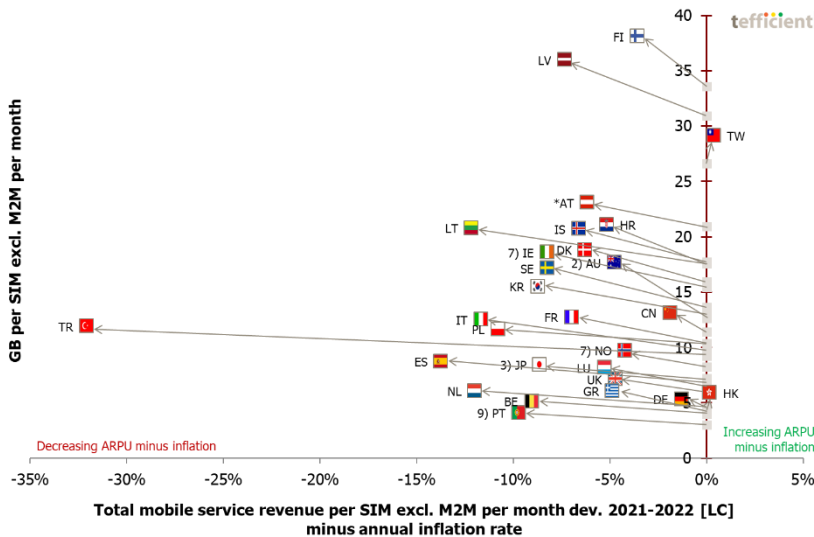# tefficient

Industry analysis #2 2023

Mobile data – full year 2022 – excluding M2M/IoT

ARPU growth almost always slower than inflation

Tefficient's 37th public analysis of mobile data development and drivers compares trends across 37 countries worldwide, excluding M2M/IoT from the total bases.

Previous analyses have shown that the pandemic led to a significant increase in mobile data usage. However, the demand for more mobile data has since slowed down. In 2022, Czechia experienced the highest growth rate in mobile

data usage, reaching 59%. At the other end of the spectrum, Qatar and Taiwan had relatively lower increases, both below 9%.

Data-only subscriptions continue to dominate average mobile data usage, although their market share remains limited. In 2022, Latvia's average data-only subscription reached 138 GB per month. In the FWA-only category, Australia recorded 286 GB, while Sweden reached 250 GB.

Overall, mobile data revenue once again reached its lowest level, although the erosion in revenue per gigabyte has slowed compared to previous analyses. Greece experienced the fastest erosion rate at 30%, while Turkey witnessed an increase.

Excluding M2M, 71% of markets experienced an increase in ARPU following onto data usage growth, which is a positive outcome. However, when accounting for overall inflation, the ARPU growth is almost always slower than inflation.

The M2M/IoT reporting dilemma

This chapter is mainly about methodology issues and can be skipped.

Regulators' reporting of M2M/IoT[1] SIMs continues to create a challenge for the comparability between countries. To make this *excluding-M2M* analysis, we had to exclude countries where M2M SIMs aren't broken out in the reporting of the respective regulator[2]: USA, Singapore, Romania, India, Mexico, Malaysia, Peru, New Zealand and Pakistan. You will find these countries solely in our *including-M2M* analysis.

Qatar and Taiwan – for which the regulators state that M2M is excluded – are, on the other hand, only shown in this analysis.

To allow full comparability between countries in this excluding-M2M context, regulators must break out all these three data points in their reporting:

1. M2M subscriber (SIM) base
2. M2M data traffic
3. M2M revenue

This is done in four countries: **Sweden**, **Norway**, **Greece** and **Bahrain**. We appreciate that the regulators PTS, Nkom, EETT and TRA have done this since it allows us to calculate the error that would be made if only the M2M subscriber base (but not the M2M data traffic nor M2M revenue) was reported.

Taiwan excludes M2M from all three data points and is therefore also fully correct and comparable. **Qatar** also excludes M2M from all three data points, but only reports its base of data-enabled mobile subscriptions, excluding voice-only subscriptions.

For **Australia**, M2M base and M2M traffic are reported and as Telstra breaks out M2M revenue in its reporting, it has been excluded (but not the M2M revenue of the other two MNOs, Optus and TPG Telecom, as these aren't reported).

The regulators in the remaining 30 countries only break out M2M subscriptions – not M2M data traffic nor M2M revenue. For these markets, the consequence of this is:

- The **mobile data usage is slightly overstated** as the M2M data traffic is included, but not the M2M base.
- Since the M2M data traffic and the M2M revenue is included, the **revenue per GB is affected, likely overstated**.
- Since the M2M revenue is included, but not the M2M base, the **ARPU is slightly overstated**.

To exemplify to what extent the numbers are overstated, we have in the table below calculated the mobile data usage, the revenue per GB and the ARPU for the four countries where we can exclude (and include) M2M data traffic and M2M revenue:

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[1] Hereafter called M2M.
[2] In the case of USA, the industry association CTIA.

2022	Mobile data usage → if including M2M traffic	Revenue per GB → if including M2M revenue and M2M traffic	ARPU → if including M2M revenue and M2M traffic
Sweden	17.1 → 17.2 GB +0.4%	0.0938 → 0.0954 EUR +1.7%[3]	16.08 → 16.43 EUR +2.2%[4]
Norway	9.7 → 9.8 GB +1.0%	0.2868 → 0.2919 EUR +1.8%	27.83 → 28.61 EUR +2.8%
Greece	6.07 → 6.08 GB +0.2%	0.2000 → 0.2013 EUR +0.7%	12.14 → 12.24 EUR +0.8%
Bahrain	30.17 → 30.18 GB +0.01%	No revenue data yet reported for 2022	No revenue data yet reported for 2022

The error when including M2M traffic and M2M revenue for the 30 countries where these are not reported could, based on these four countries, be estimated to overstate mobile data usage only marginally – up to 1%. The error is more significant on the revenue side – based on the table, we could assume that it exaggerates revenues with 1-3%.

[3] If including Swedish M2M revenues, not international M2M revenues.
[4] If including Swedish M2M revenues, not international M2M revenues.

When excluding M2M, data usage is still growing in all countries

Figure 1 shows the development of mobile data usage for 37 countries where regulators report mobile data traffic and where – at least – M2M subscribers can be excluded from the total mobile base. The usage is shown per SIM per month.
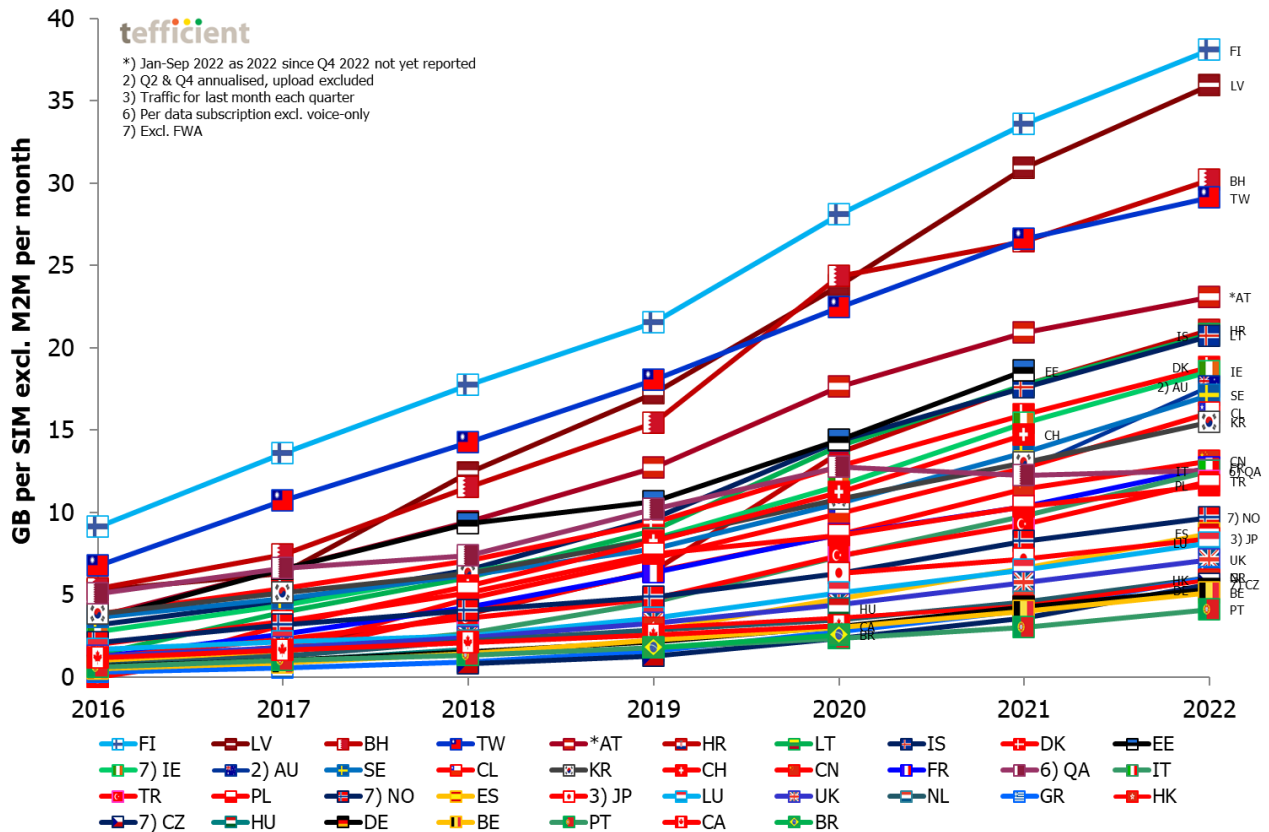

Figure 1. Development of mobile data usage per SIM (excl. M2M) per month – the legend shows the ranking[5]

Starting from the top of the chart, **Finland** is the world number one in the world when it comes to mobile data usage. **Latvia** is the runner-up and is approaching Finland. **Bahrain** is third-ranked after having overtaken **Taiwan** in 2022. **Austria** is fifth-ranked[6].

The average Finnish non-M2M SIM card carried **38.1 GB** of data per month in 2022[7] (+4.5 GB vs. 2021). There is an obvious explanation: **84%** of the Finnish non-M2M SIMs had **unlimited data volume** in December 2022. If we excluding voice-only SIMs, the share grows to 88%. No other country is as unlimited as Finland.

