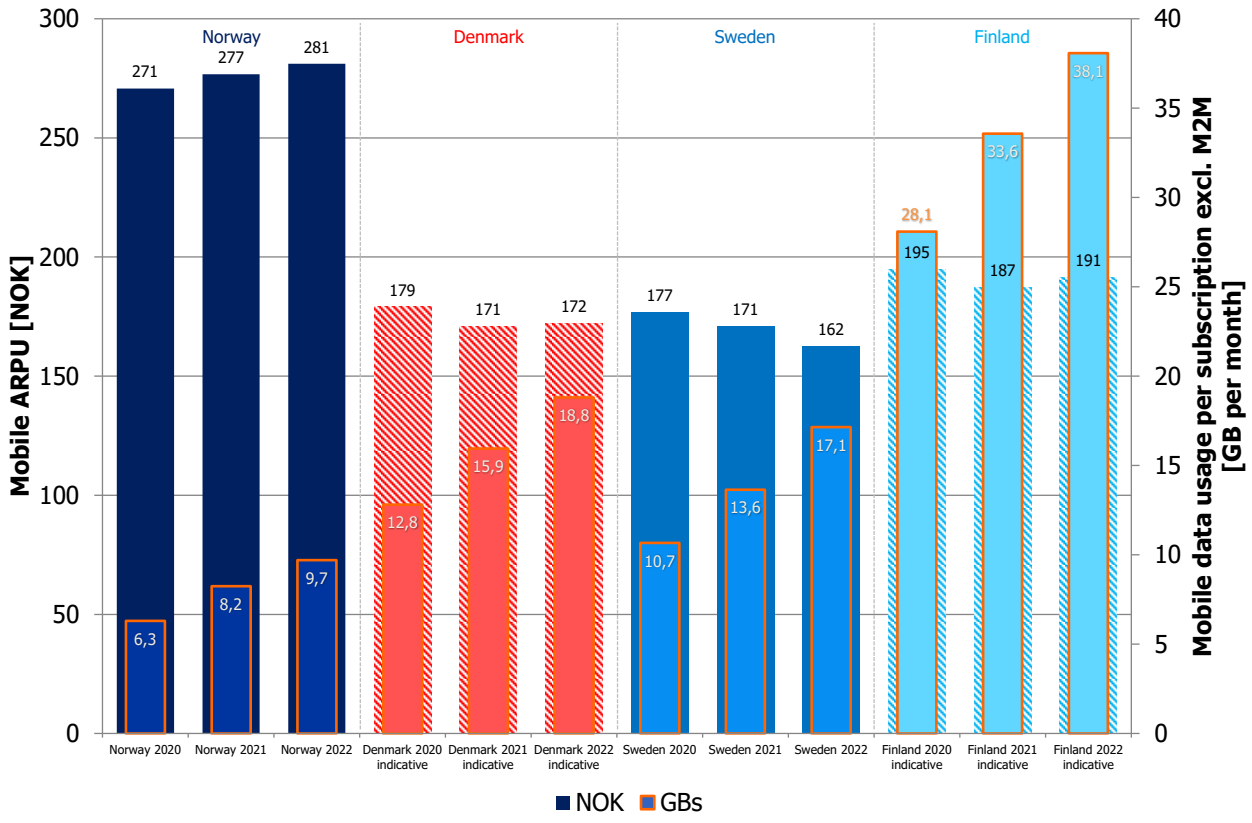

Figure 18. ARPU per mobile subscription excluding M2M vs. the average mobile data usage per subscription excluding M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022. The Danish and Finnish regulators do not break out M2M revenues so ARPU excl. M2M is including M2M revenues for Denmark and Finland [source: Nkom, SDFI, PTS, Traficom, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue].

When excluding M2M, Norway's ARPU differential vs. Sweden increases although the Norwegian average mobile data usage is lower. Denmark and Finland have much lower indicative ARPU than Norway but higher mobile data usage.

The same graph – just in PPP NOK – follows.

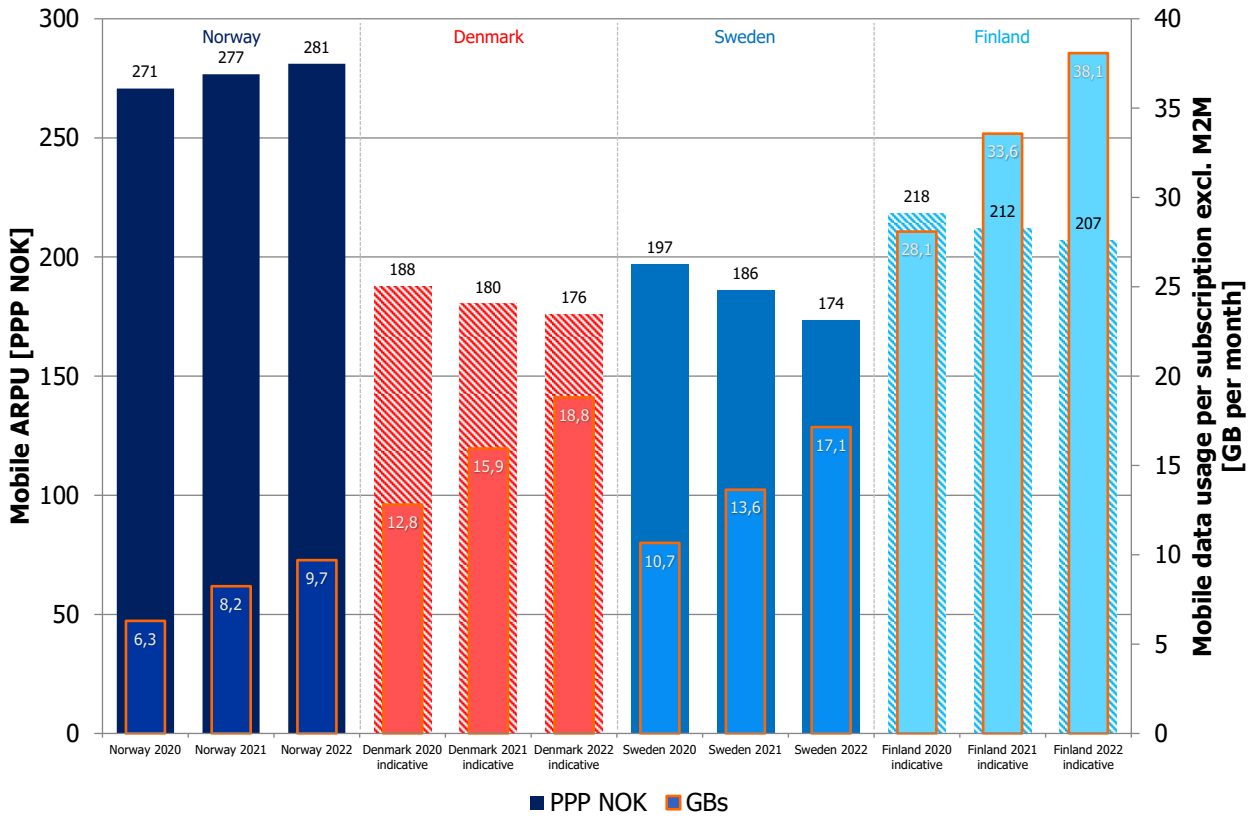

Figure 19. PPP ARPU per mobile subscription excluding M2M vs. the average mobile data usage per subscription excluding M2M for Norway, Denmark, Sweden and Finland 2020, 2021 and 2022. The Danish and Finnish regulators do not break out M2M revenues so ARPU excl. M2M is including M2M revenues for Denmark and Finland [source: Nkom, SDFI, PTS, Traficom, OECD, operator reports for 2022 for Finland and Denmark as regulators have not yet reported revenue].

When excluding M2M, Norway's PPP ARPU differential vs. Sweden increases although the Norwegian average mobile data usage is lower. Denmark and Finland have much lower indicative ARPU than Norway but higher mobile data usage.

The Norwegian ARPU is higher than the ARPU on the other three countries – if including and excluding M2M and regardless of compensation for differences in purchasing power. The Norwegian data usage is always the lowest. If data volume is what defines value, then Norwegian mobile subscribers receive the lowest value in these Nordic markets.

7. Mobile ARPU per reporting operator

Regulatory data has the benefit of being defined in the same way for all providers in a market but has the drawback of being relatively infrequently reported and published with a certain delay. Depending on regulator and type of data, it is not always possible to break it out per operator.

Figure 21 below shows the mobile ARPU as reported by the 14 MNOs in our four markets – converted into NOK.

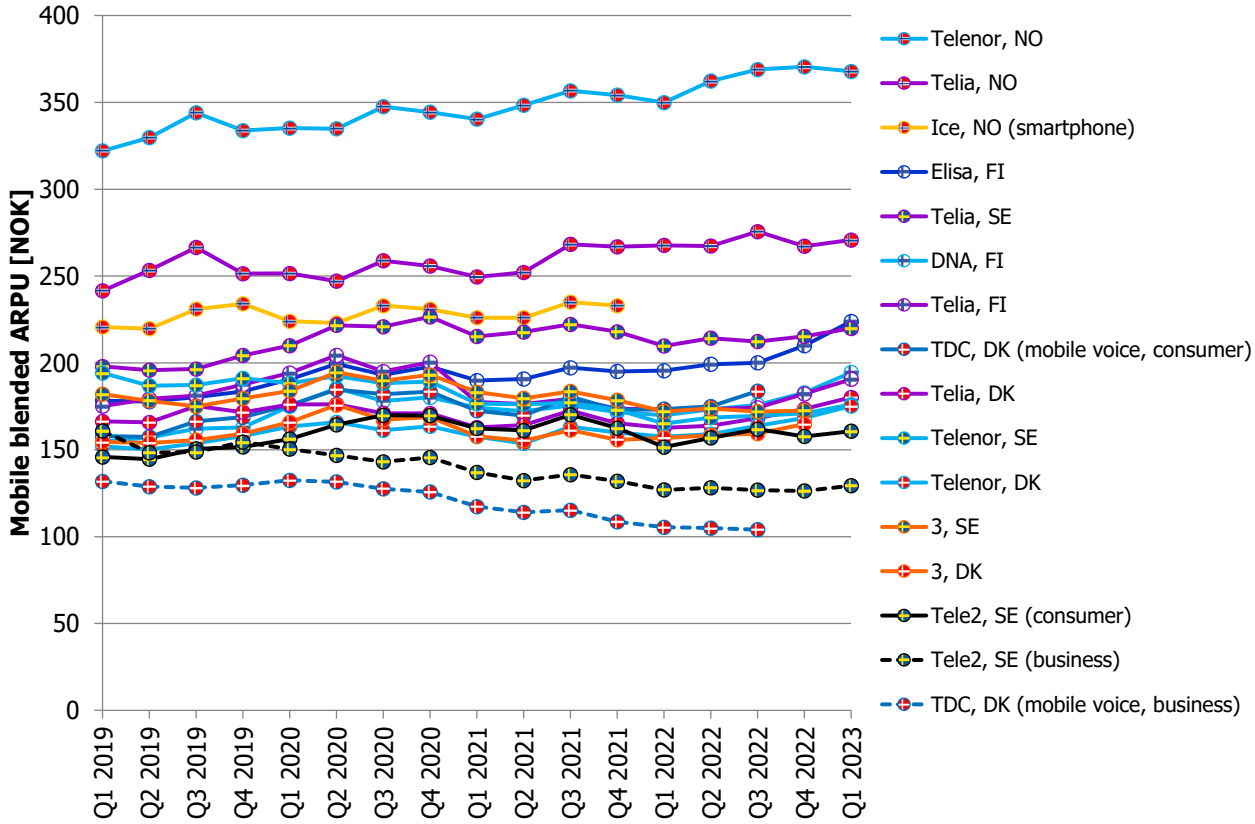

Figure 20. ARPU per mobile subscription excluding M2M for the 14 operators (MNOs) in Norway, Denmark, Sweden and Finland per quarter from Q1 2019 to Q1 2023 [source: operator reports, compiled by Tefficient]. 3's ARPU is reported every six months, hence missing for Q1 2023. Tele2 doesn't report one blended ARPU number but split between consumer and business. Same for TDC which also excludes data-only subscriptions from its reported mobile voice ARPU. TDC has been split in Nuuday and TDC NET and Nuuday has not continued to report ARPU as TDC did. Ice was acquired by Lyse in 2022 and Lyse has not continued to report ARPU for Ice.

The definitions of what is included in the reported mobile ARPU can differ somewhat between the operators, but as a rule, M2M is excluded. Figure 21 shows the blended PPP ARPU including both postpaid (contract) and prepaid subscriptions.

There's one operator with significantly higher ARPU: **Telenor Norway**. Its Q1 2023 ARPU of **368 NOK** is 36% higher than the operator with the second highest mobile ARPU, Telia Norway.

Danish and some Swedish operators are generally having the lowest ARPU levels.

Figure 21 below shows the mobile ARPU as reported by the 14 MNOs in our four markets – converted into NOK and with PPP adjustment.

