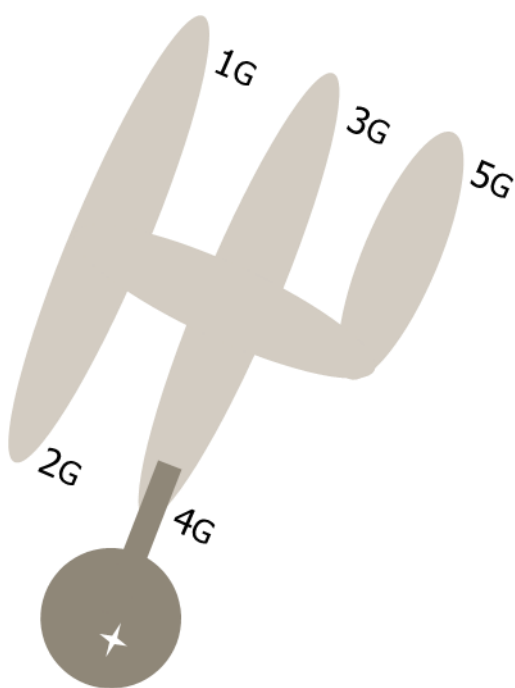


Industry analysis #3 2018 – preliminary

Mobile data – first half 2018

China and India shift to 4th gear – leave many mature markets in the dust



This is tefficient's 21st public analysis of the development and drivers of mobile data.

Mobile data usage is still growing in all of the 39 countries covered by this analysis. But there are two countries that stand out – China and India. In the first half of 2018, these two 'developing' nations have overtaken several mature markets when it comes to average data consumption per subscription. The growth is incredibly fast and driven by 4G.

But China and India aren't yet challenging the top – where the two unlimited superpowers, Finland and Taiwan, still reign.

Data-only remain a key driver for overall usage and new figures from Austria and Finland add insight to the extreme usage pattern of fixed wireless access. Since the baby steps on 5G are taken in that FWA segment, it's an interesting pointer to the future.

With the fourth gear fully engaged, the fifth gear is in reach.

There is a prerequisite for continued data usage growth, though: The total revenue per gigabyte can't be too high. Belgium, Greece and Germany have very high revenue per gigabyte – not to speak about Canada. Compared to these countries, an Indian operator earns 50 times less per gigabyte and a Finnish operator 15 times less per gigabyte.

This is a preliminary version of the analysis without yet-to-be-reported 1H 2018 data from the regulators of the Netherlands, Denmark, Romania, Iceland and Greece – and where Spain, Hong Kong and Thailand so far are represented with Q1 2018 data. We expect to be able to publish the final version in early January at www.tefficient.com/china-and-india-shift-to-4th-gear-leave-many-mature-markets-in-the-dust/.

Data usage continues to grow – also where it's high

Figure 1 shows the development of mobile data usage for 39 countries where regulators¹ report mobile data traffic. The usage is shown per SIM per month – and in Figure 1 we are including all² SIMs, also M2M/IoT SIMs.

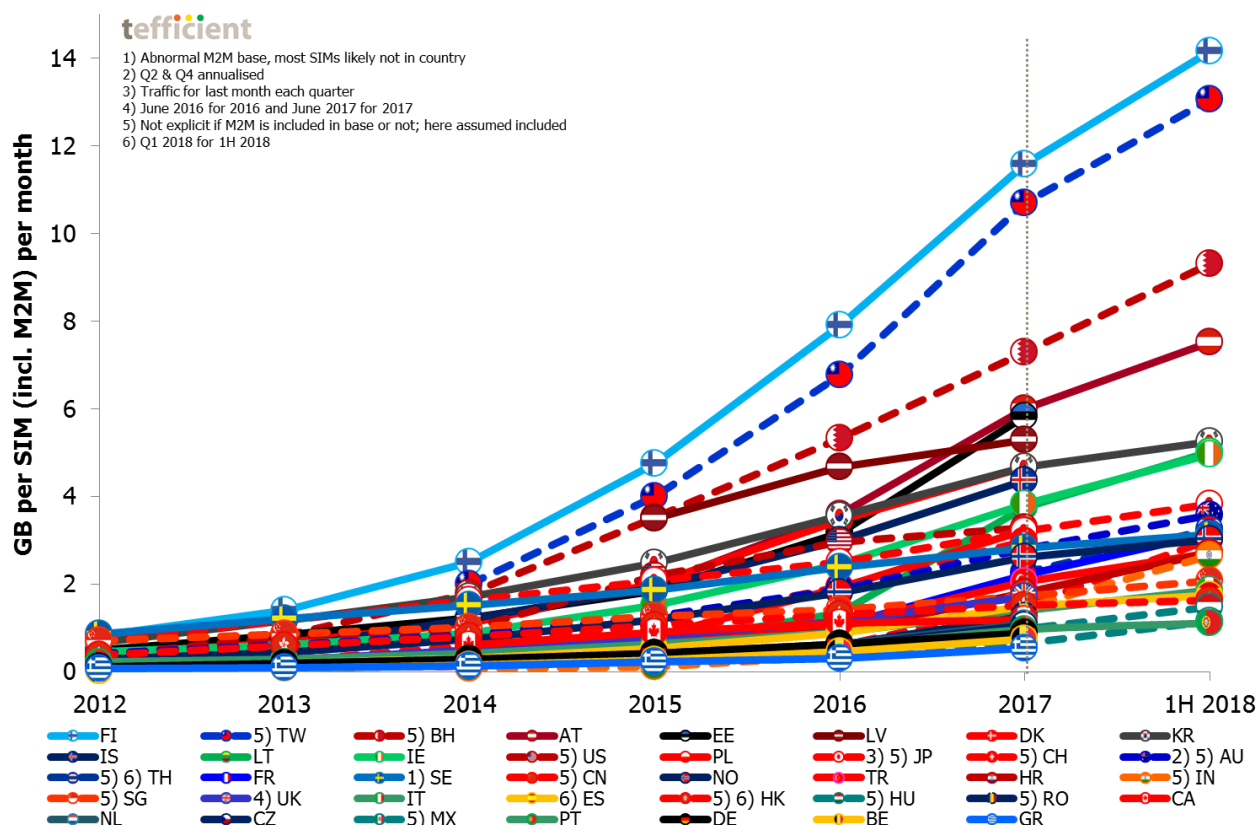


Figure 1. Development of mobile data usage per SIM (incl. M2M) per month

Starting from the top of the chart, **Finland** and **Taiwan** are still holding the number one and two positions in the world when it comes to mobile data usage. The average Finnish SIM card carried 14.2 GB of data per month in the first half of 2018. **57%** of the Finnish SIMs had **unlimited data volume** in June 2018.

The average Taiwanese SIM carried 13.1 GB per month. Unlimited is behind Taiwan's usage development as well, but it's not known how large share of the base that have it. The Taiwanese operators – there are five MNOs – have tried to cool off the market by attempting to move the unlimited price points upwards while

¹ Exception: USA, where the data is from the industry body CTIA and Canada where the input data for 2017 is from OECD's broadband portal (said to originate from CRTC). As there is an obvious error in BAKOM's mobile data traffic figure for 2017, OECD's data has been used also for Switzerland in 2017. We will replace the OECD figures with CRTC/BAKOM figures when the regulators have reported 2017.

² All SIMs in a market included; even the SIMs that used no or little data. We think this provides a better comparison than usage per 'mobile broadband subscription' even if it lowers the average mobile data usage numbers somewhat.

discontinuing unlimited for customers that have run out of binding, but the discipline doesn't seem to be there as the usage grew as quickly as in Finland in the first half of 2018.