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[5] Some countries have not yet reported 2022: USA, Estonia, Switzerland and Brazil. For some *-marked countries, Jan-Sep 2022 figures are used as Q4 2022 isn't yet reported. Brazil has not even reported the full year of 2021 yet.

[6] As shown in our including-M2M analysis, Malaysia could possibly play in the global top five too, but since the Malaysian regulator does not break out M2M SIMs, Malaysia can't join this analysis.

[7] Since the Finnish regulator does not report the M2M data traffic, this figure is – as for 30 of our markets – slightly overstated.

The average Latvian non-M2M SIM carried 36.0 GB per month (+5.1 GB vs. 2021). Unlimited is offered as a premium option in regular mobile in **Latvia** but, as we will show later in this analysis, the high usage is to a large extent explained by data-only subscriptions.

In **Bahrain** (30.2 GB), growth took off again in the first half of 2022 (+3.7 GB vs. 2021).

Going to **Taiwan**, the average SIM carried 29.1 GB per month (+2.5 GB vs. 2021). Unlimited is behind Taiwan's usage development as well. The Taiwanese operators – there are five MNOs[8] – have cooled off the market by attempting to move the unlimited price points upwards while discontinuing unlimited for customers that have run out of binding. It initially worked so-so, but the relatively late (mid-2020) introduction of 5G provided the Taiwanese operators with the tool they needed to turn the ARPU erosion curves around when the two challenger MNOs couldn't follow pace in 5G. Unlimited is still very much a standard, but with 5G it comes with a tiered premium.

Although the legend below Figure 1 shows the ranking of the 37 countries, it's difficult to spot them all. Figure 2 offers an easier visualisation.
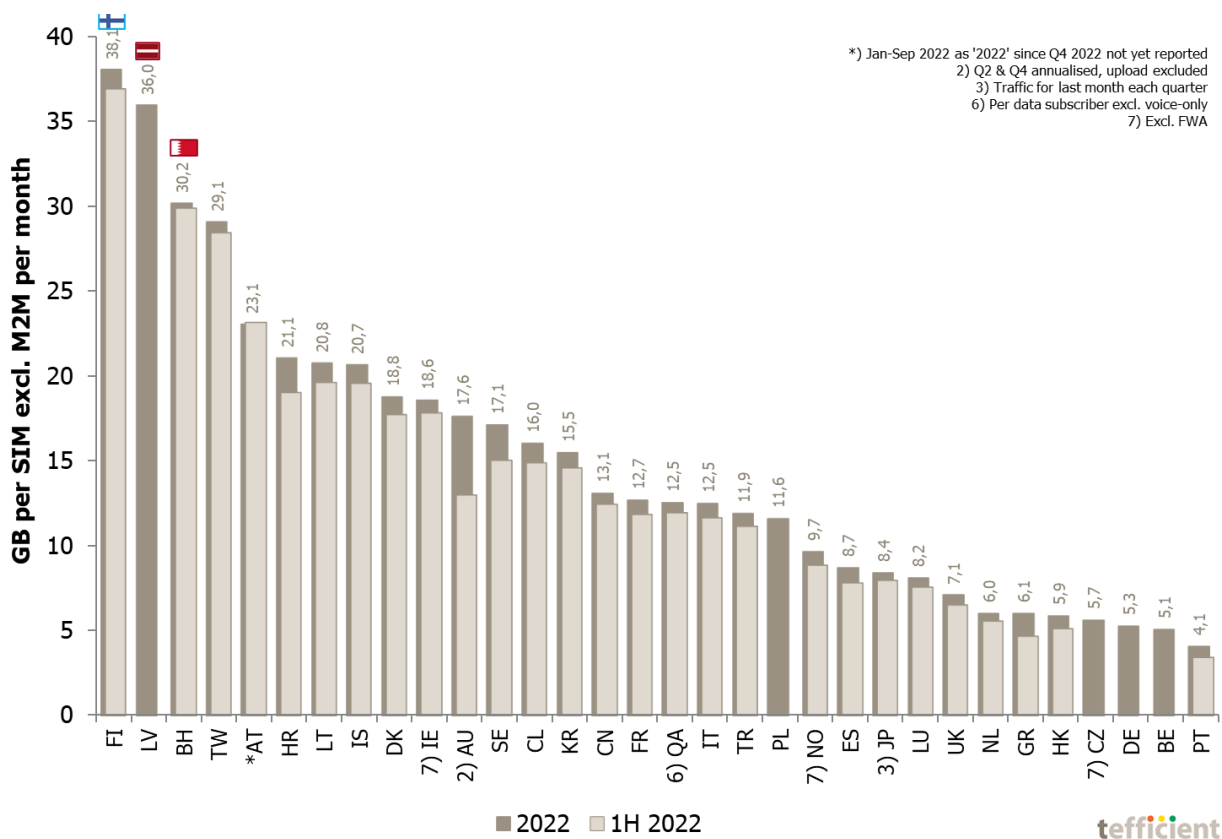

*) Jan-Sep 2022 as '2022' since Q4 2022 not yet reported
2) Q2 & Q4 annualised, upload excluded
3) Traffic for last month each quarter
6) Per data subscriber excl. voice-only
7) Excl. FWA

Figure 2. Mobile data usage per SIM (excl. M2M) per month, 2022 and 1H 2022

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[8] Taiwan Mobile is however in process to acquire Taiwan Star (TStar) and FarEasTone in the process to acquire APT (Gt). The mergers have been conditionally approved by the regulator, NCC, but would require approval also from the Fair Trade Commission.

In comparison to our historical reports there's not much dark grey on top of the 1H 2022 light grey bars which shows that for most markets, there was little usage growth in the second half of 2022.

The countries with the lowest data usage in Figure 2 are **Portugal**, **Belgium**, **Germany**, **Czechia**[9], **Hong Kong**, **Greece** and the **Netherlands**.
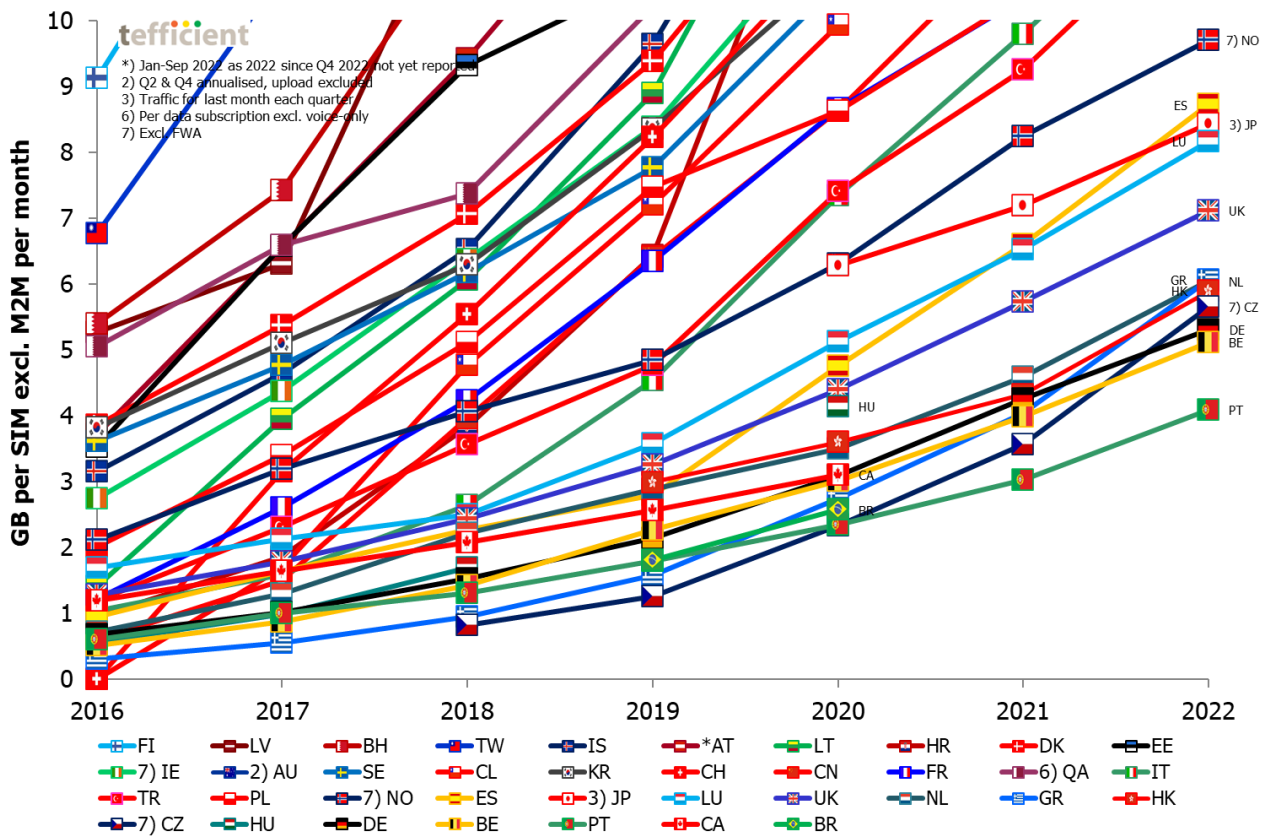
Figure 3 is a zoom-in on the lower end of Figure 1.

Figure 3. Development of mobile data usage per SIM (excl. M2M) per month [zoom-in on low end]

Albeit in the lower usage range, **Germany** and **Norway** had quite modest usage growth in 2022. Faster growth then in e.g. Czechia, Greece, Hong Kong and Portugal.

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[9] Note that FWA (fixed wireless access) traffic is excluded from the reported mobile data traffic of the regulator CTU. To make it comparable with other markets, we would have added it, if only CTU reported it.