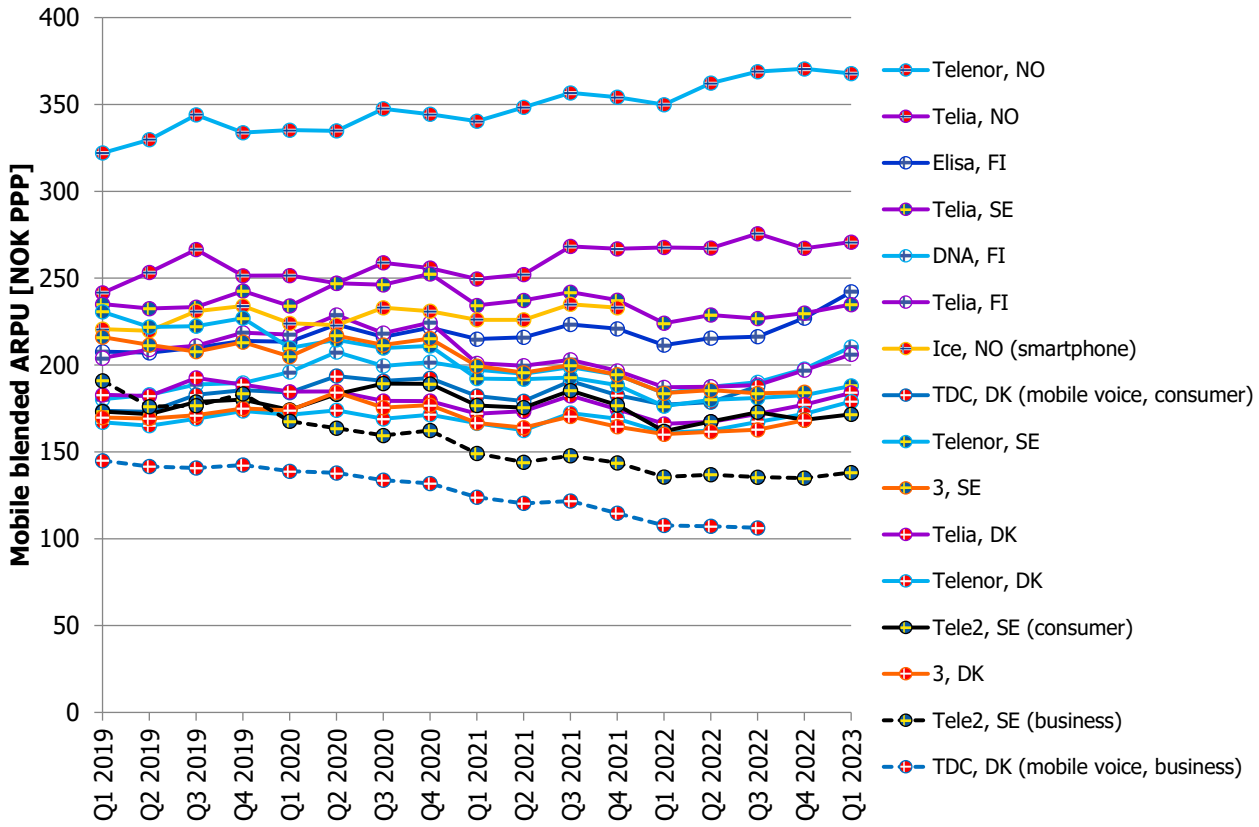

Figure 21. PPP ARPU per mobile subscription excluding M2M for the 14 operators (MNOs) in Norway, Denmark, Sweden and Finland per quarter from Q1 2019 to Q1 2023 [source: operator reports, OECD[22], compiled by Tefficient]. 3's ARPU is reported every six months, hence missing for Q1 2023. Tele2 doesn't report one blended ARPU number but split between consumer and business. Same for TDC which also excludes data-only subscriptions from its reported mobile voice ARPU. TDC has been split in Nuuday and TDC NET and Nuuday has not continued to report ARPU as TDC did. Ice was acquired by Lyse in 2022 and Lyse has not continued to report ARPU for Ice. The PPP values for the respective full year are applied to each quarter in that year.

Also after PPP adjustment, Telenor Norway stands out, followed by Telia Norway.

Danish and some Swedish operators are generally having the lowest ARPU levels after compensation for difference in purchasing power.

Also after compensation for differences in purchasing power, Telenor Norway has a uniquely high mobile ARPU – 36% higher than second ranked Telia Norway. Telia has much lower ARPU than Telenor but still higher than other operators in the Nordics in PPP terms.

[22] The purchasing power parity adjustment for Q1 2023 is based on OECD's figures for 2022.

8. Pricing comparison: Mobile plans with much mobile data

It is relatively straight-forward to compare advertised prices on mobile plans between operators and between markets, but we would like to warn against concluding solely based on such analysis as it's not representative for what mobile customers actually *pay*. It shows how much mobile customers *could pay*.

In the Nordics, only about 15-25% of mobile customers actually switch mobile provider during a year. 75-85% of mobile customers are not. Many of these are subscribing to mobile plans that are different compared to those that presently are marketed and sold. As there is price erosion[23] and data bucket inflation[24] in the Nordics, most customers that are on old plans **pay more for their usage than they could have** would they have been on a new plan.

Hence, we favour comparing the revenues derived from mobile users – as we just did when comparing ARPU – as opposed to comparing price points. But to balance this analysis, we have done an almost complete[25] market scan of the pricing of *data-rich* (defined as 30 GB or more) mobile plans in our four countries.

To differentiate, operators use e.g. different policies, service bundling tactics, inclusive services, family discounts, youth discounts and fixed-mobile bundling discounts. To make this comparison as like-for-like as possible, we have applied the following criteria:

- Only *consumer* prices considered – including VAT
- Only plans with *unlimited* voice and messaging and stipulated levels of EU roaming[26] considered
- Time limited discounts – like first three months for half price – *not* considered
- Age based discounts *not* considered
- Fixed-mobile bundling discounts *not* considered
- Energy-mobile bundling discounts *not* considered
- Family discounts *not* considered
- Binding contracts – for example 24 months – *not* considered
- Premium plans that include content – for example with several streaming services for an additional fee – *not* considered unless the content part can't be deselected

Albeit having applied these definitions, there are still differences in how mobile data is offered in our four Nordic markets. We have found a total of **86 data-rich plans** in Norway, Denmark, Sweden and Finland.

Figure 22 shows that **Finland** is unique since no bucket plans are offered. All 19 plans in Finland are entirely unlimited in data volume and speed-tiered, i.e. charged based on the maximum speed.

In **Norway**, the most common plan type (14 cases) is also charged based on maximum speed – up to 100 GB per month. Regardless of the paid-for speed up to 100 GB, providers throttle the speed to **3 Mbit/s** when 100 GB has been consumed in a month. There is also one plan – from Happybytes – that isn't part of a speed-tiered approach, but offered with *maximum* speed up to 108 GB – after which it is throttled to the

[23] When providers lower the price of a plan for new customers
[24] When providers include more data volume for new customers without changing the price
[25] All MNOs are covered if full. The most prominent sub-brands (if any) of each MNO are covered too. Also larger MVNOs that are strong in data-rich plans are covered.
[26] The data volume is typically following EU's stipulated minimum level defined by the total monthly price of a plan

same 3 Mbit/s. The one plan we have classified as "Other" is the combination of Ice's regular 30 GB bucket plan with an add-on called "Data Frihet". It allows for an additional 1000 GB of extra data in a month but throttled to maximum 10 Mbit/s from the first byte. The requirement is also that the extra data (up to 1000 GB) is consumed in Ice's own network and not through national roaming on Telia's network. Finally, there are four bucket plans – from Chilimobil, Ice and two from Happybytes[27].

Unlike Finland, there is yet no mobile plan in Norway which grants the customer an unlimited amount of *same speed* data.

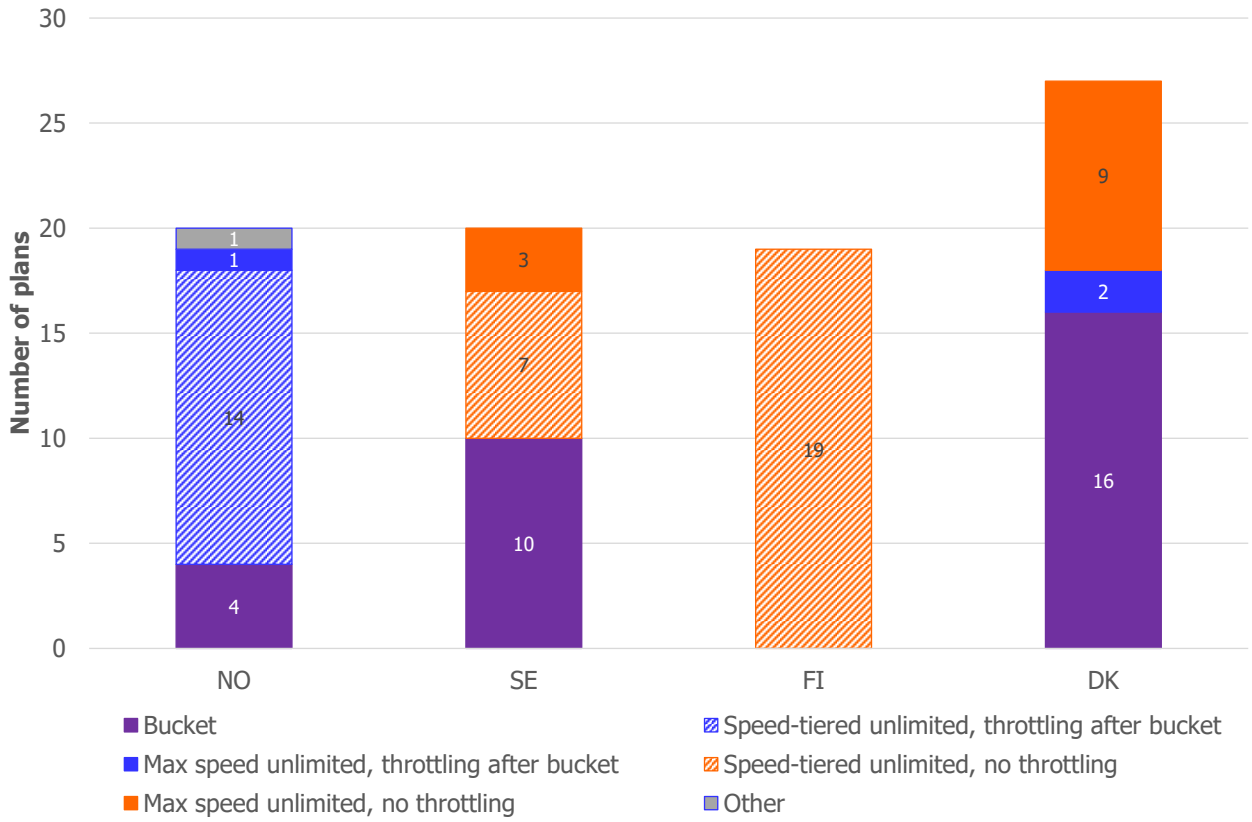

Figure 22. Comparison of the number and type of of data-rich (>30 GB) mobile plans with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 [source: Individual webpages of the mobile brands, compiled by Tefficient]

Half of the Swedish plans (10) are bucket plans. Tele2 and Chilimobil offer speed-tiered unlimited in **Sweden** – without throttling beyond a certain allotment. In a Norwegian perspective, it's interesting that Chilimobil has taken a different policy approach in Sweden than in Norway: In Norway, Chilimobil (like others) throttles the speed to 3 Mbit/s after 100 GB per month.

Denmark has the widest number of offers: 27 in total. A majority (16) of these are bucket plans and Denmark generally offers the largest buckets. Two plans from YouSee have been classified as "Max speed unlimited, throttling after bucket". These two plans are sold as 40 and 80 GB per month respectively but

[27] Happybytes offers a 30 GB per month bucket plan and a 1 GB per *day* bucket plan in parallel. The latter has been included into our analysis as it, in a flat usage situation, could meet our threshold of minimum 30 GB per month.

continue with 1 Mbit/s after that. This is the closest we get to 'the Norwegian model' in the other three markets. In addition, there are nine unlimited plans – all at maximum speed – which has no limit after which the speed is throttled. This means that Denmark is the only of these four markets without a speed-tiered option.

Having concluded the statistics on *how many* plans are offered per type per country, let's now compare the prices between them. Since the policy approaches, as shown, differ between the countries, we will have a pedagogical challenge in doing this. To highlight different angles, we will hence use **three different graphs** to compare the prices – times two: One set of graphs for unadjusted NOK and one set for PPP NOK.

First, in Figure 23, we compare the prices – in NOK – against the full speed data bucket per month. The largest bucket plans, one from CBB in Denmark and one from Call me in Denmark, have 200 GB per month. Plans with unlimited[28] full-speed mobile data allowance are shown at the **∞** symbol. Since the Norwegian providers all throttle the speed to 3 Mbit/s after 100/108 GB per month, the Norwegian unlimited plans are shown at 100/108 GB in *this* graph.

Trend lines are drawn for Norway, Sweden and Denmark, but can't be drawn for Finland since, as shown in Figure **22**Figure 22, there are no bucket plans – just unlimited plans – in Finland.

[28] Unlimited means 1000 or 2000 GB per month with Danish operators and 1000 GB with Ice's Data Frihet. With most Swedish operators, the user will have to answer an SMS after having used a certain amount of data in a day (in Tele2's case e.g. 50 GB to continue to use data in 5 GB allotments which each calls for a new SMS).