Bahrain remains our Bronze medallist. Also here, unlimited is behind.

Fourth-ranked **Austria**'s mobile data usage is continuing to develop quickly. **Fixed-line substitution** (with unlimited allowances) is a major driver of the development, fuelled by Austria's weak position within fast fixed broadband and fibre to the homes. But maybe **Estonia**'s average data usage is even higher? We don't know – and since the Estonian regulator reports market statistics only once a year, so we have to wait until our full year 2018 report for the answer. Two of the three Estonian operators offer unlimited.

The M2M reporting dilemma

Regulators' reporting of M2M/IoT SIMs continues to create a challenge for the comparability between countries. A growing problem is international M2M SIMs that are registered in one country but used somewhere else. Sweden is a good example. The country regulator, PTS, reports 12.6 million M2M SIMs in Sweden – a figure that roughly doubles the total SIM base if added to the regular SIMs base. 9.8 million of these are with the international M2M unit of Telenor group, Telenor Connexion. Most likely few of these SIMs are actually in Sweden. If including the 12.6 million M2M SIMs – like in Figure 1 – Sweden's average mobile data usage looks moderate – if excluding them, it looks higher.

The same issue now emerges in Austria where Deutsche Telekom group registers many of its international M2M SIMs. The number of 'Austrian' M2M SIMs as reported by RTR has more than doubled in a year. Similar to Sweden, Austria's average mobile data usage per SIM looks higher if excluding M2M SIMs.

But if the homebase of international M2M SIMs is an issue, there's also the fact that many regulators do not specify if M2M SIMs are included in the reported SIM base or not. These countries are marked 5) in our charts. In most of our graphs, Figure 1 included, we have assumed that M2M SIMs are included in the reported SIM base. The exception is in Figure 2 where we have assumed that M2Ms are excluded. This increases the separation between e.g. Finland and Taiwan.

Figure 2 is a variant of Figure 1 but with M2M SIMs *excluded*. As the M2M SIMs typically carry significantly less traffic than the regular SIMs, this makes the usage figures look higher.

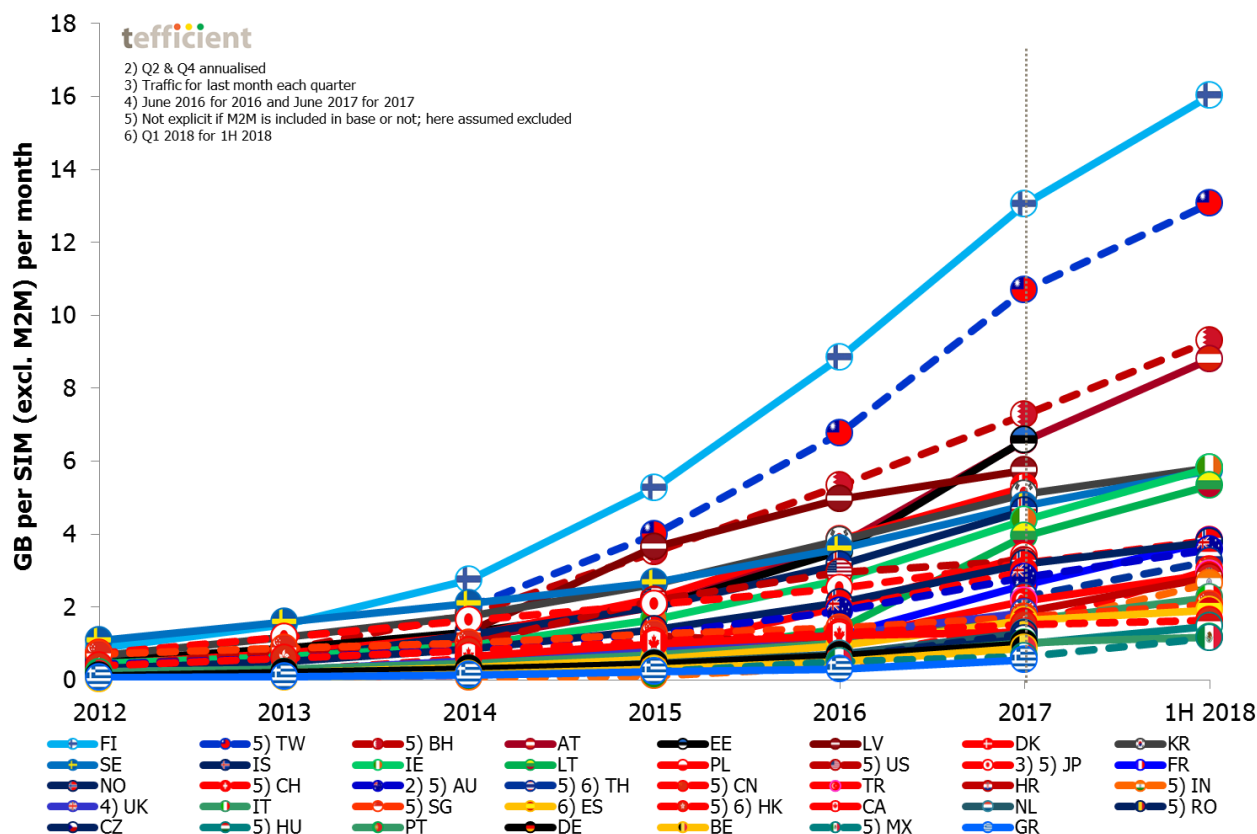


Figure 2. Development of mobile data usage per SIM (excl. M2M) per month

Since only a fraction of the countries separate out the data traffic associated with M2M SIMs in their reporting (kudos to Norway and Sweden), the assumption for most of the countries in Figure 2 is that the M2M data usage is zero. This is of course not correct and as we expect M2M/IoT SIMs to carry significantly more traffic in future, we think that Figure 1 provides the most accurate comparison.

The top four countries – **Finland, Taiwan, Bahrain** and **Austria** – are the same as in Figure 1. Finland leads with an average usage per non-M2M SIM of **16.0 GB** per month. **65%** of the Finnish non-M2M SIMs had **unlimited data volume** in June 2018.

The legends of Figure 1 and Figure 2 show the ranking of the 39 studied countries. But since it's difficult to spot them all, Figure 3 and 4 offer an easier visualisation. First including M2M:

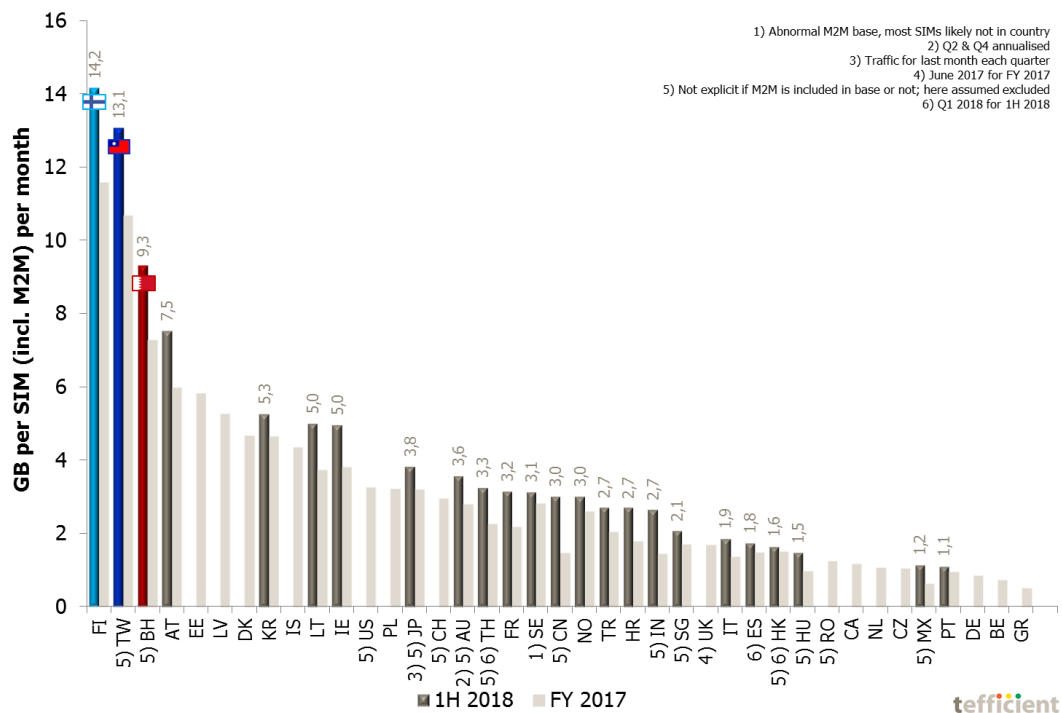


Figure 3. Mobile data usage per SIM (incl. M2M) per month, 1H 2018 and FY 2017

And in Figure 4 excluding M2M:

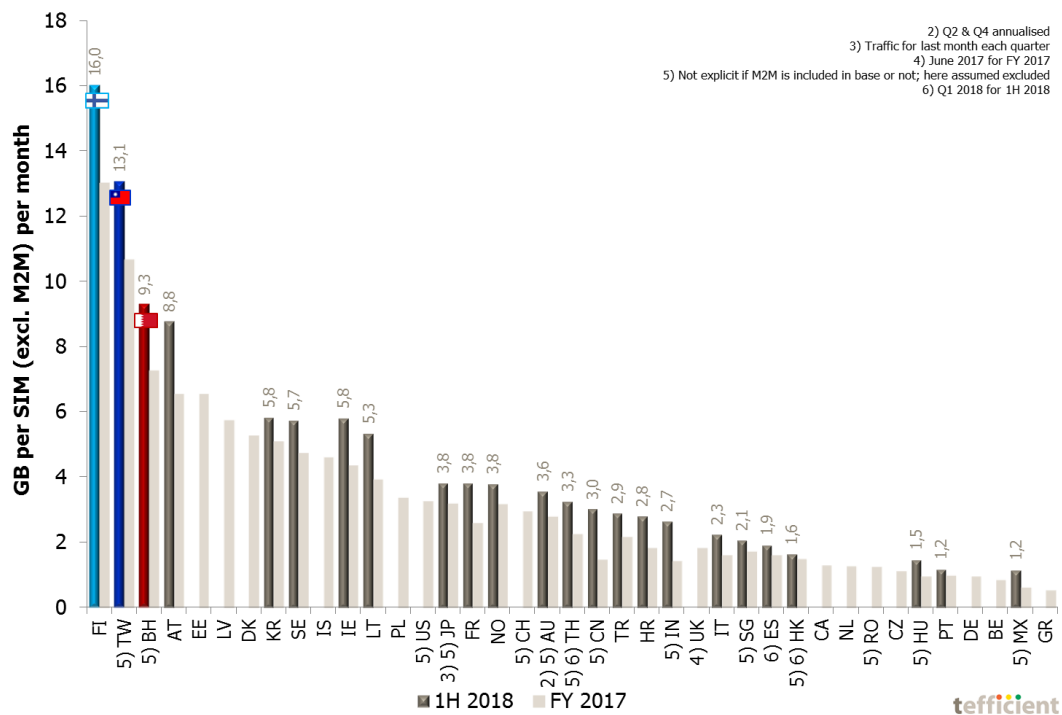


Figure 4. Mobile data usage per SIM (excl. M2M) per month, 1H 2018 and FY 2017

The countries with the lowest data usage in both Figure 3 and Figure 4 are **Greece**³, **Belgium**³ and **Germany**³.

Figure 5 is a zoom-in on the lower end of Figure 1.

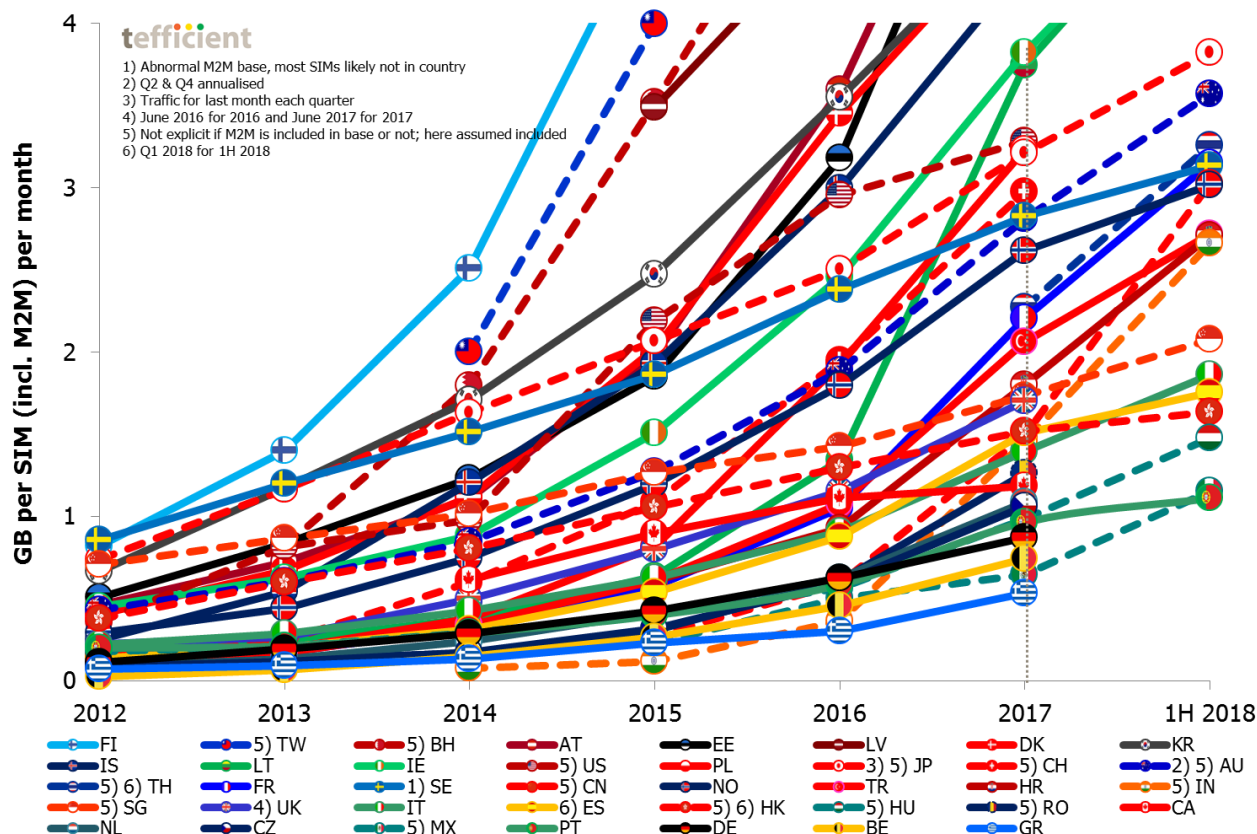


Figure 5. Development of mobile data usage per SIM (incl. M2M) per month [zoom-in on low end]

A way to use Figure 5 is to identify how many years a country is behind the global leader Finland in mobile data usage. An example: In the first half of 2018, **Italy** and **Hungary**⁴ passed the Finnish level of 2013. Average data usage in these two countries are thus at least 4 years behind Finland.