Data usage growth fastest in Czechia

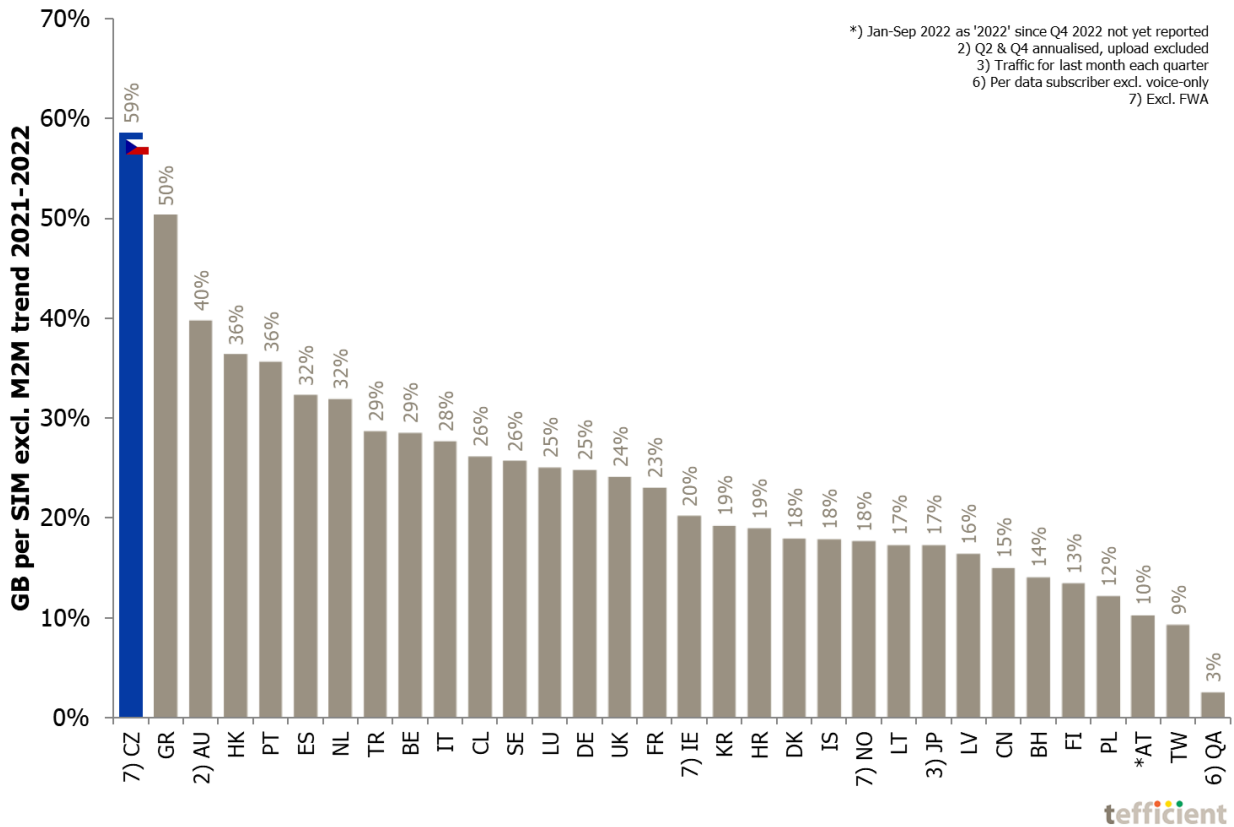Figure 4 shows the growth in average usage per SIM (excl. M2M) between 2021 and 2022.

Figure 4. Development of mobile data usage per SIM 2021-2022

Czechia had the fastest growth in mobile data usage (excluding non-reported FWA traffic). With **59%**, Czechia beats all other markets quite comfortably. **Greece** is the number two in growth with 50%. **Australia** is number three with 40% – followed by **Hong Kong** and **Portugal** with 36%.

At the right end of the scale, we find **Qatar** with a usage growth per data subscriber of just 3% in 2022. **Taiwan** had 9% and **Austria** 10% (up to September 2022).

The slowing growth rate of Austria is a bit disappointing since Austria was one of Europe's mobile data usage pioneers with many data-only subscriptions replacing slow fixed broadband. It could be that the rollout of fibre broadband in Austria eventually started to substitute some of these data-only subscriptions.

> Qatar, Taiwan and Austria had the slowest usage growth.

Data-only rarely more than 20% of base, but defines usage

Although **fixed wireless access** (FWA) experiences a renaissance with 5G in the US with T-Mobile and Verizon collectively having recruited over 5 million FWA customers in the past two-and-a-half years (read on), using mobile networks to substitute fixed broadband isn't something new. In some markets, like Finland and Austria, this was around for long. The take-up can be significant if the FWA/data-only offers are reasonably charged and without usage caps. It also helps if the fixed broadband offering is weak with much DSL in the mix.

In the second half of 2021, the Finnish regulator, Traficom, started to report also fixed data traffic, allowing a comparison with the mobile data traffic it had reported for long, see Figure 5.
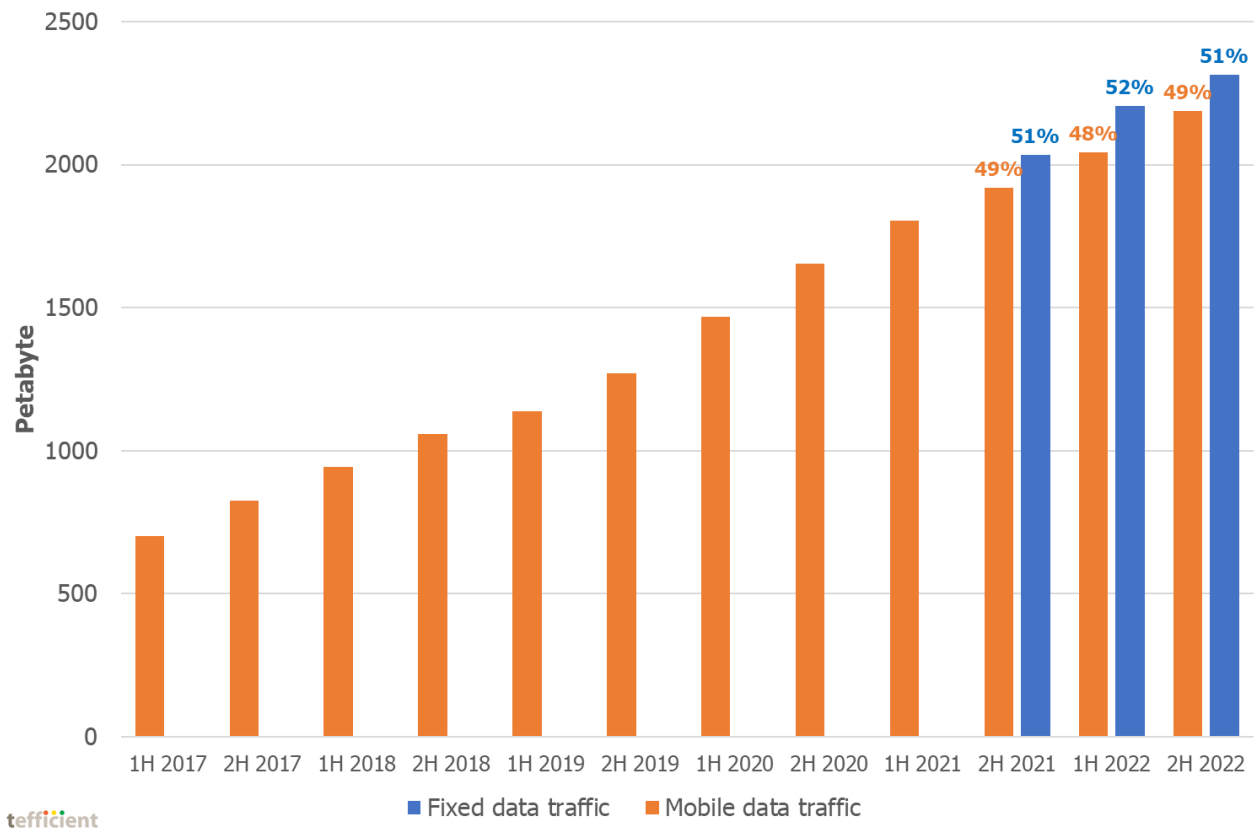

Figure 5. Development in reported mobile and fixed data traffic in Finland, 1H 2017-2H 2022

The mobile data traffic represented **49%** of the total data traffic in **Finland** in 2H 2022 whereas fixed data traffic represented 51%. It's the most even distribution between fixed and mobile networks among our 46 markets. **Austria**, in comparison, had **38%** over mobile vs. 62% over fixed in Jan-Sep 2022. Not to speak about **Germany** where it's **5%** over mobile and 95% over fixed.

This takes us to Figure 6. It plots the average data usage per SIM vs. the data-only share of a country's SIM base.
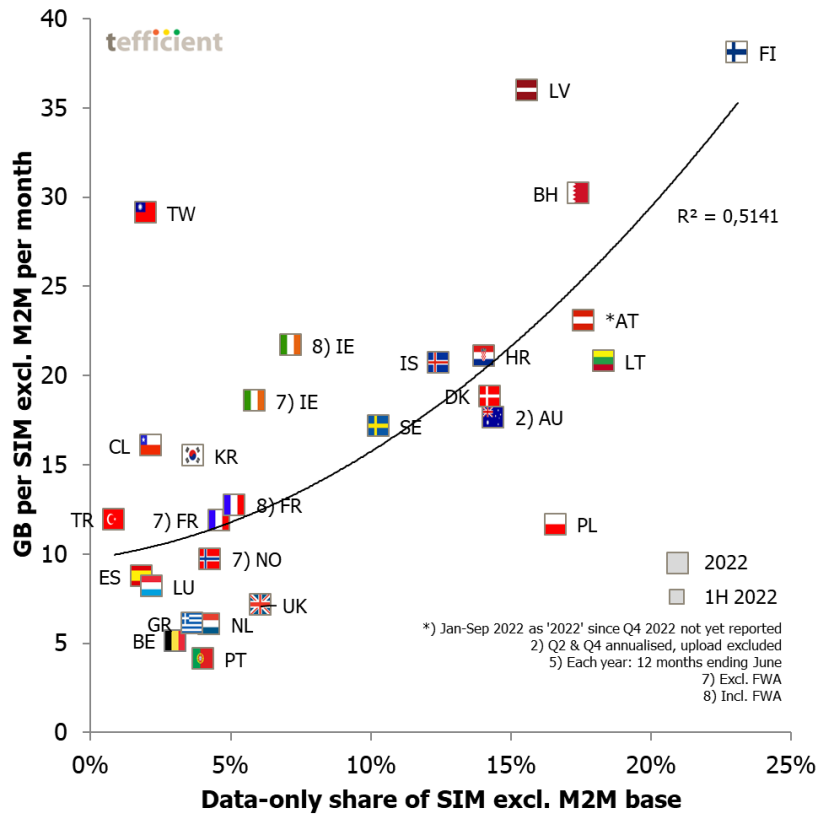
Figure 6. Mobile data usage vs. data-only share

In December 2022, **23%** of the SIM non-M2M base in Finland was data-only. That makes **Finland** the leader in data-only share of base – and the average mobile data usage is also the highest. In **Lithuania** and **Austria**, data-only represented 18% of the bases and the usage was lower than in Finland. **Bahrain** had an almost as high data-only share of base, 17%. **Poland** almost had 17% too, but much lower overall usage. **Latvia** was on 16%[10].