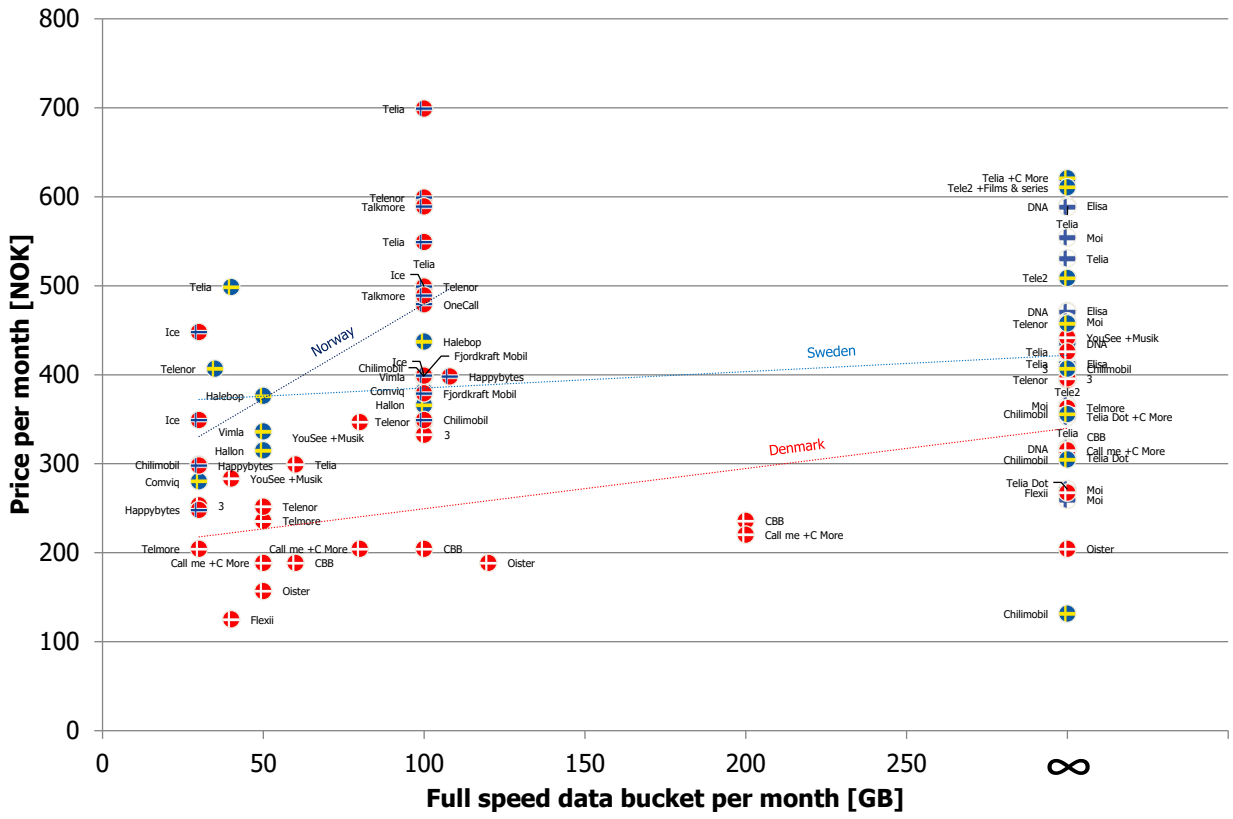

Figure 23. Comparison of the pricing of data-rich (>30 GB) mobile plans with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 against the full speed data bucket per month beyond 100 GB [source: Individual webpages of the mobile brands, compiled by Tefficient]

Norwegian and Finnish plans tend to be the most expensive across our four markets. But, as said, Finnish plans all come with unlimited data without any speed throttling beyond a certain point. Based on the trend lines, Norwegian and Swedish plans seem comparable in price up to about 50 GB per month. **Denmark generally offers the lowest prices** – both when it comes to bucket plans and unlimited plans.

Then, in Figure 24, we compare the prices – recalculated into PPP NOK[29] – against the full speed data bucket per month.

[29] Using the actual exchange rate for the same day, 5 June 2023, and the PPP conversion for 2022 since that's the latest OECD statistics.

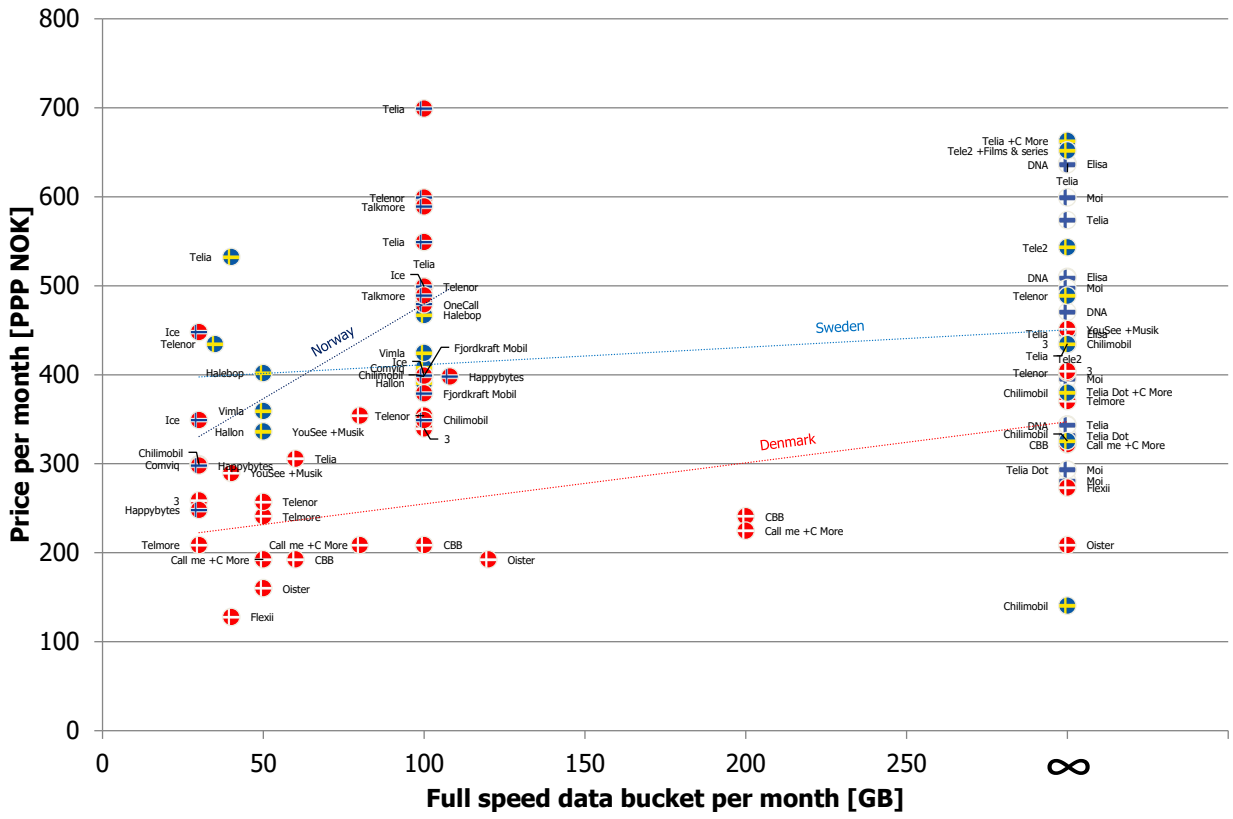

Figure 24. Comparison of the purchasing power parity pricing of data-rich (>30 GB) mobile plans with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 against the full speed data bucket per month beyond 100 GB [source: Individual webpages of the mobile brands, OECD[30], compiled by Tefficient]

In PPP terms, Norwegian and Finnish plans tend to be the most expensive across our four markets. Based on the trend lines, Norwegian and Swedish plans seem comparable in price up to about 50 GB per month also when adjusting for purchasing power. **Denmark generally offers the lowest prices** – both when it comes to bucket plans and unlimited plans.

As identified, the throttling-beyond-a-bucket policy for unlimited is unique for Norway and the representation in Figure 33 could be seen as too strict on Norway: A Norwegian unlimited plan that is throttled to 3 Mbit/s after 100 GB is here compared to a Danish or Swedish bucket plan with 100 GB and no continuation beyond 100 GB. Having established (Figure 10) that the average non-M2M subscription in Norway used 9.7 GB per month in 2022, most users would never experience the speed degradation – that only starts past 100 GB.

And since most customers won't experience it, one could turn a blind eye to this difference in policy. To do that, we have in Figure **26**Figure 25 grouped all plans with *100 GB or more* to the right in the graph.

[30] The purchasing power parity adjustment is based on OECD's figures for 2022 since 2023 isn't available yet.

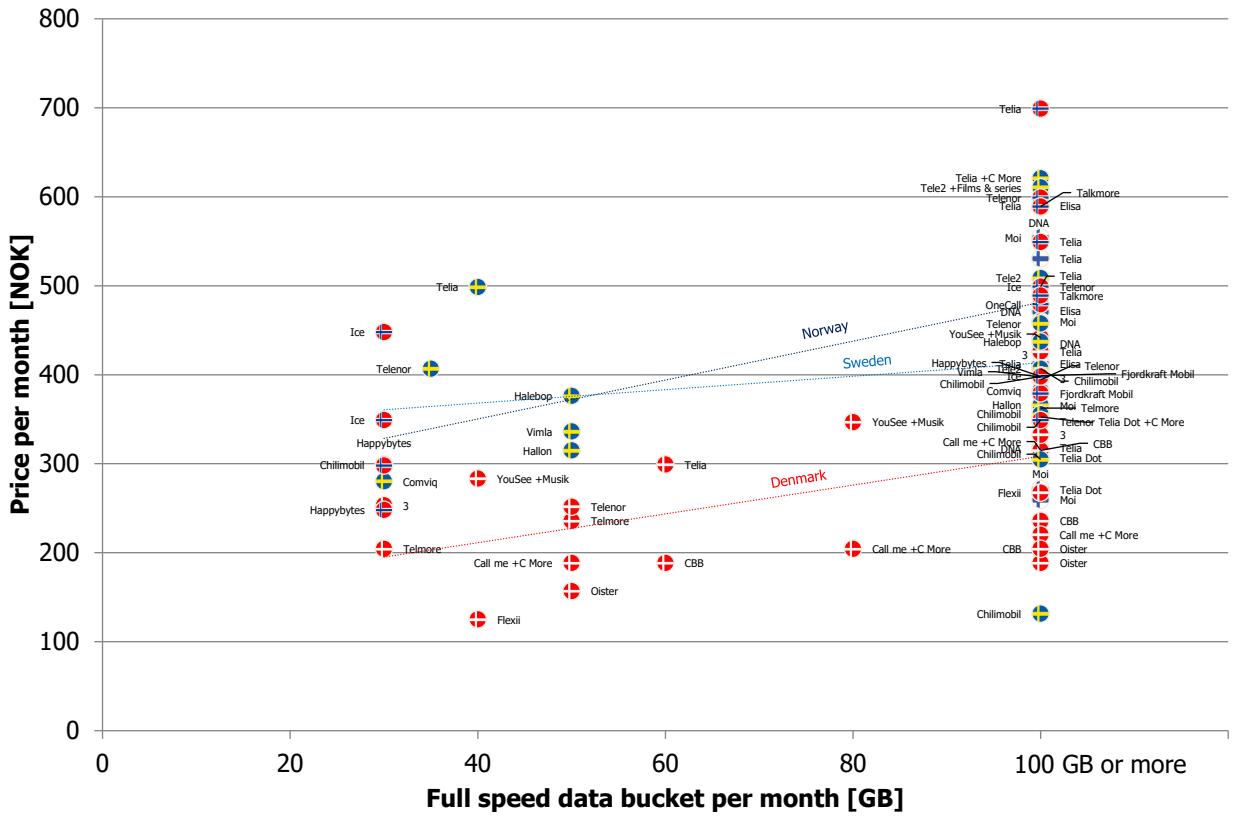

Figure 25. Comparison of the pricing of data-rich (>30 GB) mobile plans with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 against the full speed data bucket per month up to 100 GB [source: Individual webpages of the mobile brands, compiled by Tefficient]

With this visualisation, the "100 GB or more" category becomes cluttered. Comparing the trend lines, **Sweden is with this visualisation about as expensive in as Norway** whereas Denmark still generally provides the cheapest options across the four markets. The cheapest plan is also Danish – from 3's new sub-brand Flexii: 40 GB for 125 NOK.

Cheapest in the "100 GB or more" category is an unlimited data volume offer from Chilimobil in Sweden: 131 NOK. The maximum speed is however limited to just 1 Mbit/s in this case.

Let's now adjust for purchasing power.