³ Subject to that something drastic would have happened in 1H 2018 – either not yet reported by the regulator (Greece) or the regulator only reports once per year (Belgium, Germany)

⁴ Hungary's average data usage is lower than in our previous reports based on a previous misunderstanding of how Hungary's regulator KSH reported mobile data traffic. Previous years' figures have also been corrected.

Data usage growth fastest in China

Figure 6 shows the growth in average usage per SIM (incl. M2M) between FY 2017 and 1H 2018.

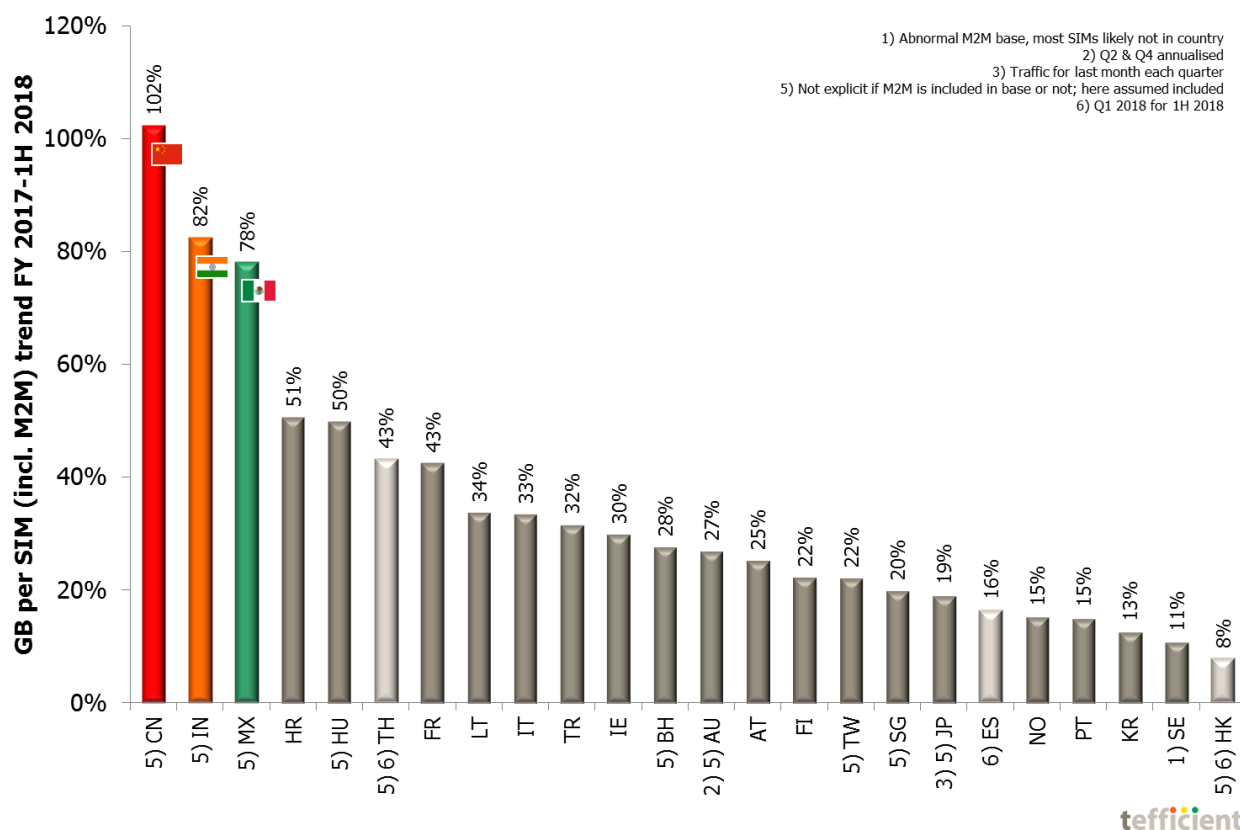


Figure 6. Development of mobile data usage per SIM FY 2017-1H 2018

China's 102% usage growth in the first six months of 2018 in usage is incredibly fast. It's fuelled by a fast take up of 4G which in turn has been fuelled by massive 4G-oriented marketing by the Chinese operators. Plans marketed as 'unlimited' contribute⁵. **China Unicom** was first with such plans and leads in usage, see Figure 7.

⁵ Albeit being throttled in speed after a certain full speed cap has been reached

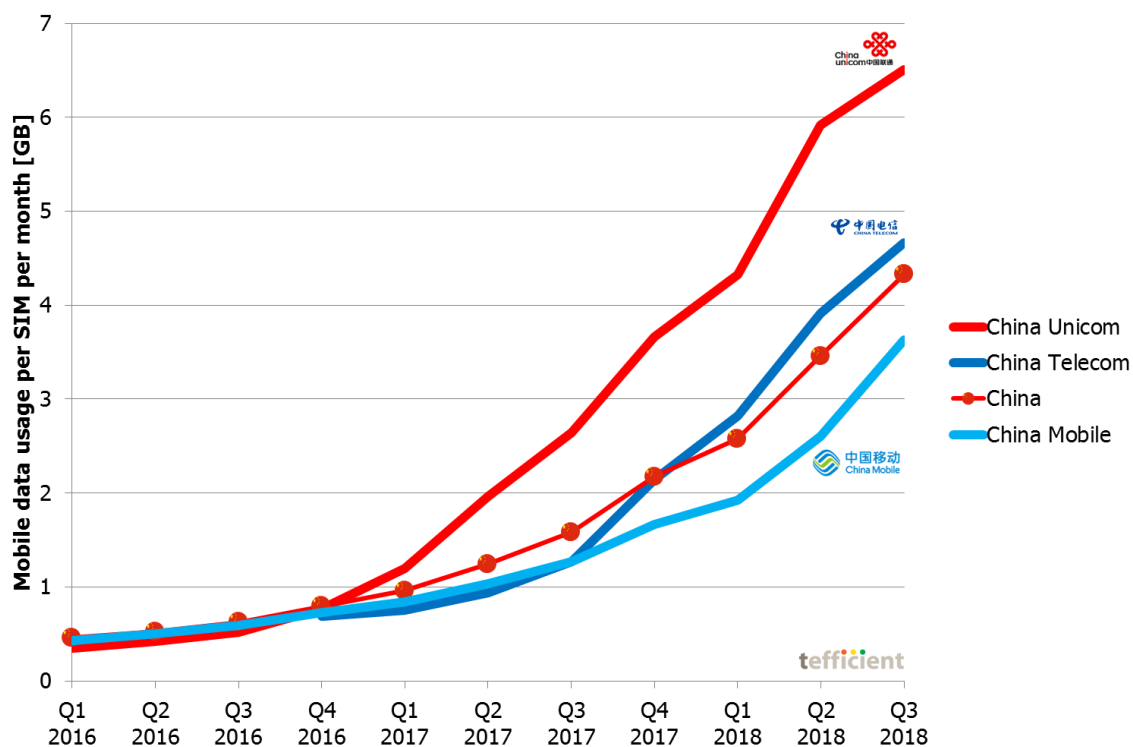


Figure 7. Development of mobile data usage per SIM per operator in China

If we revert to Figure 6 we should also note that the mobile data usage in **India** continues to grow quickly; **+82%** in the first six months of 2018. It is a direct consequence of the market entry of a new disruptive operator, **Jio**. But all of the growth isn't attributed to Jio; the existing operators such as Airtel, Vodafone and Idea (now merged into Vodafone Idea Limited) have increased its average data usage many times when prices have been decreased and mobile networks improved.