Taiwan is an exception to the overall trend: Its mobile data usage is high although the data-only share of base was just 2%. Albeit at a bit lower usage level, also Chile and Turkey have low data-only share of base.

Despite these exceptions, the adherence to the regression line is relatively strong. As in all previous reports we therefore conclude that **data-only penetration is a significant driver of the average mobile data usage**.

The easiest way for low-usage countries to grow data usage and expand the mobile market would be to **start addressing and monetising the data-only segment**. This seems to be effective particularly in markets where fast fixed broadband networks (FTTH, FTTB or HFC) aren't already available to a substantial share of the households.

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[10] The Latvian regulator reduced its reported data-only base significantly in 2022.

The US wireless market leader **Verizon** launched its first **5G** branded service in December 2018 to support a fixed wireless access (FWA) use case. **T-Mobile** has since followed. And it seems to work well sales-wise as FWA since the beginning of 2022 totally dominates the overall broadband subscriber growth, see Figure 7.
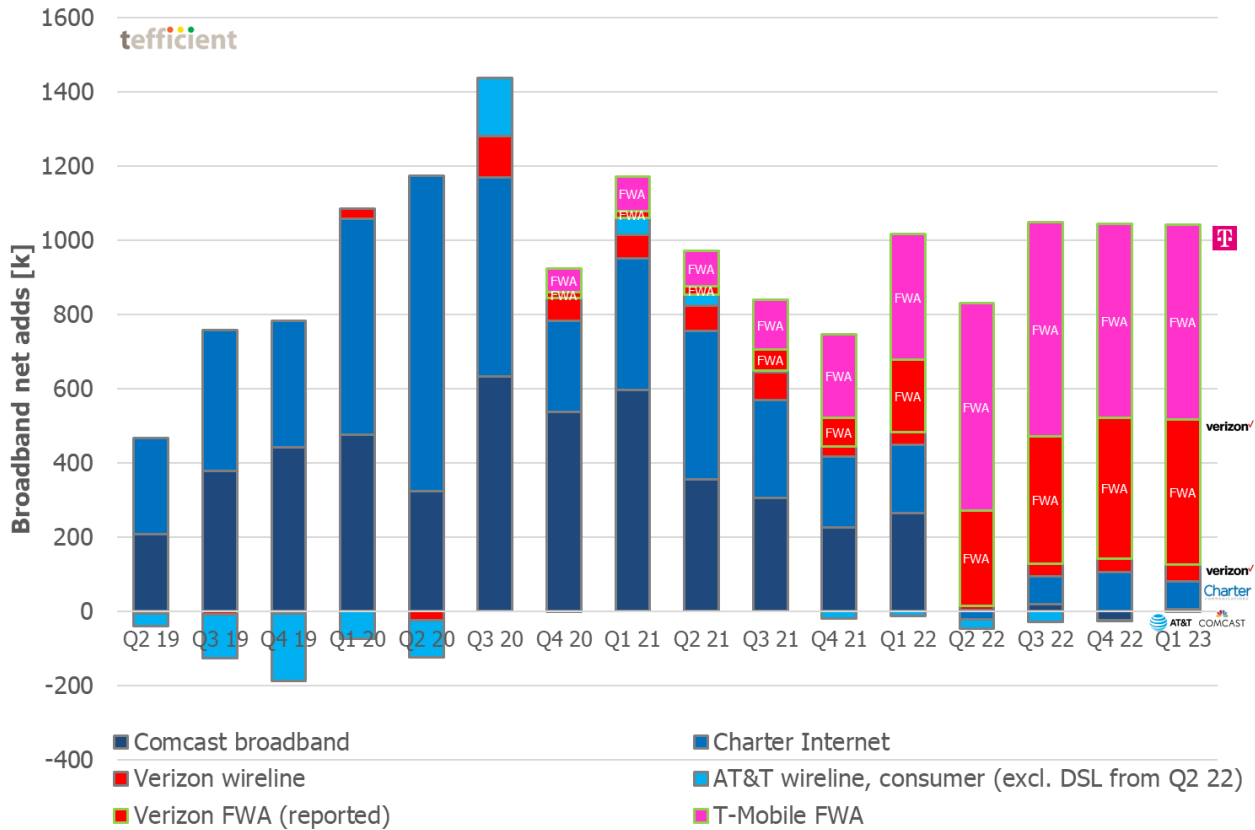

Figure 7. Broadband – fixed (grey outline) and FWA (green outline) – net adds per quarter per provider, USA

In March 2023, T-Mobile had accumulated close to **3.2 million FWA subscribers** (4G and 5G) across the US. Since Verizon offers fibre broadband in parts of the country, it doesn't sell FWA everywhere. Verizon still had close to 1.9 million FWA subscribers (again across 4G and 5G) in March 2023, representing **20%** of Verizon's total broadband (fixed+FWA) base.

Figure 6 shows that even a relatively low share of such data-only subscriptions could lift the average data consumption significantly.

Some of the countries in Figure 6 are also reporting the data-only traffic. For these countries, we can compare the data-only penetration of the SIM base to its share of the total mobile data traffic, see Figure 8.
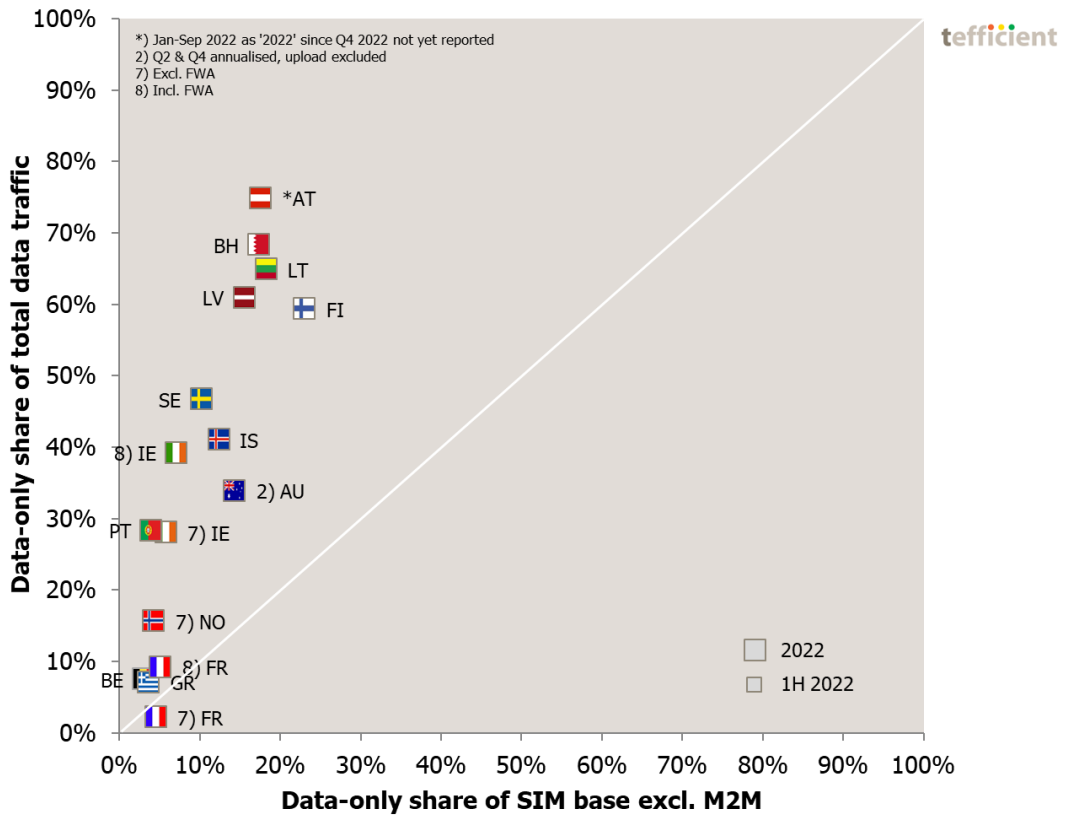
Figure 8. Data-only share of total traffic vs. data-only share of SIM base

Data-only SIMs carry a disproportionally high share of the data traffic:

- Portugal **7.0x** higher traffic per data-only SIM vs. any SIM
- Ireland (incl. FWA) **5.5x**
- Sweden **4.5x**
- Austria **4.3x**
- Bahrain **3.9x**
- Latvia **3.9x**
- Norway (excl. FWA) **3.7x**
- Lithuania **3.5x**
- Iceland **3.3x**
- Finland **2.6x**
- Belgium **2.4x**
- Australia **2.4x**
- Greece **1.9x**
- France (incl. FWA) **1.8x**