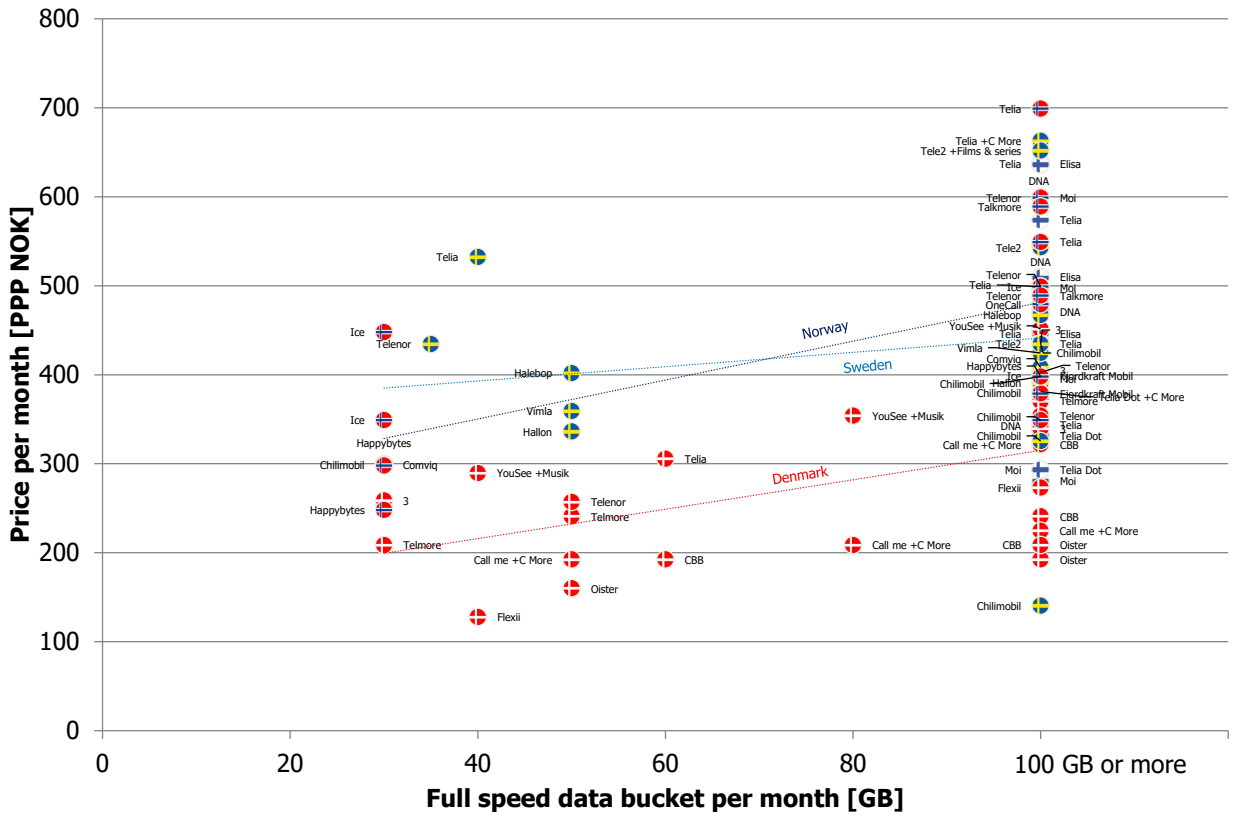

Figure 26. Comparison of the purchasing power parity pricing of data-rich (>30 GB) mobile plans with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 against the full speed data bucket per month up to 100 GB [source: Individual webpages of the mobile brands, OECD, compiled by Tefficient]

The conclusions aren't changed. **Sweden is with this visualisation about as expensive in as Norway in PPP terms** whereas Denmark still generally provides the cheapest options across the four markets.

Our last two pricing comparison graphs address the **differences in the maximum download speed** – which is important now that mobile providers in Norway, Sweden and Finland often use the maximum download speed as the only parameter defining price. Plans without an unlimited data volume, i.e. bucket plans, are not in Figure 27 as there is no speed differentiation on bucket plans.

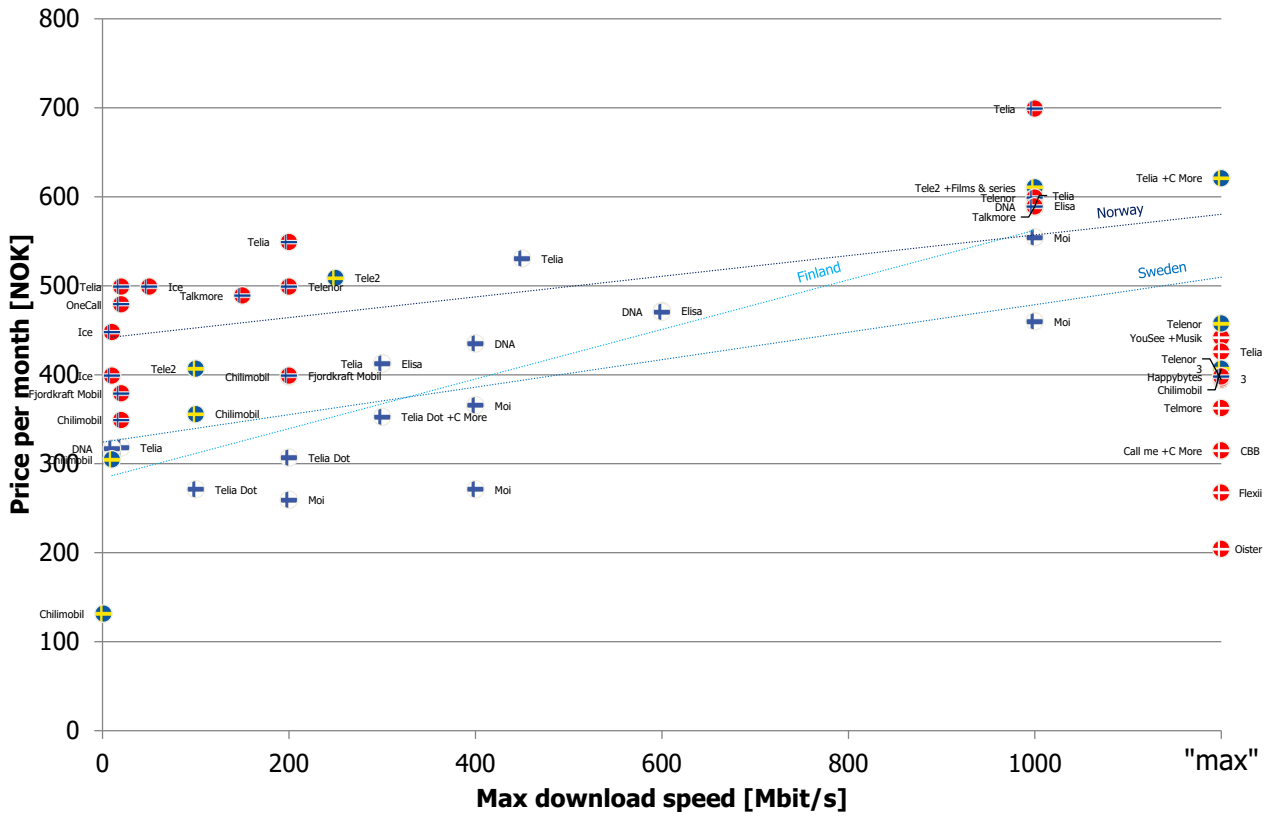

Figure 27. Comparison of the pricing of mobile plans with unlimited data volume and with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 against the maximum download speed [source: Individual webpages of the mobile brands, compiled by Tefficient]

The "max" category collects the offers where the mobile provider hasn't stated the maximum download speed, but just said that it will be always the highest available. It could be argued that this "max" speed not necessarily will be higher than with a communicated maximum of 1000 Mbit/s, but we have anyhow visualised it to the right as the mobile provider does not apply any throttling of the max speed and that it therefore, at least in theory, can be higher.

In this third set of graphs, we will have a trend line for Finland since we are now just covering plans with an unlimited data volume. We will, on the other hand, no longer have a trend line for Denmark since there's no speed-tiering in Denmark.

If comparing the trend lines, **Norway comes across as the most expensive market** at least in the slower speed range. The trend line is steeper in Finland than in Norway and Sweden, i.e. higher speed costs relatively more in Finland.

The trend lines of Sweden and Norway are quite parallel, i.e. if considering the maximum download speed only (in Norway's case up to 100/108 GB), the Norwegian unlimited mobile plans are generally more expensive than the Swedish.

Albeit without a trend line (due to no speed-tiering), Denmark is once again seen as the most affordable market.

Next figure is with adjustment for purchasing power.

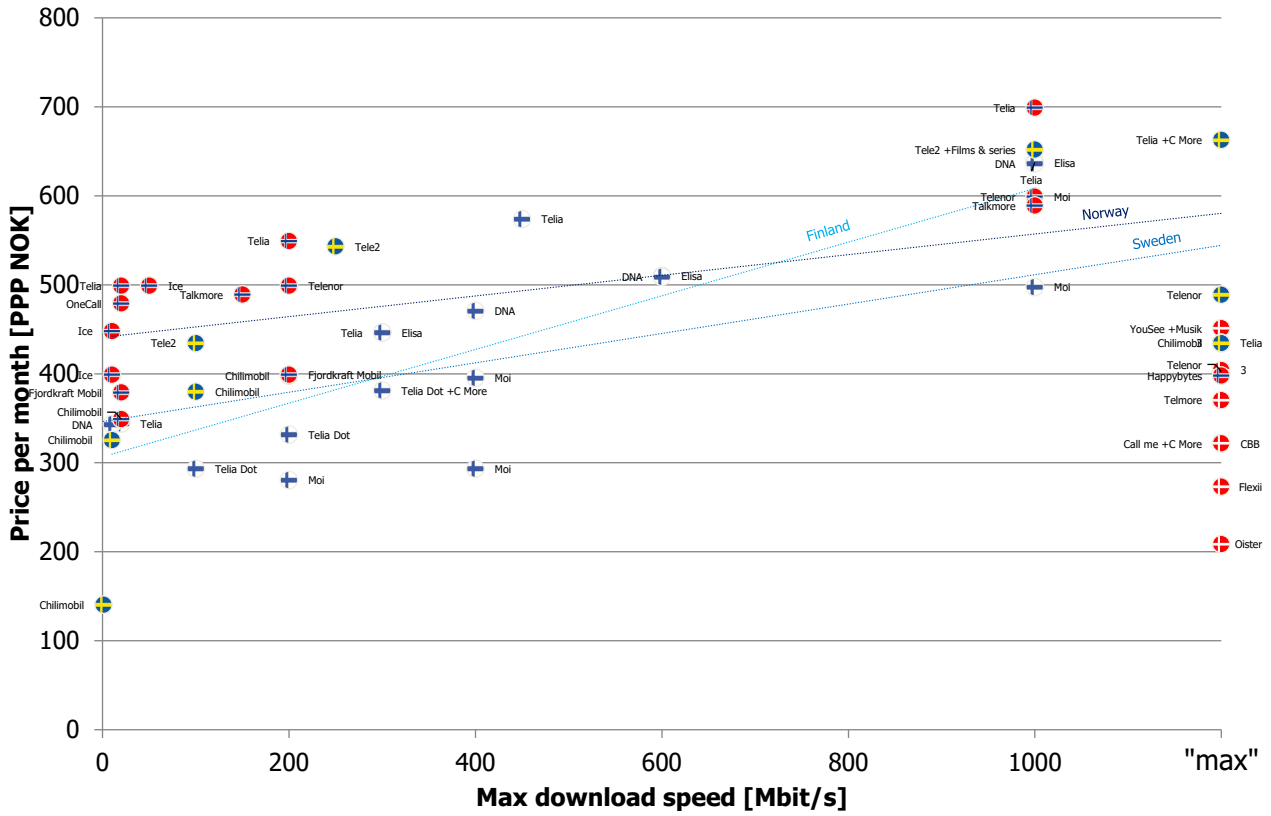

Figure 28. Comparison of the purchasing power parity pricing of mobile plans with unlimited data volume and with unlimited voice & messaging across main MNO brands, most secondary MNO brands and a few selected MVNO brands in Norway, Denmark, Sweden and Finland 5 June 2023 against the maximum download speed [source: Individual webpages of the mobile brands, OECD, compiled by Tefficient]

If comparing the trend lines, **Norway comes across as the most expensive market** in the slower speed range whereas **Finland comes across as the most expensive market for higher speeds** (in PPP terms). There are though plenty of speed-based options to choose from in Finland. But the trend line is steeper in Finland than in Norway and Sweden, i.e. higher speed costs relatively more in Finland.

The trend lines of Sweden and Norway are again quite parallel, i.e. the Norwegian unlimited mobile plans are generally more expensive – in PPP terms – than the Swedish.

Albeit without a trend line (due to no speed-tiering), Denmark is once again seen as the most affordable market.

Before concluding on the current prices, we need to comment to the **increase in inflation rate** that occurred since our last update of this analysis – using prices of December 2021. Have mobile providers increased prices to compensate for the inflation?

Not everywhere. For where there's comparability, we observe that in local currency:

- Almost all Norwegian prices that were changed (5 of 6) were **lowered**
- Most Danish prices that were changed (9 of 13) were **increased**
- Most Swedish prices that were changed (5 of 7) were **increased**
- No Finnish prices were changed[31]

This means that the position of Norway – relative to its Nordic peers – has moved in a direction of higher affordability. Another factor that makes Norway move in that direction is the **weakening of the Norwegian Krona in 2023** against the Euro, the Swedish Krona and the Danish Krona (see section 4).

But although there's a currency fluctuation issue, the conclusion on Norway from the comparison of current pricing of data-rich plans changes compared to the previous two analyses.

After compensation for differences in purchasing power, Norwegian plans can compete on price with Swedish plans for data buckets up to about 50 GB per month. If comparing unlimited, Norwegian plans can generally compete with Sweden and Finland – but tend to still be a bit pricier. Although prices generally were increased in Denmark, Danish mobile providers are still offering the most affordable data-rich plans in the Nordics.

We however started this section warning against concluding solely based on current pricing. Few customers are today on the plans currently offered. The ARPU is representative of what mobile customers actually *pay* and should be given more weight in a balanced conclusion, see section 13.