Jio's lead in average usage is obvious, though; see Figure 8.

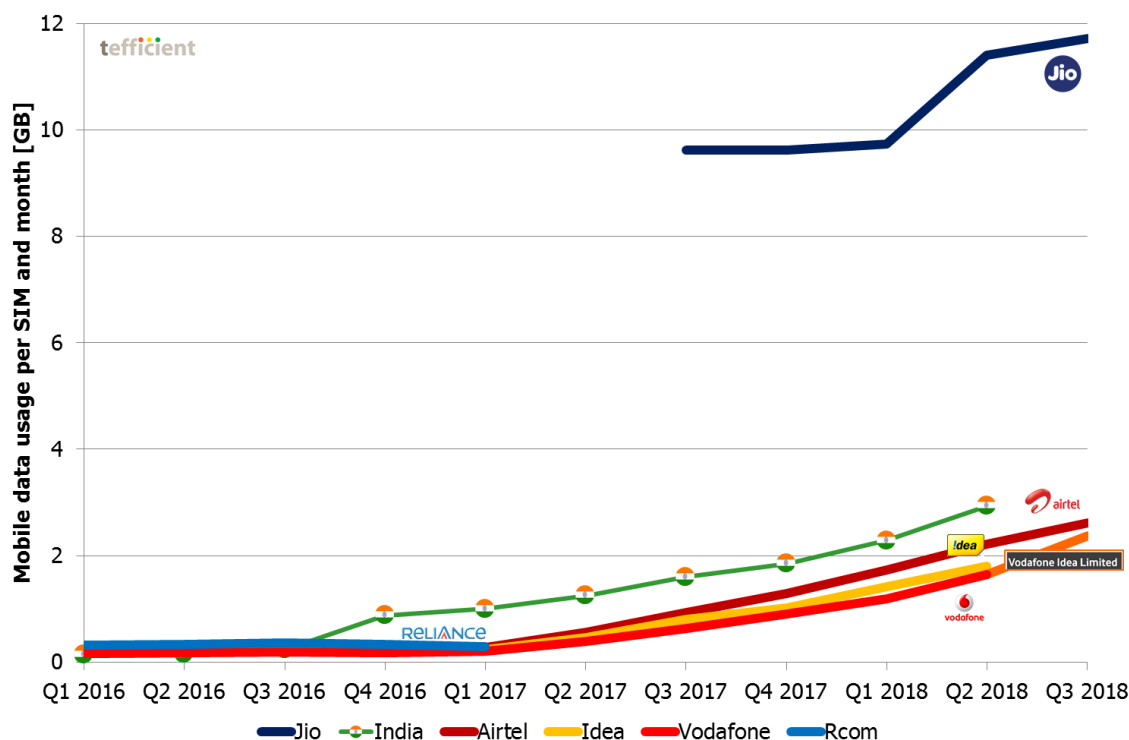


Figure 8. Development of mobile data usage per SIM per operator in India

Back to Figure 6, we should also highlight the usage growth in a market which is new to our analysis:

Mexico. The country had **78%** growth in mobile data usage in the first six months of 2018. Plans with unlimited social media have been around for a while in Mexico, but Movistar has just launched an 'unlimited' plan. As usual it isn't; after 20 GB, it slows down to 1 Mbit/s, but in a Mexican perspective it's a lot of data – the average SIM used 1.2 GB in 1H 2018.

There's good growth in the average data usage also in **Croatia, Hungary, Thailand** (Q1 only) and **France**. The growth laggards are **Hong Kong** (Q1 only), **Sweden**⁶ and **Korea** – three mature markets where fixed broadband speeds are very high, fuelled by high **fibre** penetration. Consequently there's access to good **Wi-Fi** in the homes – but in Hong Kong and Korea's case also widespread access to operator Wi-Fi in public areas.

⁶ In part due to fast growth in international M2M SIMs, see the grey box at page 4

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

We touched upon how Wi-Fi and fibre rollout could affect mobile data usage. But mobile operators could also address the home market with **fixed-line substitution** offers. The take-up can be significant if these offers are reasonably charged and come without caps. It also helps if the fixed broadband offering is weak with much DSL is the mix.

This pretty much described the situation in **Austria**, a country that has emerged as one of Europe's mobile data leaders. Since Q4 2017, the Austrian regulator RTR publishes the fixed data traffic of Austria. If we compare it to the mobile data traffic, it's obvious how important the mobile networks have become for the overall internet in Austria: In the second quarter of 2018, the mobile data traffic was **46.6%** of the fixed data traffic – a ratio that increased compared to the previous two quarters.

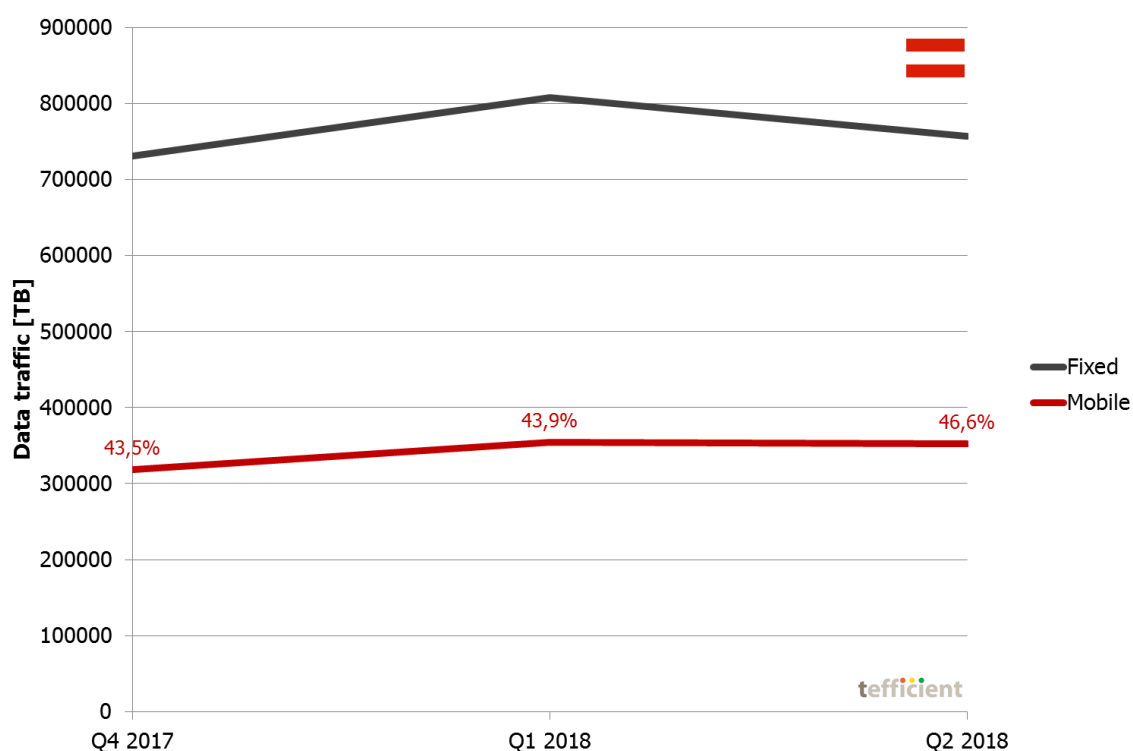


Figure 9. Development of fixed and mobile data traffic in Austria

This takes us to Figure 10. It plots the average data usage per SIM vs. the data-only penetration of a country's SIM base.