For the countries that are reporting both data-only traffic and the number of data-only subscriptions, we can compare the average usage per *data-only* subscription, see Figure 9.
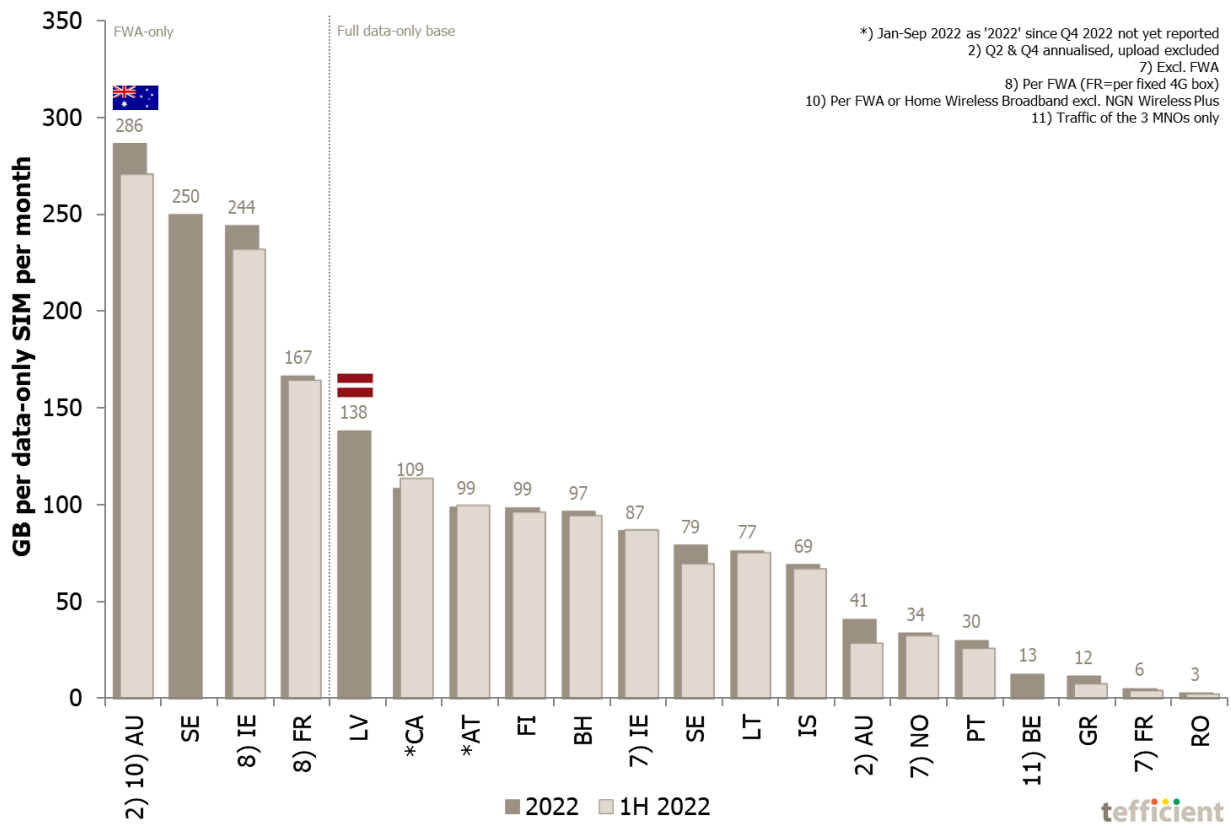
Figure 9. Mobile data usage per data-only SIM per month, 2022 and 1H 2022

Starting from the left, the average FWA and Home Wireless Broadband subscription in **Australia** carried **286 GB** of mobile data per month in 2022. New on the FWA-only part of the chart is second-ranked **Sweden** with 250 GB per month. We added **Ireland** as number three with 244 GB per month per FWA subscription. At the end the short FWA-only top list, we have **France** where the average '4G box' carried **167 GB** of mobile data per month.

If instead looking at the whole data-only base (not just the FWA segment), **Latvia** leads with the average mobile data consumption per data-only SIM of **138 GB**. **Canada** follows with 109 GB for the first nine months of 2022. **Austria** and **Finland** both had 99 GB. **Bahrain** follows with 97.

In comparison to previous reports, there's not much dark grey on top of the 1H 2022 light grey bars which shows that for most markets, there was little usage growth in the second half of 2022. In some cases, like Canada, Austria and Ireland (excl. FWA), the average data-only usage was even decreasing.

> The average Latvian data-only subscription consumed 138 GB per month in 2022

If **5G** should become the fibre-over-radio solution that T-Mobile and Verizon suggest, the data-only FWA usage figures of Australia and Sweden give a taste of the usage that the solution must at least manage. Fixed broadband usage is yet higher – often reaching 400 GB per month.

5G adoption a driver of data usage – or?

5G has been in commercial operation for four years by now and it would be high time to **correlate mobile data usage with 5G adoption**. Too few regulators (and operators for that sake) are however reporting 5G traffic – and 5G base – to make a sensible correlation graph for 5G. We strongly encourage regulators to see to that 5G numbers are reported.

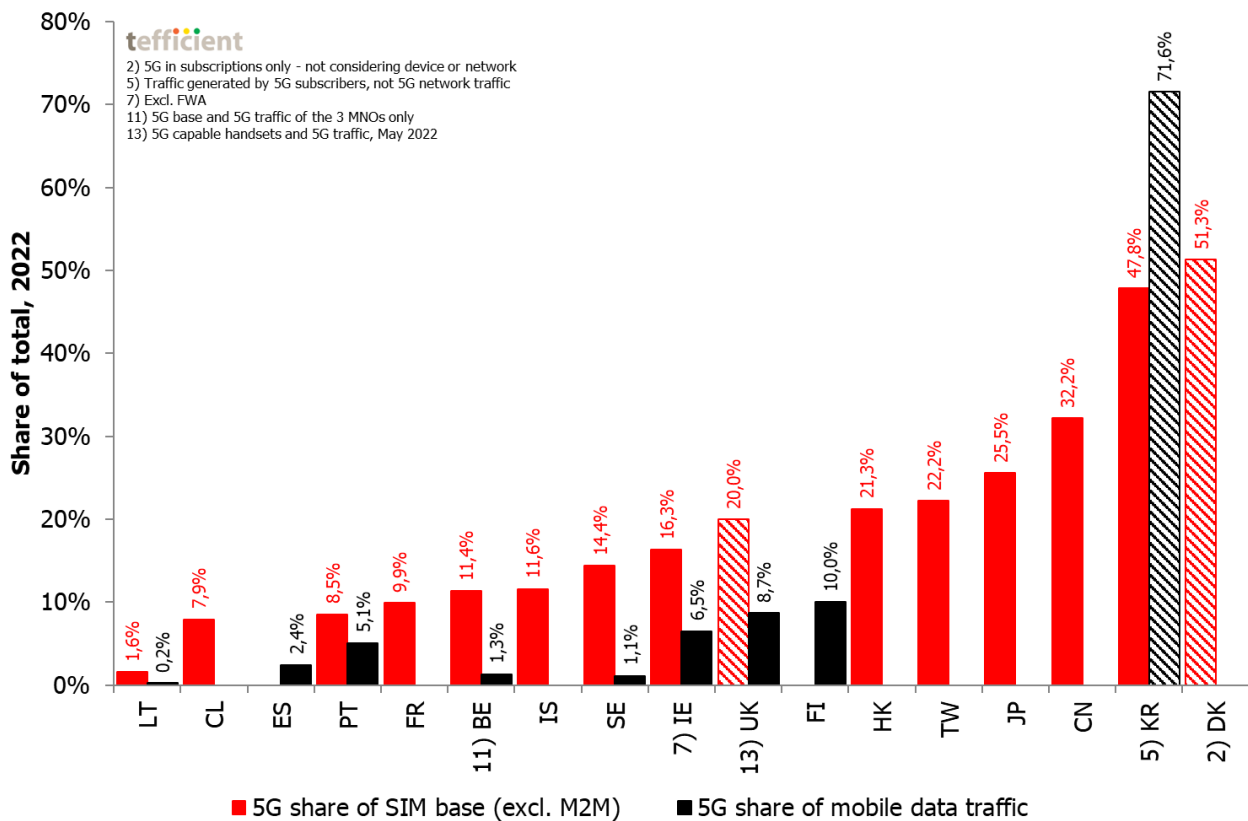Figure 10 below gathers all 5G information reported for our 37 markets in 2022 (or 1H 2022).

Figure 10. 5G share of base and 5G share of total mobile data traffic – reporting countries

From left in Figure 10: 1.6% of **Lithuania**'s mobile non-M2M subscriber base was 5G in December 2022, which means that Lithuania had the lowest share of 5G base among reporting countries. Lithuania's share of traffic on 5G was yet lower; 0.2% in 2022. In **Chile**, 5G's share of the subscriber base was 7.9%. In 2022, a mere 2.4% of the total mobile data traffic in **Spain** was carried by 5G.

Portugal was, alongside Belgium, one of the last countries in western Europe to launch 5G, but in December 2022, 7.9% of the mobile subscriber base was on 5G and 5.1% of the mobile data traffic was over 5G in 2022, i.e. double compared to its neighbour Spain.

France had 9.9% of its mobile subscriber base on 5G in December 2022. In **Belgium**, one of the last western European countries with 5G, 11.4% of the subscriber base was 5G in December 2022 – but in 2022, only 1.3% of the data traffic was carried by 5G networks. 5G represented 11.6% of **Iceland**'s mobile subscriber base in December 2022.

Sweden had a yet higher share of the total mobile subscriber base on 5G in December 2022: 14.4%. But the delayed rollout of 5G – triggered by a last-minute authority decision to couple the frequency licenses with a requirement not to use equipment from Huawei or ZTE – has taken its toll on traffic: In 2022, only 1.1% of Sweden's mobile data traffic was carried by 5G networks. Of reporting countries only Lithuania is lower.

Ireland had much more of its mobile data traffic over 5G in 2022: 6.5%. The Irish 5G subscriber penetration was 16.3% in December 2022. The figures of the **UK** are from May 2022. Whereas the 5G share of subscriber base can't be directly compared to the other countries since it shows the share of handsets being 5G capable, 5G's share of traffic was fairly high in May 2022: 8.7%.

With 10% of the traffic in 1H 2022, **Finland** might be the European leader in 5G share of traffic. We have however not seen an update on this figure from the Finnish regulator, Traficom, in 2H 2022 and can't therefore give a full year 2022 figure.

The following four markets in Figure 10 are in Asia and China: 21.3% of **Hong Kong**'s mobile subscriptions were 5G in December 2022. **Taiwan** ended 2022 a bit higher: 22.2%. 25.5% of **Japan**'s mobile subscriptions were 5G in December 2022. In **China**, it was yet higher: 32.2%. But highest is of course **South Korea** where 47.8% of mobile subscriptions were 5G in December 2022. In 2022, 5G subscriptions generated **71.6%** of South Korea's total mobile data traffic. Not all that traffic is necessarily on the 5G networks, though: Unlike other countries, all traffic generated by 5G subscribers (even when on 4G networks) is included.