[31] Disregarding that Elisa and Telia changed all prices from xx.9 EUR to xx.99 EUR, i.e. increased them with 0.09 EUR

9. EBITDA margin per reporting operator

In section 5, 6 and 7, we concluded that Norwegian operators generally enjoy high ARPU although mobile data usage is low. Does this trickle down to high profitability too?

First, we will look at what remains of revenue after having paid recurring OPEX: The adjusted EBITDA (earnings before interest, tax, depreciation and amortisation). The adjusted EBITDA margins of all mobile operators in Norway, Denmark, Sweden and Finland are shown in Figure 29.

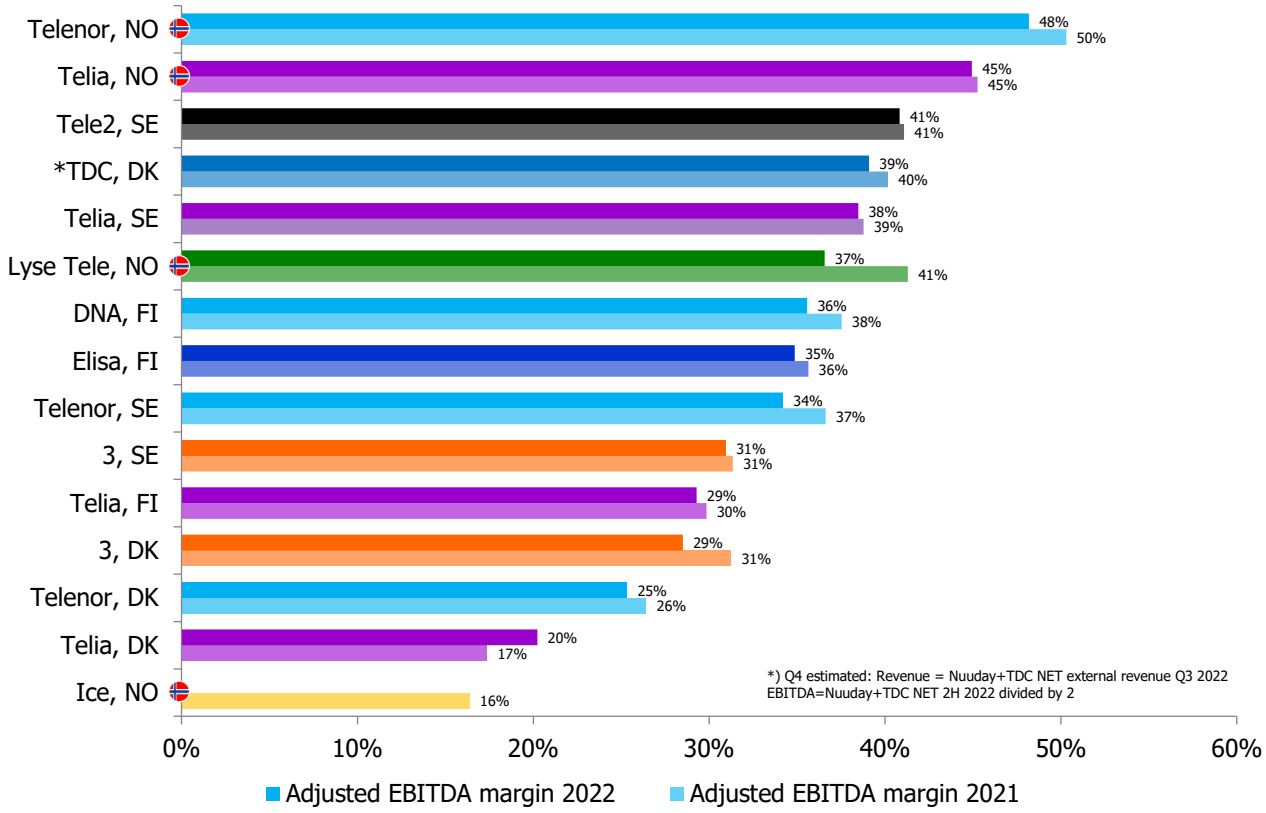

Figure 29. Adjusted EBITDA margin for all operators (MNOs) in Norway, Denmark, Sweden and Finland 2021 and 2022. Note that operators report their EBITDA for their complete business which most often is wider than just mobile; three operators are pure mobile: 3 Sweden, 3 Denmark and Ice [source: operator reports, compiled by Tefficient]

The two established Norwegian operators, **Telenor** and **Telia**, have the highest adjusted EBITDA margins in these four countries. This is true both for 2021 and 2022. The adjusted EBITDA margin of Telia and, more so, Telenor decreased in 2022 which is the general trend across almost all operators in these four countries. This is largely attributable to inflation – especially in energy prices – in 2022.

In contrast to the positions of Telenor and Telia, the third Norwegian mobile operator, **Ice**, had the lowest adjusted EBITDA margin in 2021. The energy and broadband provider **Lyse** acquired and incorporated Ice from 30 March 2022. The telecom parts of Lyse (in these graphs called "Lyse Tele") were in 2021 the operator with the third highest EBITDA margin – after Telenor and Telia Norway – but the inclusion of Ice lowered Lyse Tele's EBITDA margin in 2022 to a number six position in these four markets.

That Telenor and Telia Norway have the strongest adjusted EBITDA margins is an indication of 1) that their revenue is unusually high, or, 2) that their OPEX is unusually low, or, 3) both. Ice's position in 2021 is a result of weaker revenue per customer (ARPU) and higher OPEX. The position of Lyse Tele in 2022 (including Ice) is relatively strong in a Nordic perspective.

Neither Telenor Norway nor Telia Norway has a problem with high OPEX. If so, their EBITDA margins wouldn't be best in class. Ice had the lowest EBITDA margin in 2021 and Lyse's acquisition of Ice has affected the EBITDA margin of Lyse's telecom business negatively. Lyse Tele's EBITDA margin is though still relatively high in a Nordic perspective.

10. EBITDA-CAPEX (cash flow approximation) margin per reporting operator

There are other costs than OPEX, though. We also need to take CAPEX into account. Figure 30 compares the CAPEX to revenue ratios for our operators. In 2022, **3 Denmark** was the operator that invested the most in CAPEX given the revenues at hand – 33%.

In 2021, it was **Ice** that was leading, using 32% of revenues. Since 30 March 2022, Ice is part of Lyse and **Lyse**'s telecom business had an estimated[32] CAPEX to revenue ratio of 31% in 2022.

TDC in Denmark is today split between the "ServCo" Nuuday and the "NetCo" TDC NET but with certain assumptions for Q4 2022, we have been able to recreate the integrated TDC to be able to compare apples-to-apples. TDC had a late fibre start but is now rolling out fibre at high speed and used a high 28% of its revenues on CAPEX in 2022.

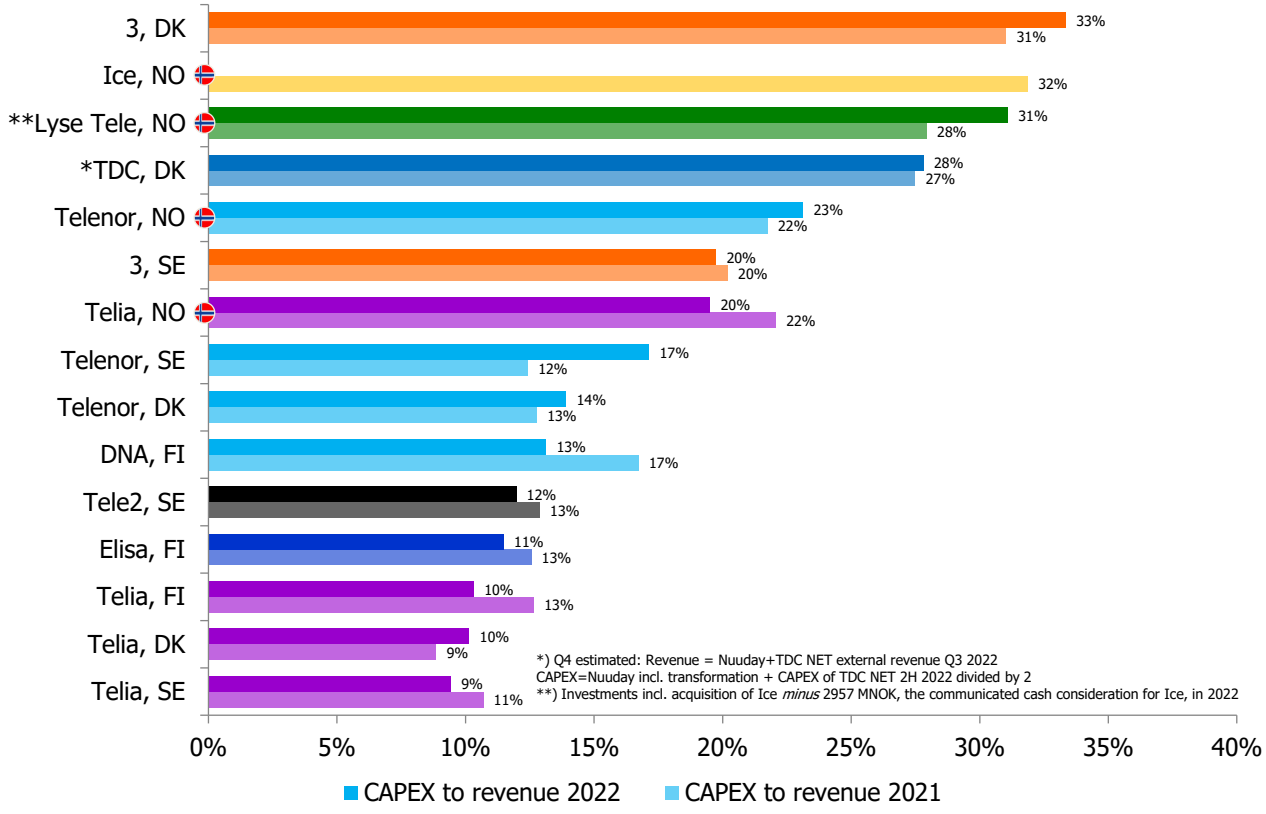

Figure 30. CAPEX to revenue for all mobile operators in Norway, Denmark, Sweden and Finland. Note that operators report their CAPEX for their complete business which most often is wider than just mobile; three operators are pure mobile: 3 Sweden, 3 Denmark and Ice [source: operator reports, compiled by Tefficient]

Fifth-ranked **Telenor** Norway invested 23% of its revenues in 2022. **Telia** Norway is also investing a bit more than what is common in the Nordics; 20% of revenues in 2022. Most of the Norwegian investments

[32] Lyse only reports its investments, including acquisitions. To estimate the Lyse Tele CAPEX, we have subtracted the communicated 2957 MNOK of cash consideration for the Ice acquisition as reported by Lyse.

are in fixed and fibre (63%) rather than in mobile networks (37%)[33]. But since all Norwegian operators end up in the upper part of the chart, there's merit in the claim that **Norwegian operators invest more**.

Norwegian operators all invest more – as share of total revenue – than the median Nordic operator.

Does the generally high CAPEX in Norway then destroy the cash flow of the operators? Here we make an approximation when subtracting the CAPEX from the EBITDA and calling it the cash flow margin. It shows what remains of revenue after having paid recurring OPEX and CAPEX.

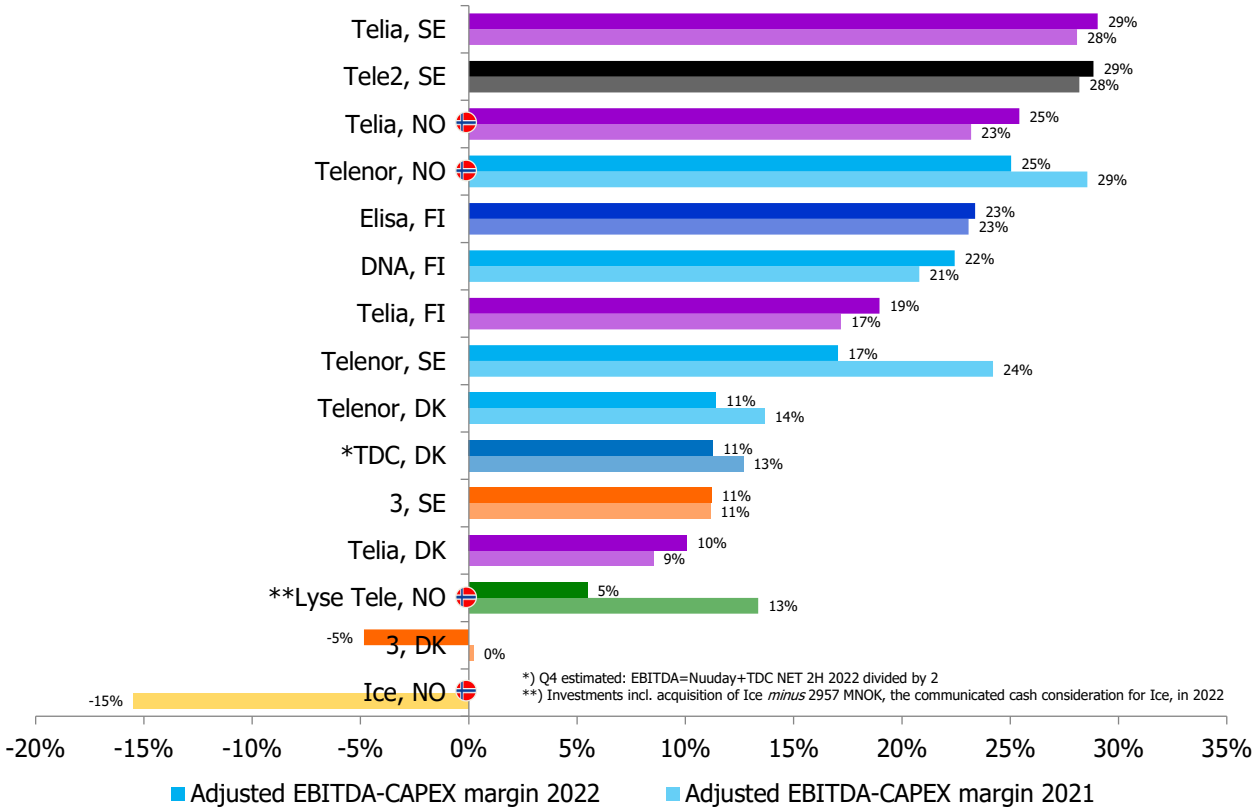

Figure 31. Adjusted EBITDA-CAPEX margin for all mobile operators in Norway, Denmark, Sweden and Finland. Note that operators report their EBITDA and CAPEX for their complete business which most often is wider than just mobile; three operators are pure mobile: 3 Sweden, 3 Denmark and Ice [source: operator reports, compiled by Tefficient]

Since **Telenor** Norway's and **Telia** Norway's CAPEX levels are higher than the median of the four markets, Telenor and Telia are no longer holding the number 1 and 2 positions after having also deducted CAPEX. They are still well positioned as number 3 and 4, though, with Telia narrowly having overtaken Telenor due to lowered CAPEX where Telenor's CAPEX increased. **Ice** had a negative EBITDA-CAPEX margin in 2021. Already before the acquisition of Ice, **Lyse**'s telecom business resulted in a much lower EBITDA-CAPEX margin compared to Telenor and Telia.