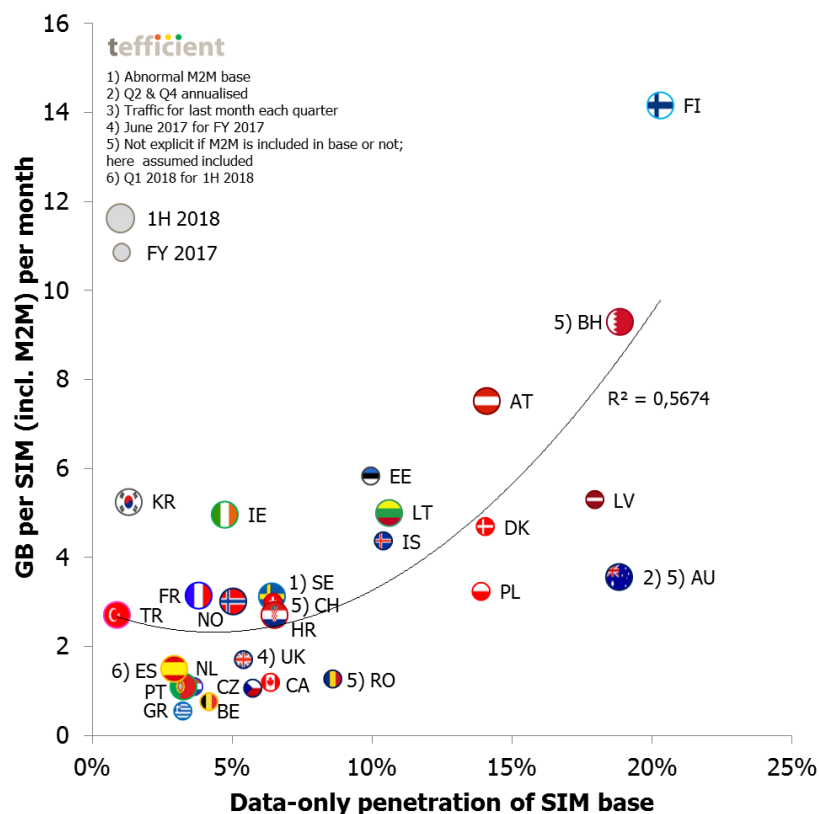


Figure 10. Mobile data usage vs. data-only penetration

In June 2018, **20%** of the SIM base in Finland was data-only. This makes **Finland** the leader in data-only penetration⁷ – and Finland is also the country with the highest average mobile data usage in the world.

Bahrain follows with 19%. After this come Australia (19%), Latvia (18%, Dec 2017), Austria, Denmark and Poland (14%; Denmark & Poland Dec 2017).

The adherence to the regression line is strong. As in all previous reports we conclude that **data-only penetration is a significant driver of 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**. Based on the Austrian and Finnish examples 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. The US wireless market leader **Verizon** has just launched its first **5G** branded service supporting the **fixed wireless access** use case. Figure 10 shows that even relatively low penetration of such data-only services could lift the average data consumption significantly.



⁷ Our last report highlighted Austria as the leader, but the regulator RTR had earlier included M2M SIMs in its reported data-only base, something it has now stopped. Consequently, the Austrian data-only penetration fell. Regrettably, the change is not done retrospectively.

Some of the countries in Figure 10 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 11.

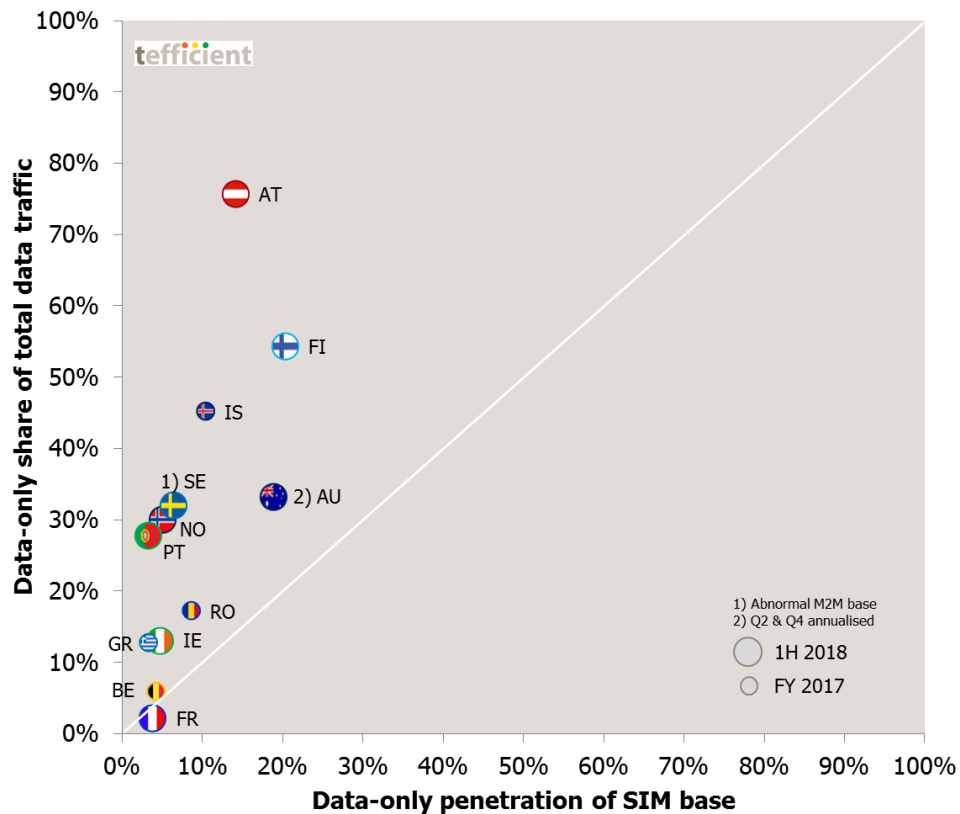


Figure 11. Data-only share of total traffic vs. data-only penetration

With the exception of France, data-only SIMs are carrying a disproportionately high share of the data traffic:

- Portugal **8.5x** higher traffic per data-only SIM vs. any SIM
- Norway **6.0x**
- Austria **5.4x**
- Sweden **5.0x**
- Iceland **4.3x**
- Greece **3.9x**
- Ireland **2.8x**
- Finland **2.7x**
- Romania **2.0x**
- Australia **1.7x**
- Belgium **1.4x**
- France **0.6x**

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 12.