> South Korea: 72% of the mobile data traffic was generated by 5G subscribers in 2022

The last country in Figure 10 is **Denmark** where the regulator SDFI reported that a whopping 51.3% of mobile subscriptions were 5G in December 2022. If it would have been a comparable figure, Denmark would be world-leading in 5G adoption. But the Danish regulator reports the share of subscriptions that are 5G enabled – not considering if these subscribers have 5G devices or are in 5G coverage. In reality, we believe that Denmark is close to its Nordic friends Sweden, Iceland and Finland.

So South Korea should still be considered as the global 5G leader. The Korean government reports monthly stats which allows us to plot the monthly development for the subscriber and traffic adoption, comparing 5G with 4G, as in Figure 11.
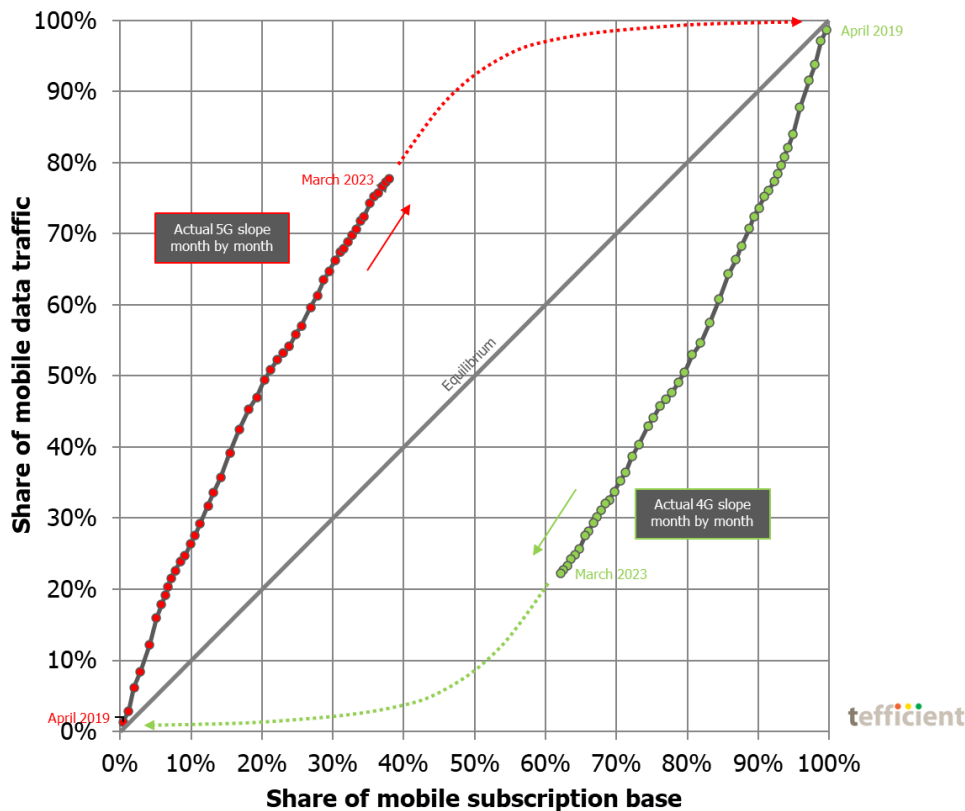
Figure 11. 5G share of total traffic vs. 5G share of SIM base and 4G share of total traffic vs. 4G share of SIM base – Korea per month since 5G launch

In March 2023, **78%** of the mobile data traffic in South Korea was generated by 5G subscribers. 5G represented 38% of the total SIM base, indicating that the average mobile data usage per 5G subscriber is far higher than for non-5G subscribers in South Korea.

The usage figures for March 2023 are:

- 5G: **28.8** GB per month
- 4G: **7.9** GB per month

Although 4G still represents 62% of the mobile subscriber base in South Korea, these 4G subscriptions only generate 22% of the mobile data traffic – as shown by the latest green dot in Figure 11.

It's important to point out that it's not 5G as such that alone explains the higher mobile data usage in 5G: Korea's operators are offering **unlimited** data plans more widely in 5G compared to what they did in 4G. But even if comparing apples to apples – unlimited to unlimited – 5G still seems to drive usage: In March 2023, the average unlimited 5G subscription generated **51.1 GB** whereas the average unlimited 4G subscription generated much less – **27.5 GB**.

A gigabyte has never been cheaper

Most mobile operators in mature markets aren't attempting to monetise voice and SMS based on usage any longer; they have instead made these allowances unlimited and included them in a flat fee. This means that the last price-defining parameter for most mobile users is **data volume**. Even though more and more operators introduce unlimited propositions, these are often the last step in a tiered data plan[11] – which means that price still, essentially, is about data volume.

Figure 12 plots the *total* mobile service revenue per consumed gigabyte[12] against the average mobile data usage per SIM and month.
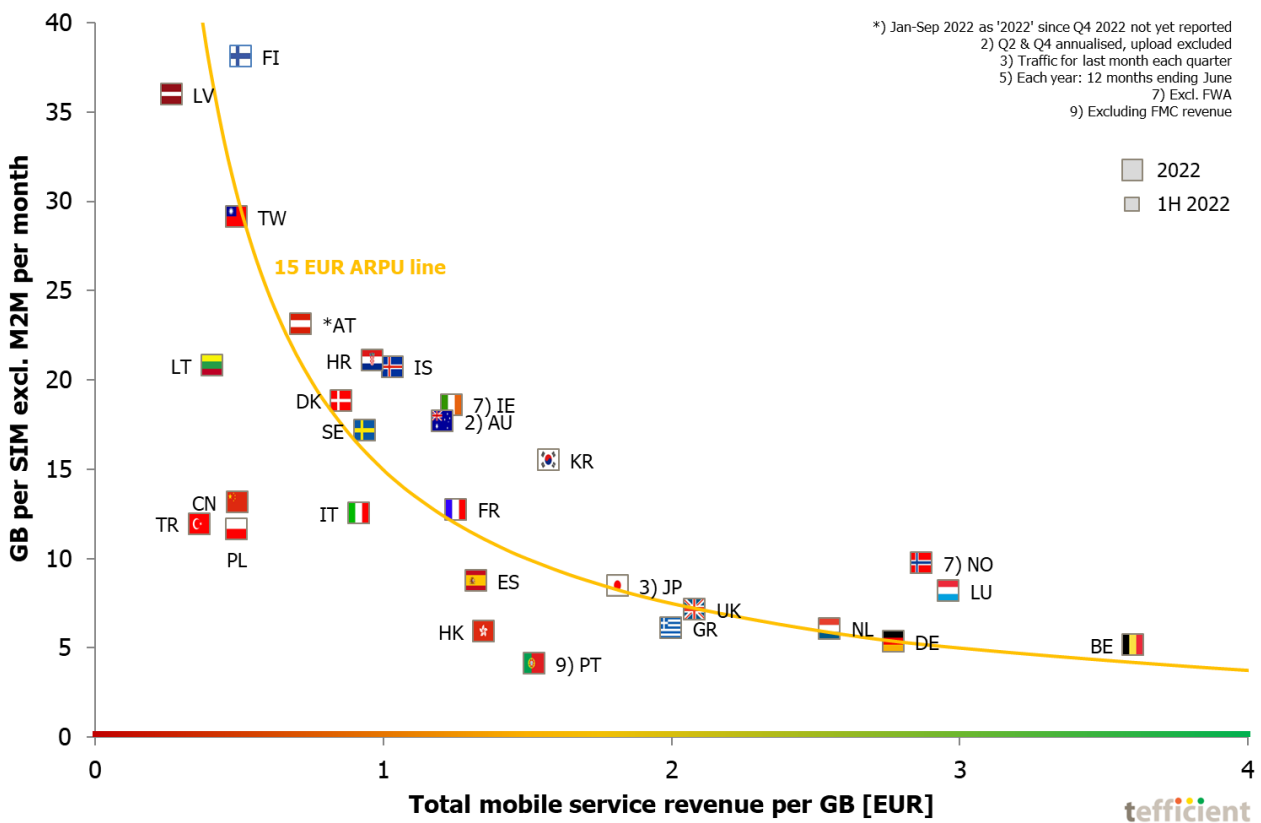

Figure 12. Mobile data usage vs. total mobile service revenue per consumed GB

The amber line shows where **15 EUR of ARPU** is earned. Countries below it had an ARPU lower than 15 EUR, countries above an ARPU higher than 15 EUR.

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[11] There are exceptions to this – where the price-defining parameter instead is data throughput – e.g. Finnish operators, Swisscom, O2 Germany, Norwegian operators and Vodafone in Spain, the UK and most other European Vodafone markets (except Germany). There are also operators mixing several parameters such as volume, throughput, policy, zero-rating, video resolution, service bundling etc.
[12] Attributing zero value to voice and messaging.

With Canada and New Zealand not joining this excluding-M2M analysis (due to lack of M2M reporting), **Belgium** has the position where operators collectively earn the highest total service revenue per consumed mobile GB.

There is a cluster of countries with high revenue per GB without being as extreme as Belgium: **Luxembourg**, **Norway**[13], **Germany** and the **Netherlands**.

It's important to point out that our analysis looks at what the mobile operator industry de facto makes on end-users, not what the best offer on the market currently is. Most users are on old price plans because they are still locked in by a contract – or because they have not bothered to find the best deal.

In the other end of the scale, we find the markets where operators get the lowest revenue per consumed gigabyte: **Latvia**, **Turkey**, **Lithuania**, **Taiwan**, **Poland**, **China** and **Finland**.

Looking at Figure 12 we can conclude – as in all our previous analyses on this topic – the key explanation to high mobile data usage is low effective revenue per gigabyte: **Bigger data buckets lead to lower revenue per GB – which, on the other hand, increases usage**. At least when customers can use those big buckets also within the data-only segment, see Figure 6.

> Latvia's operators have the lowest total revenue per GB – Belgium's operators the highest

But we also said that a gigabyte has never been cheaper. More correctly put is that operators never had lower total service revenue per gigabyte than what they currently have – which is true for all markets except Turkey. Figure 13 shows the revenue development from 2021 to 2022.