[33] Based on 2022 statistics from Nkom

Neither Telenor Norway nor Telia Norway has a problem with high OPEX+CAPEX. If so, their EBITDA-CAPEX margins wouldn't be higher than the median Nordic operator. The situation for Ice was different in 2021 when Ice had the lowest (and negative) EBITDA-CAPEX margin. Lyse's telecom business could in 2022, including Ice, cover its CAPEX with EBITDA, but the margin is much lower than for Telia and Telenor Norway.

11. Market concentration and HHI per country

As shown in section 7, Telenor Norway's mobile ARPU is uniquely high not just in a Nordic perspective, but in Norway. This, together with a leading market share in subscriptions, results in a solid market share in revenue, see Figure 32. It shows the distribution of mobile service revenue in Norway between the three MNOs Telenor, Telia and Ice – and other (non-MNO) providers.

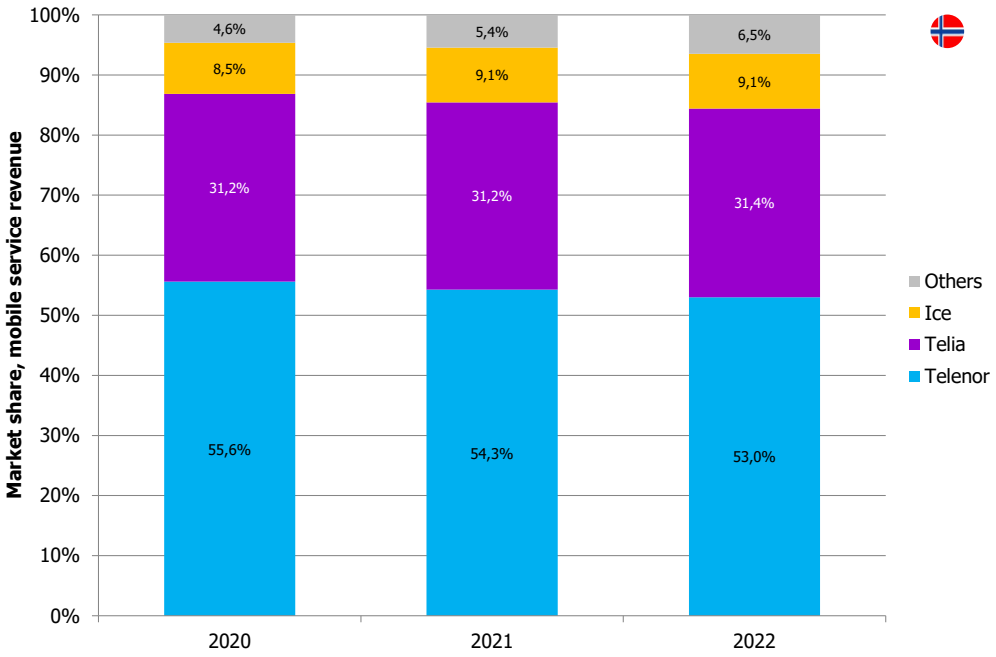

Figure 32. Market share in mobile service revenue, Norway [source: Nkom]

Although Telenor's mobile service revenue market share is leading, **53.0%** in 2022, it has declined compared to 2021 and to 2020. Ice and 'Others' have taken market share from Telenor whereas Telia has been essentially flat.

Denmark's mobile service revenue distribution is shown below.

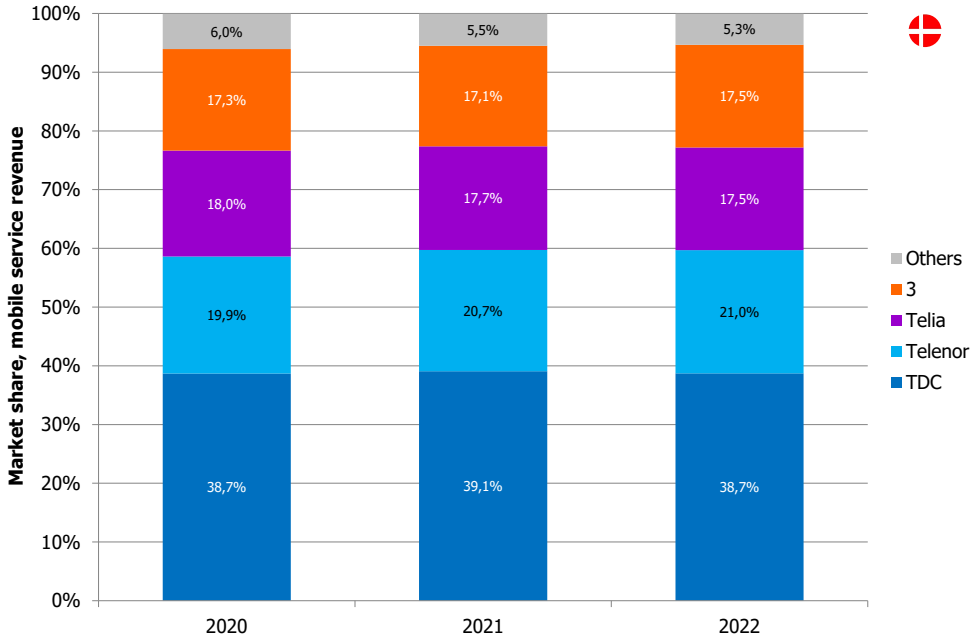

Figure 33. Market share in mobile service revenue, Denmark [source: Operator reports for 2020, 2021 and 2022 as SDFI has not yet reported 2022 revenues; 'Others' revenue assumed being 700 MDKK in line with previous years' trend]

Denmark has four MNOs and the incumbent operator TDC has a more limited market share than in Norway: **38.7%** in 2022. The graph for Sweden follows below.

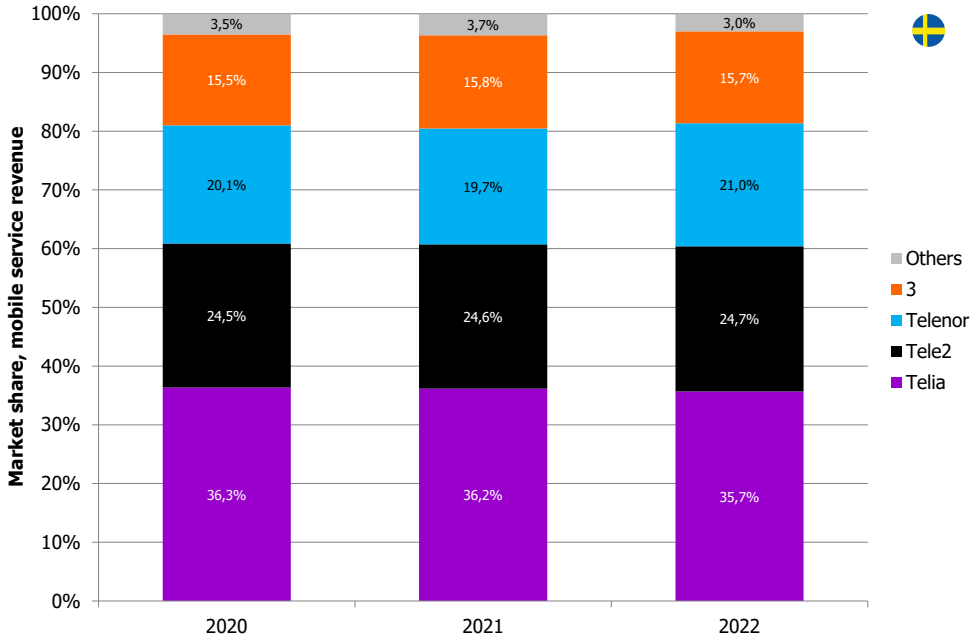

Figure 34. Market share in mobile service revenue, Sweden [source: PTS]

The incumbent in Sweden, Telia, had a **35.7%** revenue market share in 2022. Like Denmark, Sweden is a four MNO market.

Finally, the graph for Finland:

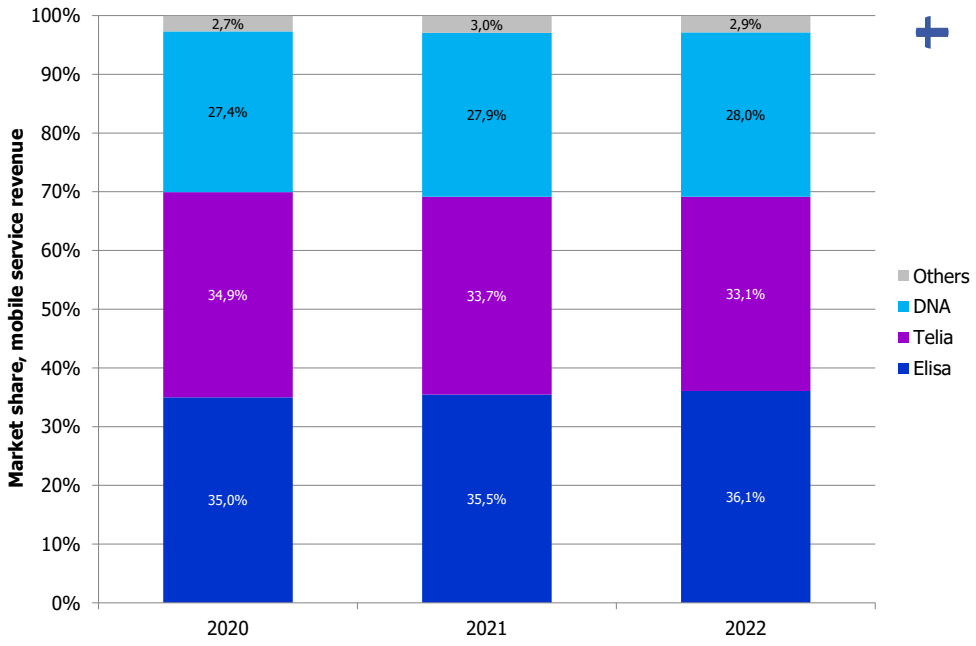

Figure 35. Market share in mobile service revenue, Finland [source: Traficom for 2020 and 2021 – for 2022 operator reports as Traficom hasn't yet reported revenue. 'Others' revenue in 2022 assumed to be unchanged vs. 2021]

The largest operator in Finland[34], Elisa, had a **36.1%** market share in 2022.

The table below summarises the market shares of the incumbent in each other markets – and calculates the concentration index HHI for the individual mobile markets as a whole.

What is HHI?

The Herfindahl-Hirschman Index is a simple and widely applied economic concept that often is used in regulation and antitrust matters. It is defined as the sum of the squares of the market shares of the companies competing in a market. A monopoly would thus get an index of $100^2 = 10000$ which is the maximum value and depicts a fully concentrated market.

Where the line should be drawn between a moderately concentrated and a highly concentrated market is obviously debatable but the U.S. Department of Justice has in its merger guidelines stated that a HHI value above 2500 should be considered highly concentrated.

The mobile business, with its limited number of licences, is often having higher HHI values than 2500, though.

[34] Elisa here assumed as the Finnish incumbent as it had the largest revenue market share in 2022. Unlike the other markets, Finland has not had a nationwide incumbent as the fixed networks rather were local monopolies.