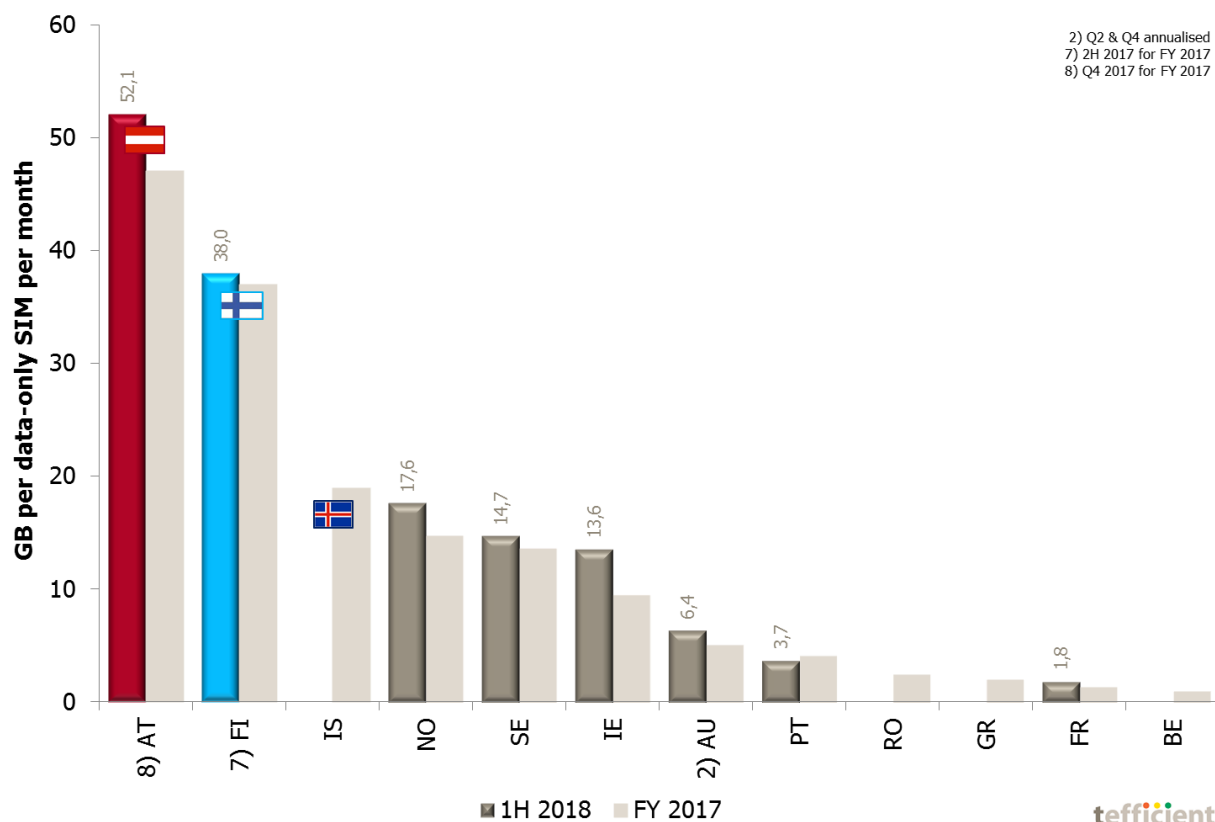


Figure 12. Mobile data usage per data-only SIM per month, 1H 2018 and FY 2017

With RTR's new definition of data-only, **Austria** is the data-only usage leader. In the first half of 2018, the average Austrian data-only SIM consumed **52.1 GB** of data. The Finnish regulator, Viestintävirasto, doesn't report data-only traffic as such, but has started to indicate average usage per data-only subscription. It's lower than in Austria, but still a whopping **38 GB**. Other countries are far from the levels of Austria and Finland. The most likely explanation is that unlimited data-only plans are absent there.

If **5G** really should become the fibre-over-radio solution that e.g. Verizon outlines, the data-only usage figures of Austria and Finland give a taste of the usage that the solution must manage.

4G adoption a weakening driver of data usage

If data-only defines the overall data usage, the same can't really be said for 4G.

Figure 13 plots the average data usage per SIM vs. the 4G adoption within the country SIM base. **Taiwan** leads with 87% followed by **Korea** with 82%. But the adherence to the regression line is weaker than in the previous data-only section.

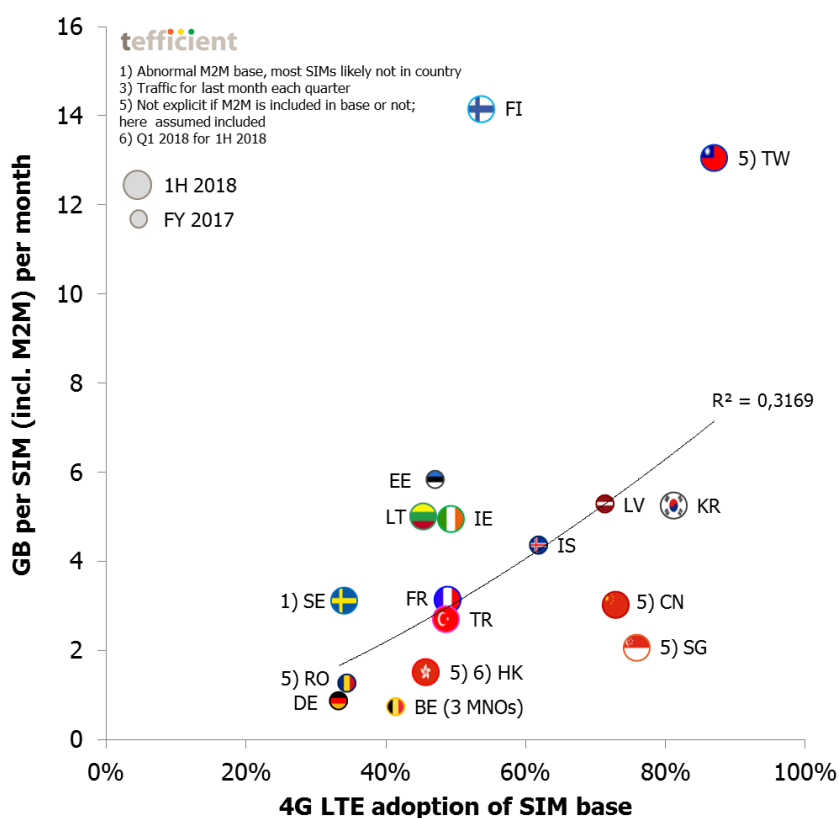


Figure 13. Mobile data usage vs. 4G LTE adoption

In Finland, only 54% of SIMs have subscriptions which allow 4G speeds⁸ but the average data usage is still the highest. While operators from time to time still like to report that 4G drives data usage, Figure 14 shows that 4G in itself is a much weaker driver of traffic than data-only (compare with Figure 11).

Korea has already reached the point where effectively all data traffic is on 4G. This happened even though the 4G penetration was 'just' 82% in December.

4G adoption is a
weakening driver of
mobile data usage
– but 5G is soon
here

⁸ Higher or equal than 30 Mbit/s

Also **Turkey** and **Taiwan** have soon reached 100% of data traffic being on 4G networks.