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[13] FWA not included in the revenue nor the data traffic due to the reporting of the regulator, Nkom.
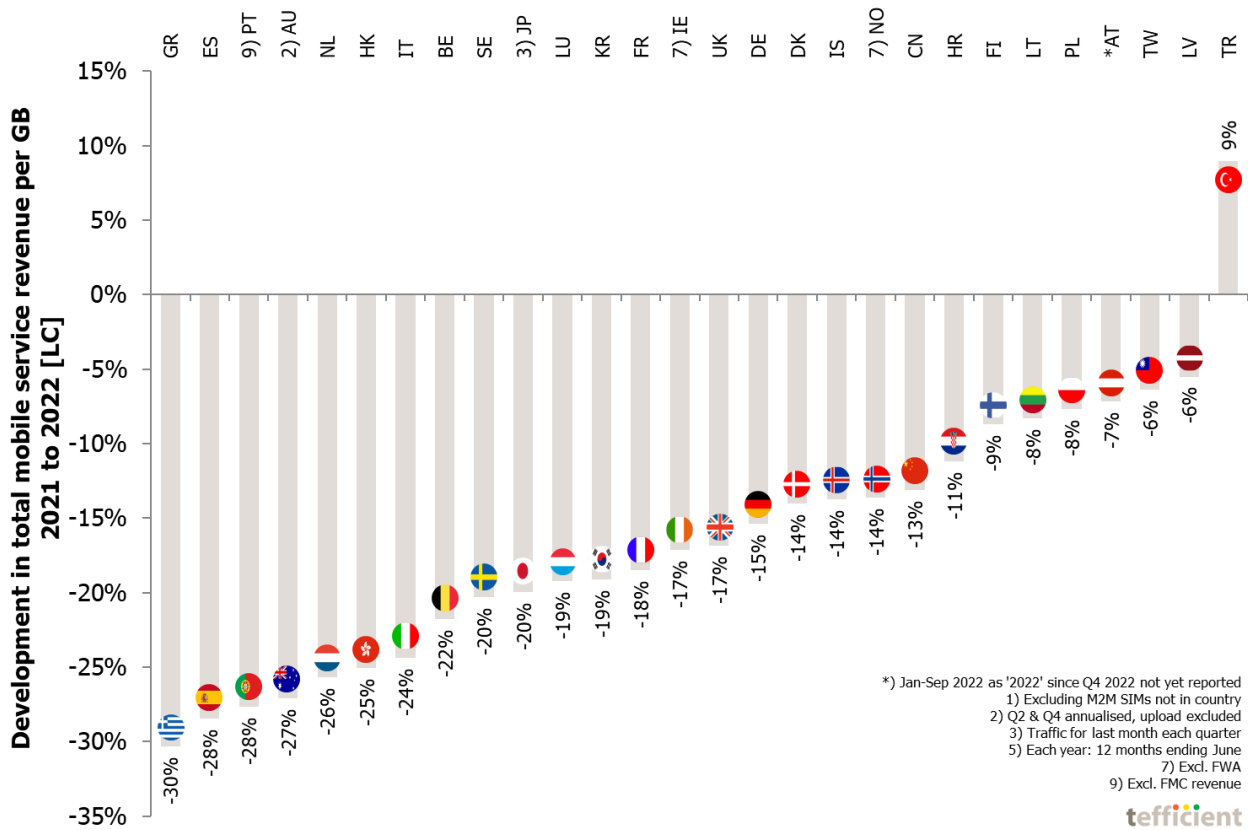
Figure 13. Development in total mobile service revenue per consumed GB – 2021 to 2022

The prerequisite to appear in Figure 13 is of course that the statistics have been reported both for 2021 and 2022. Of these markets, **Greece** had the fastest revenue erosion, 30%. **Spain** and **Portugal** both had 28%, **Australia** 27%, the **Netherlands** 26% and **Hong Kong** 25%.

In **Turkey**, the revenue per GB **increased with 9%** - in local currency – between 2021 and 2022. But where inflation generally increased in the world in 2022, Turkey had *hyperinflation*: It was 72% in 2022, making Turkey an international outlier.

Markets with a slow erosion in the revenue per GB are **Latvia**, **Taiwan**, **Austria**, **Poland**, **Lithuania** and **Finland**.

No correlation between data usage and ARPU

Figure 14 is a variant of the revenue per GB chart – it plots the usage against the average revenue per SIM, i.e. the ARPU.
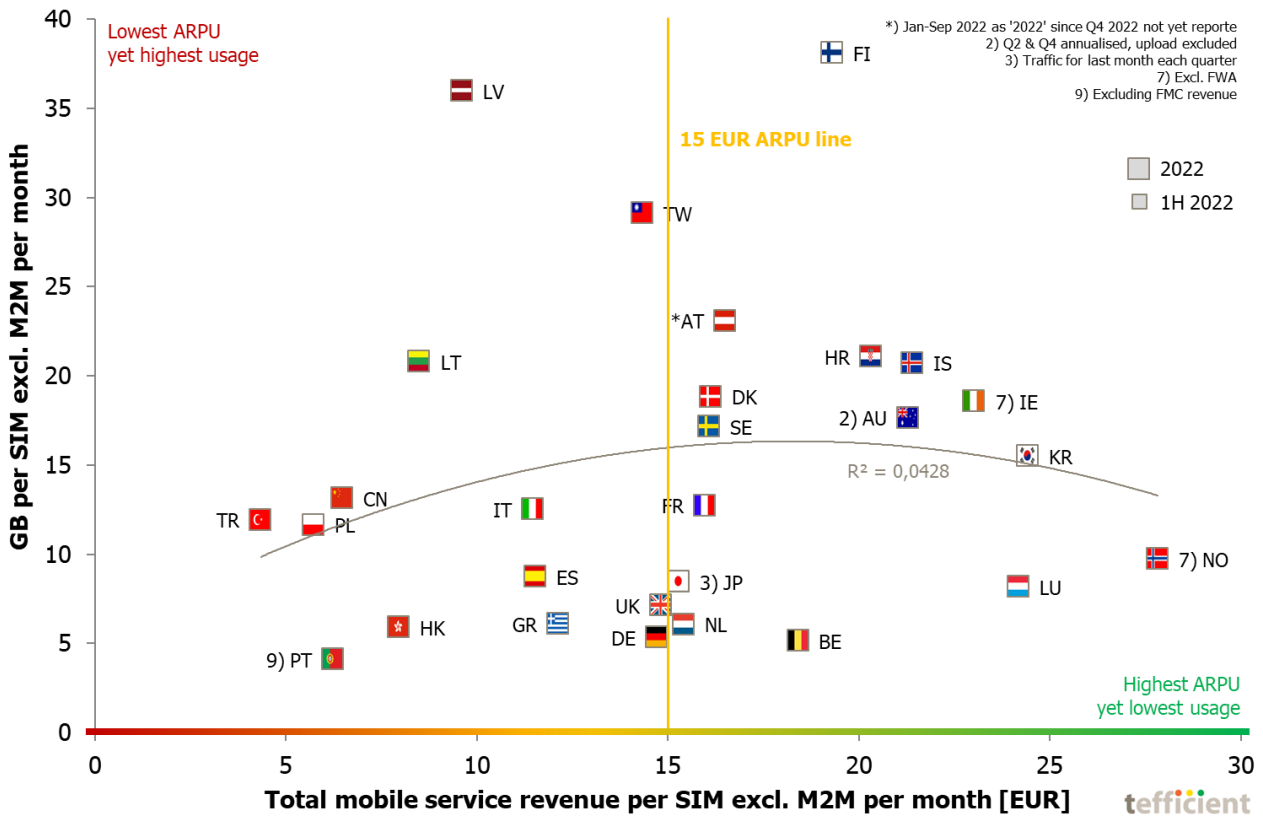

Figure 14. Mobile data usage vs. total mobile service revenue per SIM

Norway[14] has the highest ARPU among our markets without having high mobile data usage. **South Korea** is the country with the second highest ARPU – but with a relatively high mobile data usage. **Luxembourg** is very close to South Korea in the ARPU, but the usage level is much lower. **Ireland**[15] too has a high ARPU, but also high usage.

Operators to the upper left – **Finland**, **Taiwan**, **Latvia**, **Lithuania**, **China**, **Poland** and **Turkey** – are the most generous with mobile data considering their ARPU. These countries form a nice imaginative trend line suggesting that operators could expect to get rewarded with higher ARPU as usage grows.

But that's regretfully not to overall trend: The adherence to the grey regression line is weak but it's not pointing in the north-easterly direction one would like to see – with more usage leading to higher ARPU.

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[14] FWA traffic, FWA subscriptions and FWA revenues excluded.
[15] FWA traffic, FWA subscriptions and FWA revenues excluded.