	Revenue market share of incumbent MNO 2022	Herfindahl-Hirschman Index (HHI) 2022 [0-10000][35]
Norway (3 MNOs)	53.0%	3920 (-110)
Denmark (4 MNOs)	38.7%	2579 (-9)
Sweden (4 MNOs)	35.7%	2578 (+12)
Finland (3 MNOs)	36.1%	3186 (+7)

Figure 36. Comparison of incumbent market shares in mobile service revenue, Norway, Denmark, Sweden and Finland – as well as HHI for the whole mobile market, 2022 (change from 2021 within parentheses) [source: Nkom, SDFI/operators, PTS, Traficom/operators, compiled by Tefficient]

The Norwegian mobile market is **uniquely concentrated**. This is true both when comparing the revenue market share of the incumbent as well as when comparing the HHI. The HHI has though decreased 110 points since 2021 whereas the other three countries are virtually unchanged.

The fact that Norway only has three MNOs doesn't explain this; Finland too has three MNOs and although the Finnish HHI is a bit higher than in Denmark and Sweden that is mainly due to 'Others' being very limited in Finland. When looking at the revenue market share of the largest operator, Elisa had 36.1% in 2022, a number on par with the incumbents in Denmark (38.7%) and Sweden (35.7%).

Of the HHI for Norway, Telenor's contribution is **72%** (2809 of 3920 HHI points). In comparison TDC's contribution to the Danish HHI is 58%, Telia's 49% to the Swedish HHI and Elisa's 41% to the Finnish HHI.

The Norwegian mobile market is uniquely concentrated. It is not just explained by the number of MNOs. Telenor's market share explains 72% of Norway's HHI. Norway is, unlike the other countries, slowly moving towards a lower concentration, though.

[35] 'Others' is treated as one which increases HHI a bit in all markets

12. Comparison of the mobile network experience

We have seen that Norwegian operators enjoy high revenue although the data usage is low – and that Telia and Telenor have good cash flow margins albeit having invested more than what's typical. Does this result in a great mobile network experience that would contribute to the perception of value for money?

If we start with data from the American crowdsourcing company **Ookla Speedtest**, we can see that the Norwegian networks have delivered median download speeds that are about 30-40 Mbit/s faster than in Sweden and Finland and 10-20 Mbit/s faster than in Denmark. Norway is the country in the world with the **third highest** median download speed[36] in May 2023, with Denmark as number 5. Sweden is number 10 and Finland number 13 (of 140 countries).

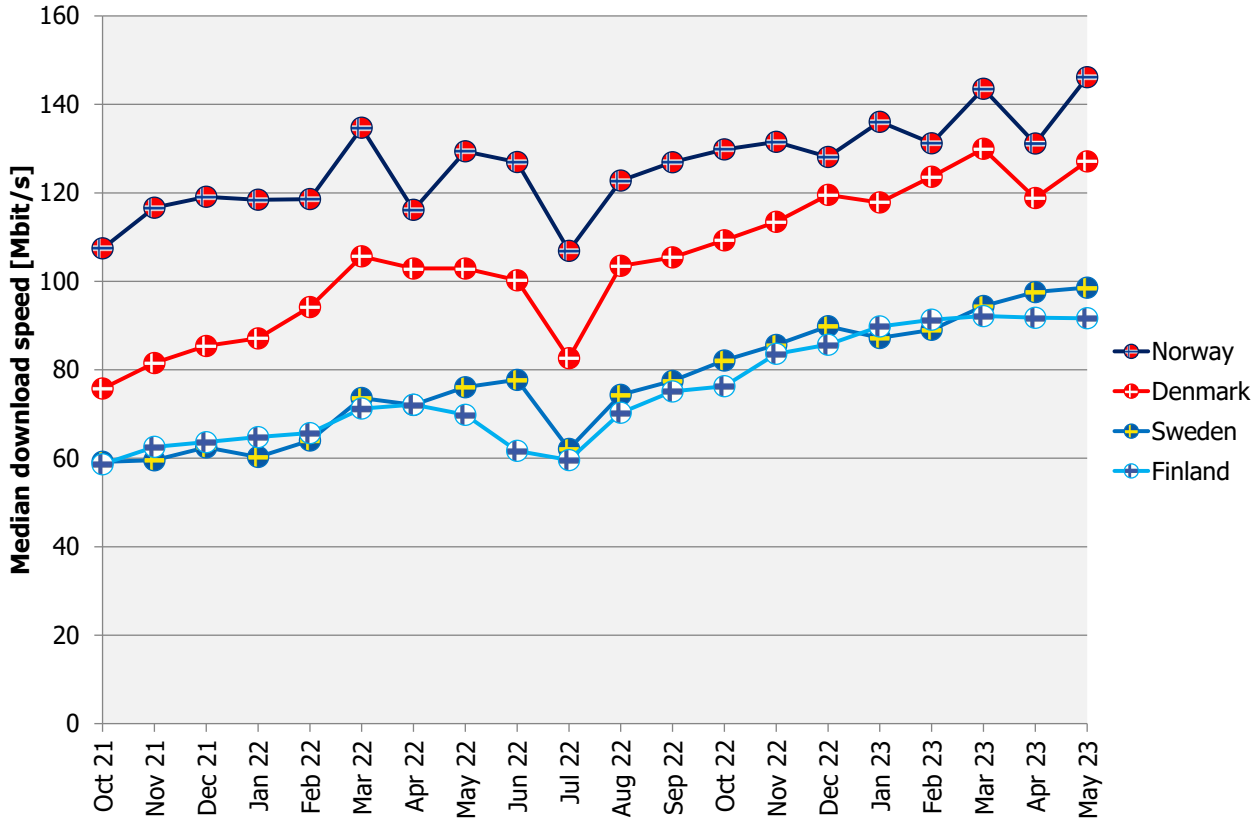

Figure 37. Median mobile broadband download speed for Norway, Denmark, Sweden and Finland per month Oct 2021-April 2023 [source: Ookla Speedtest]

When interpreting Figure 37, it's important to remember that 84% of non-M2M subscriptions in December 2022 were **unlimited and charged based on speed tiers**[37] in Finland. The average Finnish mobile speed can therefore be curbed by customers not willing to pay more for speed. Similar statistics aren't available for

[36] https://www.speedtest.net/global-index

[37] The Norwegian mobile providers have introduced a similar speed-tiered approach starting in June 2020. Also a few Swedish providers have followed. Unlike in Finland, these are though offered as options to traditional bucket plans whereas Finnish operators only offer speed-tiered unlimited plans.

the other market, but the share of unlimited mobile subscriptions is estimated to be much lower (high single or low double-digit figures) in Norway, Sweden and Denmark.

As shown in the table in section 3, Finnish operators have generally overall come the furthest with its **5G** rollout. Norway and Denmark are approaching Finland whereas Sweden is still behind. As 5G speeds always cost extra in Finland, customers need to be convinced to pay more – for a new device, but *also* for a new subscription. The 5G introductions in Norway, Denmark and Sweden have more often been done so that existing customers *automatically* get access to 5G; the only thing they need is a new device.

Another important point to make is that mobile networks **share the existing capacity** between the users of a cell. If there is much demand for data, the speed per user will be slower. If there is little demand, the speed per user will be higher. Operators can improve the user experience by adding more capacity.

Since Norway has the lowest mobile data usage in the Nordics, the average speeds will be higher – if the capacity is the same – than in the other three markets. It is relatively simpler for Norway to win a speed award because of the lower mobile data usage. On top of this, Norwegian operators could of course have deployed more capacity[38] – but that can't be assessed based on crowdsourced network performance tests.

Other crowdsourced tests take other factors than just speed into account. The Canadian company Tutela, acquired by **Opensignal** since our last report, has defined what they call *excellent consistent quality* as:

- >5 Mbit/s download throughput
- >1.5 Mbit/s upload throughput
- <50 ms latency
- <30 ms jitter
- <1% packet loss

Based on that, Opensignal has ranked operators from around the world[39]:

[38] The higher CAPEX of Norwegian operators could suggest that

[39] https://cdn.opensignal.com/public/data/reports/pdf-only/data-2023-02/2023_globalmobilenetworkexperienceawards_opensignal.pdf

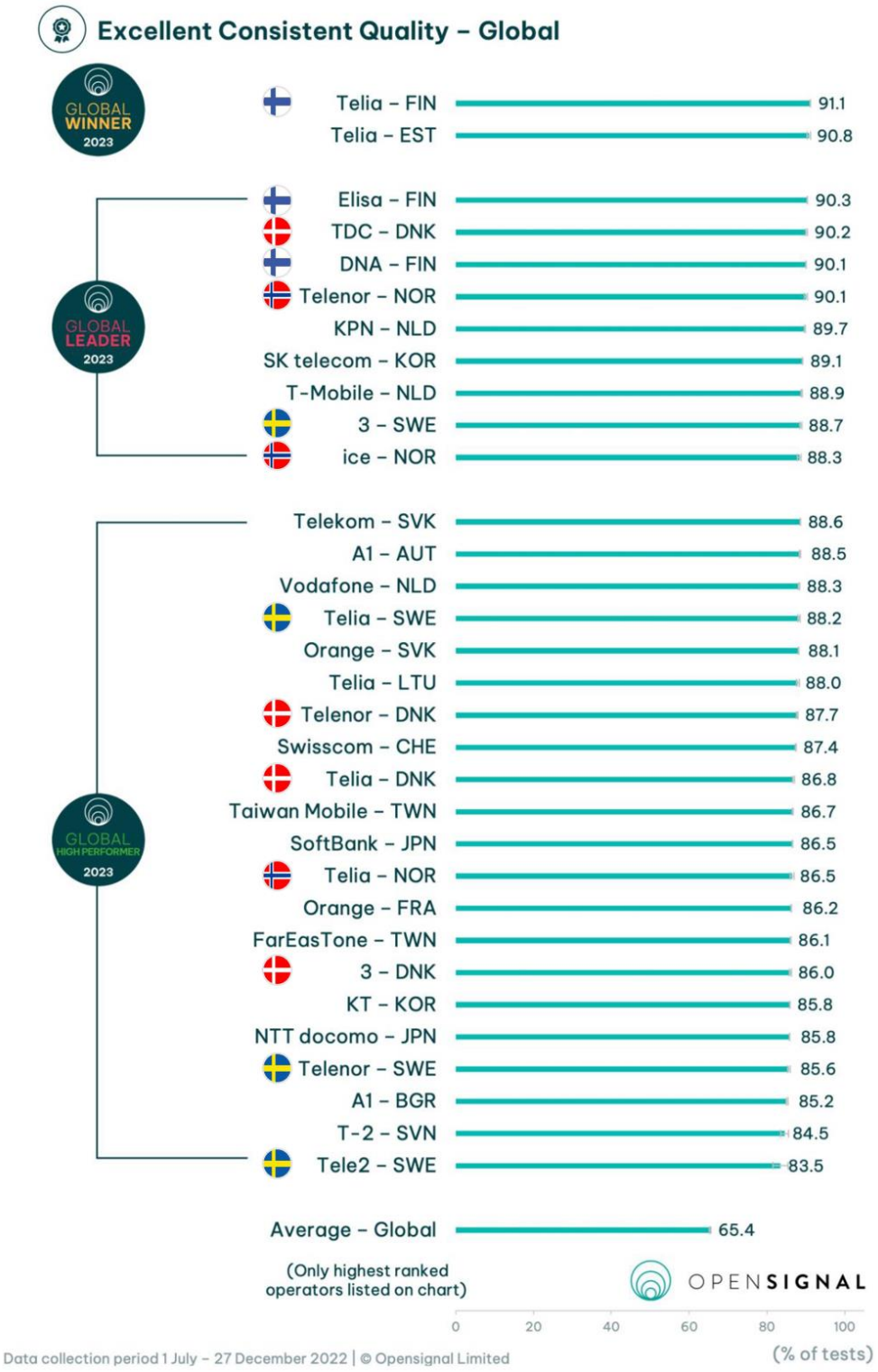

Figure 38. Top countries with regards to Excellent Consistent Quality Percentage July-Dec 2022 [source: Opensignal]. Country flags identifying Nordic operators added by Tefficient.

All the fourteen mobile network operators in Norway, Denmark, Sweden and Finland are on this global top list. It's fair to say that Nordic operators dominate the whole top list. The Finnish operators are number 1, 3

and 5 on the top list and Finland could thereby be declared as the winner. The Norwegian operators are nicely mixed with Danish and Swedish operators, but not standing out.

Let's again turn to the British crowdsourcing specialist **Opensignal**. It has issued Mobile Network Experience Reports for Denmark in February 2023, with Norway[40], Sweden and Finland added in June 2023. To complement the just-covered "excellent consistent quality" measure – which covers all network generations including 4G and 5G – we have put together some of their key **5G specific** statistics in two charts that allow a direct comparison between the countries, see Figure 39 and Figure 40.

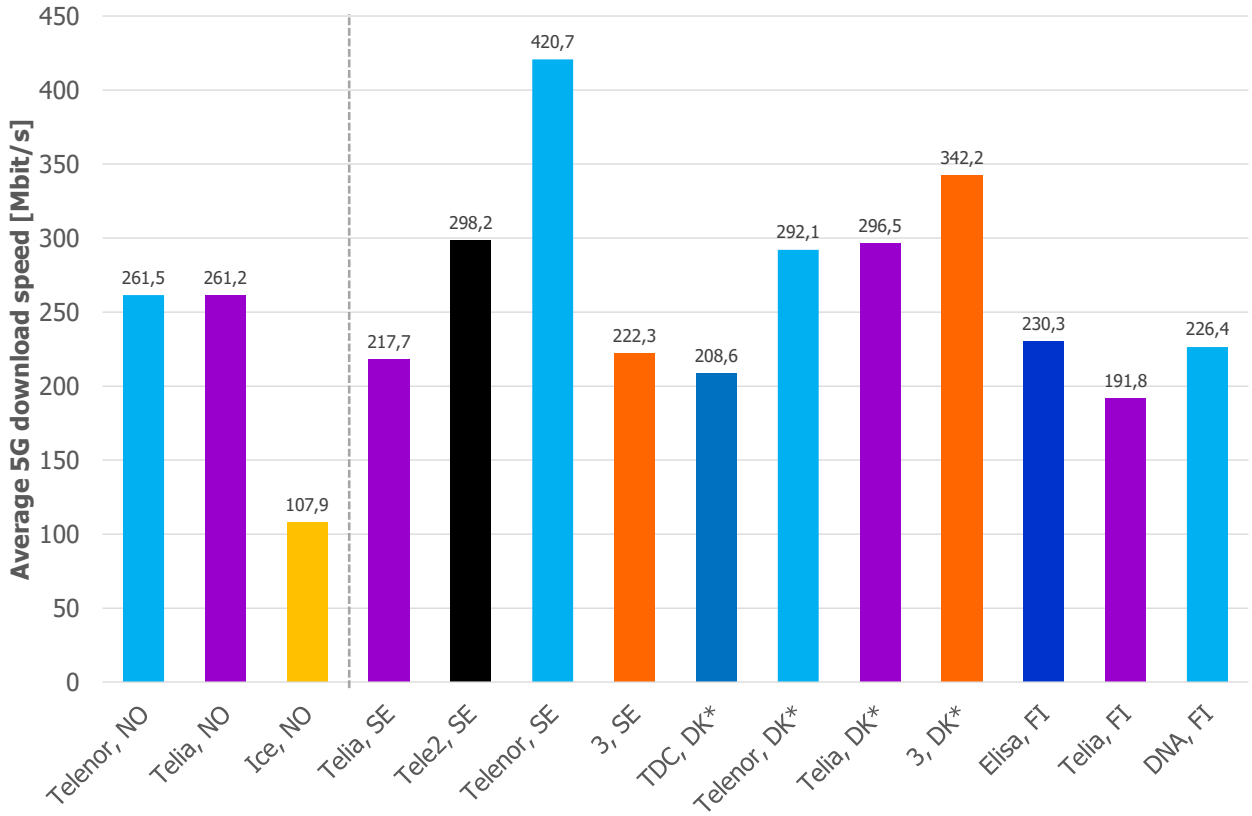

Figure 39. Average 5G download speed Feb-May 2023 for Norway, Sweden and Finland, Nov 2022-Feb 2023 for Denmark [source: Opensignal, compiled by Tefficient]

The customers of the Norwegian operators Telenor and Telia averagely experience download speeds of about **260 Mbit/s** on 5G whereas Ice, who started rolling out 5G later, averagely delivered **108 Mbit/s**.

260 Mbit/s positions Telenor and Telia close to the Nordic average of 284 Mbit/s. Some Swedish operators deliver higher 5G speeds. Danish operators also (except TDC) whereas Finnish operators deliver lower speeds. Rather than finding technical reasons to this, part of the answer to why the Finnish experience is slower is likely rather in the dominant speed-tiered pricing of mobile plans in Finland.

[40] https://www.opensignal.com/norway

If instead comparing the 5G availability[41], we see a different picture.

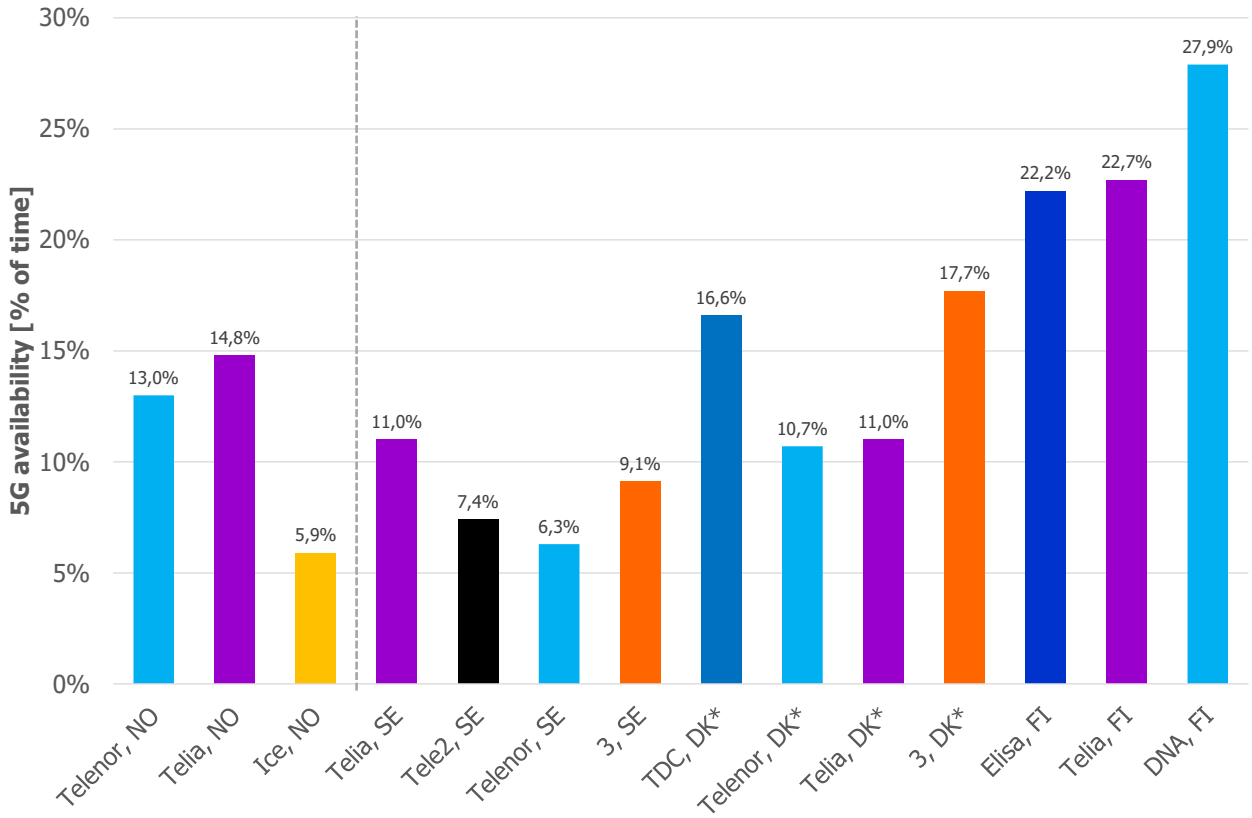

Figure 40. 5G availability Feb-May 2023 for Norway, Sweden and Finland, Nov 2022-Feb 2023 for Denmark [source: Opensignal, compiled by Tefficient]

It's logical that the customers of the Finnish operators generally experience a higher 5G availability: The Finnish operators started to rollout 5G before the rest of the Nordics. The actual share of time that Finnish users are on 5G, 22.2-27.9%, is still far from the operator communicated population coverage at around 80%, see the table in section 3. The Danish operators are also doing relatively well, but here we should remember that the Opensignal data for Denmark is three months fresher than for the other three countries.

Sweden is clearly behind all the other three countries in 5G availability – whereas Norway does averagely well in a Nordic perspective.

[41] 5G Availability shows the proportion of time Opensignal users with a 5G device and subscription have a 5G connection https://www.opensignal.com/methodology-overview

Norway is still providing a faster download speed on its networks than the other Nordic countries. The difference is today smaller than it used to be. Low mobile data usage contributes to the fast-speed position of Norway. It is also likely that Norwegian operators have invested in capacity not currently fully utilised. With regards to excellent consistent quality, Finnish operators are however higher ranked than Norwegian operators. Telenor stands out positively in Norway. If comparing the pure 5G experience, Telenor and Telia have an average download speed and an average 5G availability in a Nordic perspective. The mobile network experience in Norway is great but doesn't explain Norway's higher PPP ARPU – as the experience is equally good in the other countries.

13. Summary and conclusion

This analysis is an update of the previous 2023 analysis version dated 26 June 2023. Compared to the June version, the basis for purchasing power parity (PPP) has been changed, affecting revenue and pricing comparisons in PPP NOK. In summary, the findings are:

Market ARPU, PPP

- Including M2M: Norway's ARPU is higher than Denmark's, Sweden's and Finland's.
- Excluding M2M: Norway's ARPU is significantly higher than Sweden's. Although no exact comparison can be made to Denmark and Finland, the Norwegian ARPU excluding M2M is higher.

Total mobile service revenue per consumed GB, PPP

- 2.9-5.4 times higher in Norway than in the other Nordic countries.
- Likely that the high revenue per GB hampers the Norwegian usage.

Mobile data usage vs. market ARPU, PPP

- If including M2M, Norway's ARPU is higher than Denmark's, Sweden's and Finland's. If excluding M2M, Norway's ARPU is significantly higher than Sweden's. Although no exact comparison can be made to Denmark and Finland, the Norwegian ARPU excluding M2M is higher.
- In contrast to the ARPU position of Norway, the Norwegian data usage is always the lowest.
- If data volume is what defines value, Norwegian mobile subscribers receive the lowest value in these Nordic markets.

Operator ARPU, PPP

- Telenor Norway has a uniquely high mobile ARPU.
- Telia Norway has much lower ARPU than Telenor Norway but still higher than other operators in the Nordics in PPP terms.

Pricing of data-rich plans, PPP

- Prices on data-rich plans have come down in Norway. Since the other markets have not had the same development, Norway is today closer to the other three markets.
- Norwegian plans can compete on price with Swedish plans for data buckets up to about 50 GB per month. If comparing unlimited, Norwegian plans can generally compete with Sweden and Finland – but tend to still be a bit pricier.
- Although prices generally were increased in Denmark, Danish mobile providers are still offering the most affordable data-rich plans in the Nordics.

EBITDA

- Neither Telenor Norway nor Telia Norway has a problem with high OPEX. If so, their EBITDA margins wouldn't be best in class.

- Ice had the lowest EBITDA margin in 2021 and Lyse's acquisition of Ice has affected the EBITDA margin of Lyse's telecom business negatively. Lyse Tele's EBITDA margin is though still relatively high in a Nordic perspective.

CAPEX

- Norwegian operators all invest more – as share of total revenue – than the median Nordic operator.

Cash flow approximation (EBITDA-CAPEX)

- Neither Telenor Norway nor Telia Norway has a problem with high OPEX+CAPEX. If so, their EBITDA-CAPEX margins wouldn't be higher than the median Nordic operator.
- The situation for Ice was different in 2021 when Ice had the lowest (and negative) EBITDA-CAPEX margin. Lyse's telecom business could in 2022, including Ice, cover its CAPEX with EBITDA, but the margin is much lower than for Telia and Telenor Norway.

Market concentration

- The Norwegian mobile market is uniquely concentrated. In 2022, the market concentration index (HHI) however decreased faster than in the other countries.
- Norway's high HHI isn't just explained by the number of MNOs. Telenor's market share explains 72% of Norway's HHI.

Mobile network experience

- Norway is overall providing a faster download speed on its networks than other Nordic countries. Low mobile data usage contributes to this. It is also likely that Norwegian operators have invested in capacity not currently fully utilised.
- With regards to excellent consistent quality, Finnish operators are however higher ranked than Norwegian operators. Telenor stands out positively in Norway.
- If comparing the pure 5G experience, Telenor and Telia have an average download speed and an average 5G availability in a Nordic perspective.
- The mobile network experience in Norway is great but doesn't explain Norway's higher PPP ARPU – as the experience, on average, is equally good in the other countries.

This updated analysis doesn't repeat the full root cause analysis of the original analysis issued in 2020 but re-establishes the key finding: After adjustment for purchasing power, the Norwegian mobile revenue per GB is higher than in Denmark, Sweden and Finland and the most likely root cause is the higher market concentration in Norway.

Trends over three analyses

Since this is the third analysis of its kind – December 2020, January 2022 and June 2023 (updated with new PPP methodology in September 2023) – spanning over 2.5 years, we can identify certain **trends** when it comes to Norway's position. Due to the change in PPP methodology, the trends below are based on unadjusted NOK.

- Norway still has the **highest market ARPU both when including and excluding M2M**.
- Norway still has the **lowest mobile data usage** but the strong take-up of FWA in Norway in 2020-2021 combined with that the Norwegian FWA traffic, unlike the other markets, isn't included in the reported traffic makes us increasingly concerned that Norway's average usage is understated.
- **Prices on data-rich plans have come down** in Norway. Since the other markets have not had the same development, Norway is today closer to the other three markets. These price decreases have not yet had any effect on ARPU when excluding M2M, though.
- The leading Norwegian operators Telenor and Telia continue to be in the Nordic top layer when it comes to **EBITDA margin**.
- All Norwegian operators – also Ice/Lyse – continue to invest more of its revenue on **CAPEX** than the median Nordic operator. The approximate cash flow margin (after both OPEX and CAPEX) is however still higher than the Nordic median for Telenor and Telia.
- The **market concentration** is still high in Norway but continues to decrease faster than in the other countries.
- Norwegian mobile networks overall continue to deliver **faster download speeds** than in the other countries, but the difference is smaller than it used to be. The overall **consistency** in the network experience continues to be very high in Norway but this is as true for Denmark, Sweden and Finland.