Dressing the Christmas tree based on ARPU development

Now to our Christmas tree graph which we continue to be immensely proud of. It's the graph were we like to see the branches stretch to the right – since that means that the ARPU grew in the past year. That would demonstrate that the operators of a country have been able to monetise the growth in data usage.
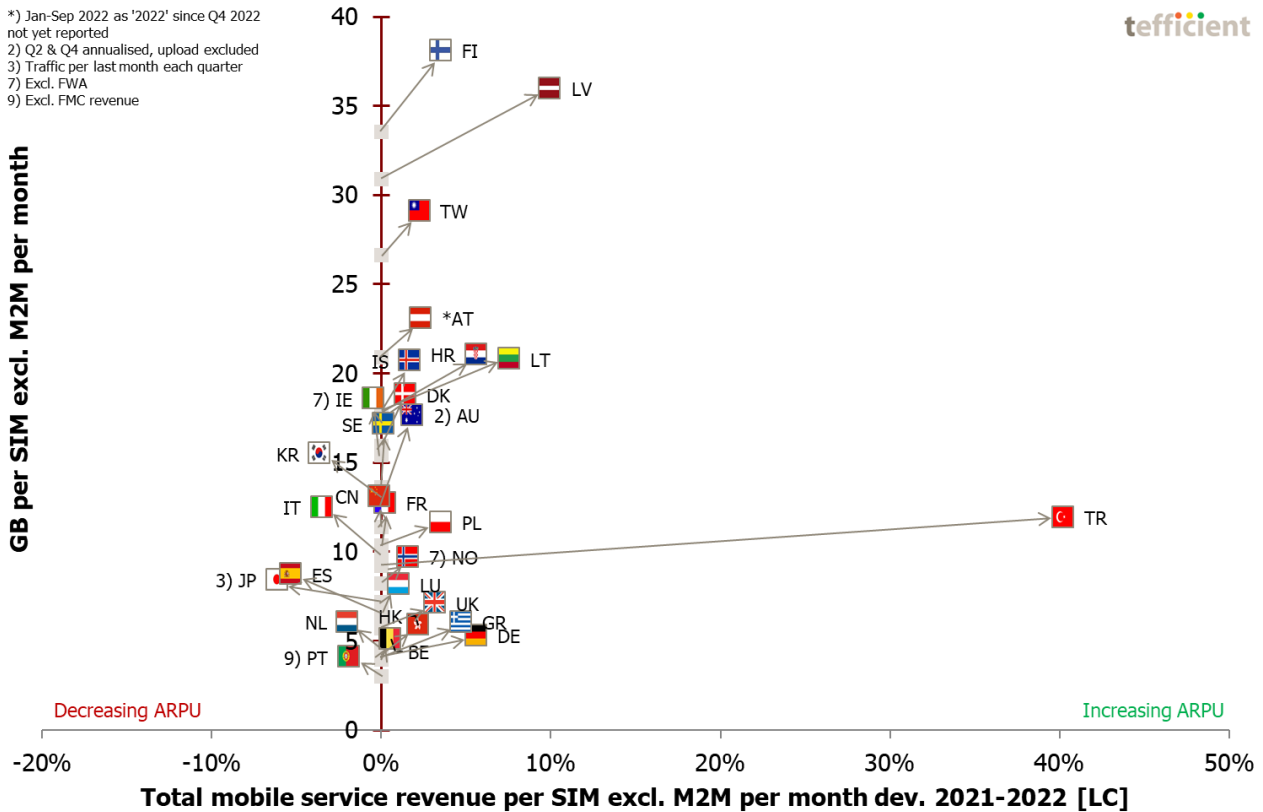

Figure 15. Development in mobile data usage vs. the development in ARPU – 2021 to 2022

The branches stretch right in **20 of 28 markets**[16] (71%). These are – from the top – **Finland**, **Latvia**, **Taiwan**, **Austria**, **Lithuania**, **Iceland**, **Croatia**, **Denmark**, **Australia**, **Sweden**, **France**, **Turkey**, **Poland**, **Norway**, **Luxembourg**, the **UK**, **Greece**, **Hong Kong**, **Germany** and **Belgium**. In 8 markets (29%), the branches stretch left meaning that even though data usage generally grew, ARPU fell. The ARPU erosion in **Japan** is the fastest; 6%. **Spain** follows with 5%.

Compared to the Christmas tree graph in our including-M2M analysis, a higher share of countries are to the right. This shows that M2M has a quite negative influence on the overall monetisation of mobile data – it dilutes the ARPU but as the M2M base continues to grow, it worsens the ARPU development too. If excluding M2M – like we have done in this analysis – the situation looks better and no longer alarming. Most mobile operators seem capable of turning the growth in *human* mobile data usage into ARPU growth.

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[16] The 28 markets for which regulators/operators have reported the necessary underlying stats to date.

But what about **inflation**? We just said that Turkey's inflation in 2022 was 72% – a figure that overshadows Turkey's ARPU growth of 40%. What if we subtracted the annual inflation of 2022[17] from the ARPU development shown in Figure 15. Then we get Figure 16.
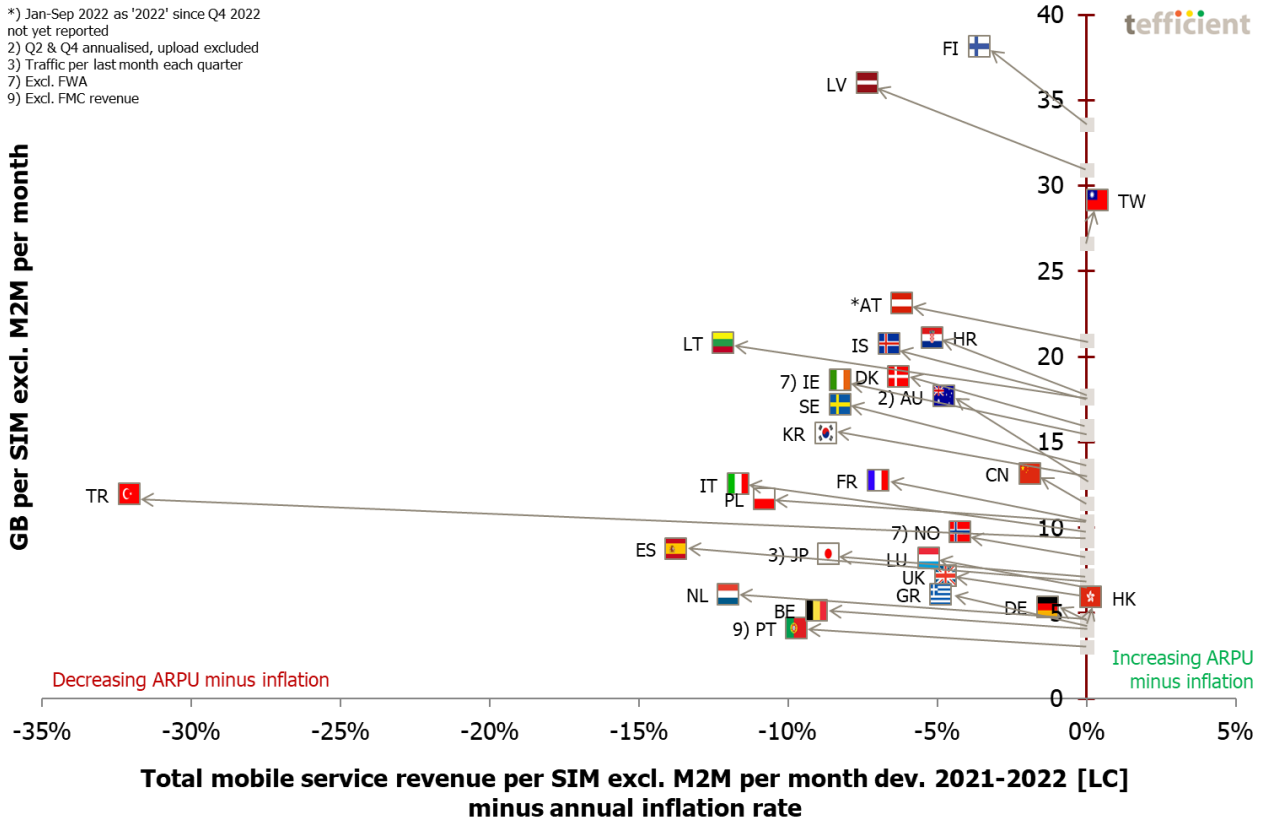

Figure 16. Development in mobile data usage vs. the development in ARPU minus inflation – 2021 to 2022

The Christmas tree suddenly became very ugly. There are only two markets where operators collectively could compensate inflation with ARPU growth: **Taiwan** and **Hong Kong**.

In all other remaining markets (26 of 28), **ARPU growth was slower than the inflation**.

To balance this, there's no rule saying that mobile ARPU should follow inflation. The inflation in 2022 was to a large extent driven by increasing energy and food prices. Although some operators seem to suggest it, energy doesn't represent a major share of mobile operator cost – in mature markets energy is often just 2-4% of total OPEX.

> ARPU growth was slower than the inflation in 26 of 28 markets

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[17] We have used the annual CPI as defined by the OECD https://www.oecd-ilibrary.org/economics/data/prices/consumer-prices-complete-database_0f2e8000-en to the degree possible. As not listed by the OECD, we have used the CPIs reported by the government functions in China, Hong Kong, Taiwan and Croatia.

But why are we then comparing ARPU growth and inflation rate? In the past years, many operators have implemented **CPI[18]-driven price increases** which, after some time, should make the two more linked. Based on how adverse Figure 16 looks, it has not had much of an effect overall yet though. Unless all mobile providers in a market all do CPI-based price increases, customers might compensate the trend by simply switching to a provider not doing it.

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[18] Consumer price index

Conclusion

This is our first analysis solely focused on mobile data usage and revenues **excluding M2M**. The requirement leads to that we had to omit a few markets where the reported data isn't sufficient. In each of our 37 remaining markets, the **mobile data usage grew in 2022**.

As usual, **Finland** tops the charts – with 38.1 GB per average SIM (excl. M2M) per month in 2022. But despite **84%** of non-M2M SIMs being **unlimited** and three 5G networks covering 80% of the population in December 2022, the data usage growth rate was slow in Finland – 13%. Usage in **Czechia** grew 59%. But in absolute terms, the data usage grew 4.5 GB in Finland and just 2.1 GB in Czechia.

Our analysis shows strong correlation between the **data-only share** of a country's SIM base and the average data usage. Five countries – **Finland**, **Lithuania**, **Austria**, **Bahrain** and **Latvia** – are the data-only powerhouses of the world. Official Finnish statistics show that mobile networks carried 49% of the total data traffic in the second half of 2022 – fixed networks just slightly more, 51%.

5G – or the monetisation model changes associated with 5G – seems to drive data usage in countries where operators have rolled out much 5G on dedicated frequency bands. Such as South Korea. Here traffic generated by 5G subscribers surpassed the traffic generated by 4G subscribers in March 2021 and has represented a majority of the mobile data traffic since April 2021. The data consumption per 5G subscription was 28.8 GB per month in March 2023 – about **3.6 times** that of the average 4G subscription.

Regardless of technology, data usage could be elevated by an increased data-only penetration through fixed-line substitution. But a prerequisite for this – and for high data usage in general – is that the **total revenue per gigabyte** is low.

This is the case in **Latvia, Turkey, Lithuania, Taiwan, Poland, China and Finland**. Without Canada and New Zealand appearing in this excluding-M2M analysis, **Belgium** represents the other end.

Low usage doesn't necessarily mean low ARPU, though. Market ARPU is uncorrelated with usage. **Norway** has, alongside **South Korea** and **Luxembourg**, much higher ARPU than other countries without having high usage.

After having eliminated M2M, **20 of 28 markets could grow ARPU** on the back the data usage growth. This is a better result than compared to our including-M2M analysis. But when we subtract the overall inflation, the Christmas tree graph becomes unattractive: **The ARPU growth was slower than the inflation in 26 of 28 markets.**

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