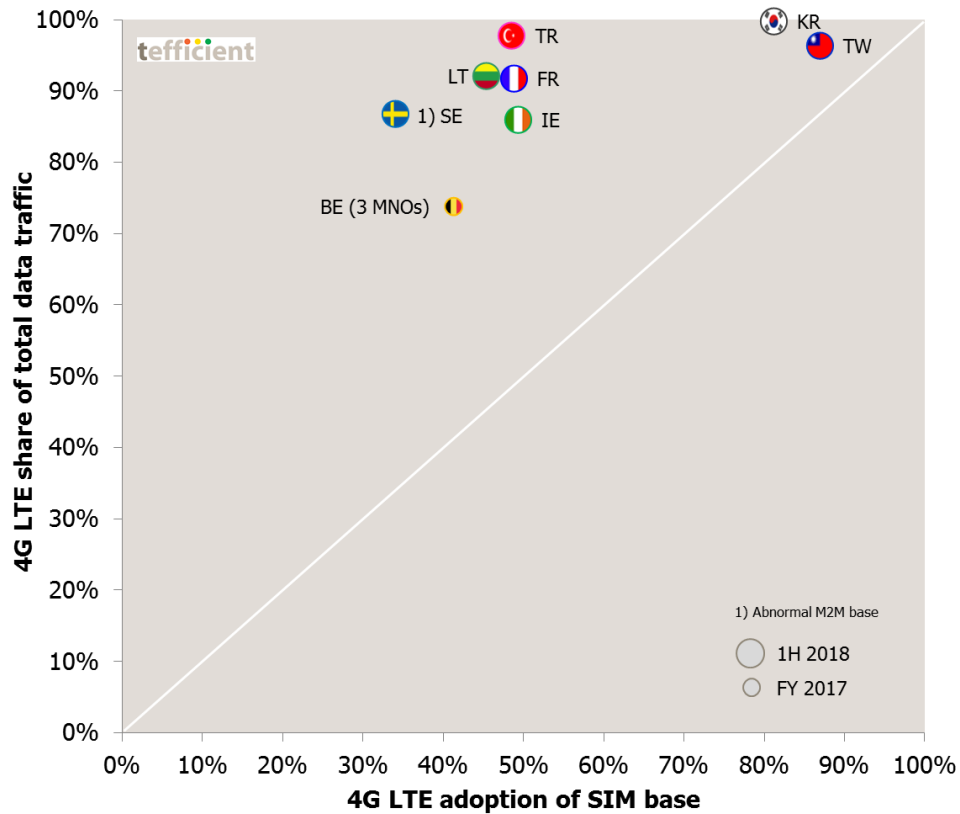


Figure 14. 4G LTE share of total traffic vs. 4G LTE adoption

Without exceptions, 4G users are carrying a disproportionately high share of the data traffic – but in comparison to data-only, the multipliers are much lower:

- Sweden **2.6x⁹** higher traffic per 4G user vs. any SIM
- Lithuania **2.0x**
- Turkey **2.0x**
- France **1.9x**
- Belgium **1.8x**
- Ireland **1.7x**
- Korea **1.2x**
- Taiwan **1.1x**

If comparing with Figure 14 it is clear that the 4G multiplier drops with an increasing 4G adoption. It is, in other words, when 4G still has a relatively low adoption that it makes a difference for the overall data usage.

⁹ The low 4G LTE adoption in Sweden is much because of the large number of international SIMs registered in Sweden

Once 4G has become more common, the effect of the early adopters is watered out and the delta between a 4G user and any SIM becomes smaller.

Over time, the 4G penetration will grow – simply because new terminals will, almost by default, have 4G – but it will no longer have any strong impact on the average data usage.

With **5G** becoming commercially available already this year – the three Korean operators are launching 5G plans for enterprise customers 1 December – we will of course follow 5G's effect on data usage closely.

The total revenue per GB can be anything it seems

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 remaining 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 plan¹⁰ – which means that price still, essentially, is about data volume.

Figure 15 plots the *total* mobile service revenue per consumed gigabyte¹¹ against the average mobile data usage per SIM and month.

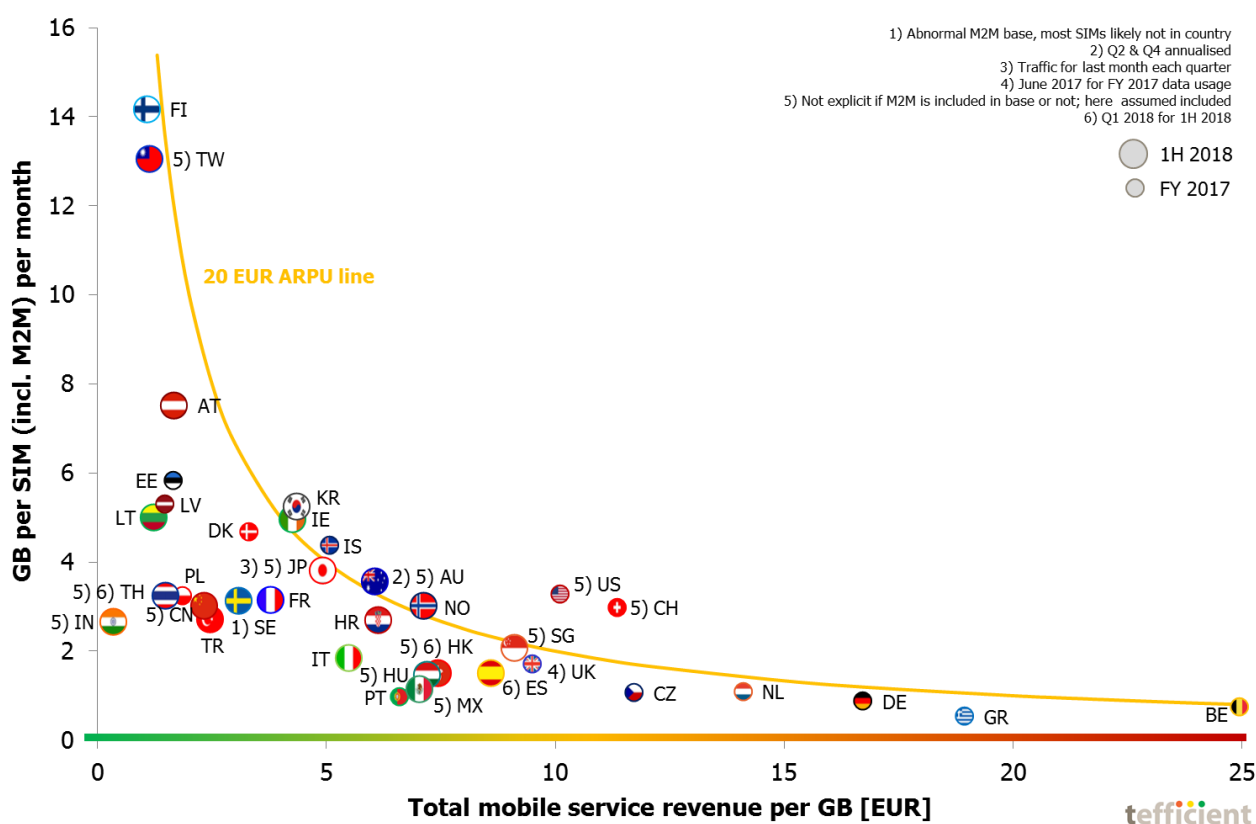


Figure 15. Mobile data usage vs. total mobile service revenue per consumed GB

The amber line shows where **20 EUR of ARPU** is earned. Countries below it had an ARPU lower than 20 EUR; countries above an ARPU higher than 20 EUR.

¹⁰ There are exceptions to this, e.g. Finnish operators and Swisscom, where the price-defining parameter instead is data throughput. There are also operators mixing several parameters such as volume, throughput, policy, zero-rating, video resolution, service bundling etc.

¹¹ Attributing zero value to voice and messaging

There are three countries where operators enjoy much higher total revenue per consumed gigabyte: **Belgium, Greece and Germany**¹². This was at least the case in 2017 based on the latest available data. Even with newer data available, it's highly likely that these are the markets with the highest revenue since the countries constantly have played in the high end of the axis in all of our previous reports.

It's important to point out that our analysis looks at what the mobile operator industry *de facto* charges end-users, not what the best offer on the market currently is. In reality, 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 countries where operators earn the lowest revenue per consumed gigabyte: **India, Finland, Taiwan, Lithuania, Latvia, Thailand, Estonia and Austria**.

Looking at Figure 15 we can conclude – as in all our previous analyses on this topic – that 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 on data-only devices; see Figure 10.

Indian operators get the lowest total revenue per GB – operators in Belgium, Greece and Germany the highest

¹² Canada doesn't fit to the horizontal axis. A reason not to display Canada is that CRTC has not yet reported official figures for 2017 and the usage value is based on OECD's statistics (said to originate from CRTC). By not showing Canada's position in this chart we also hope to this time avoid being discredited by Canadian industry lobbyists that doesn't like the conclusion.

Only weak correlation between data usage and ARPU

Figure 16 is a variant of the just-shown revenue per GB chart – it plots the usage against the average revenue per SIM, i.e. the ARPU.

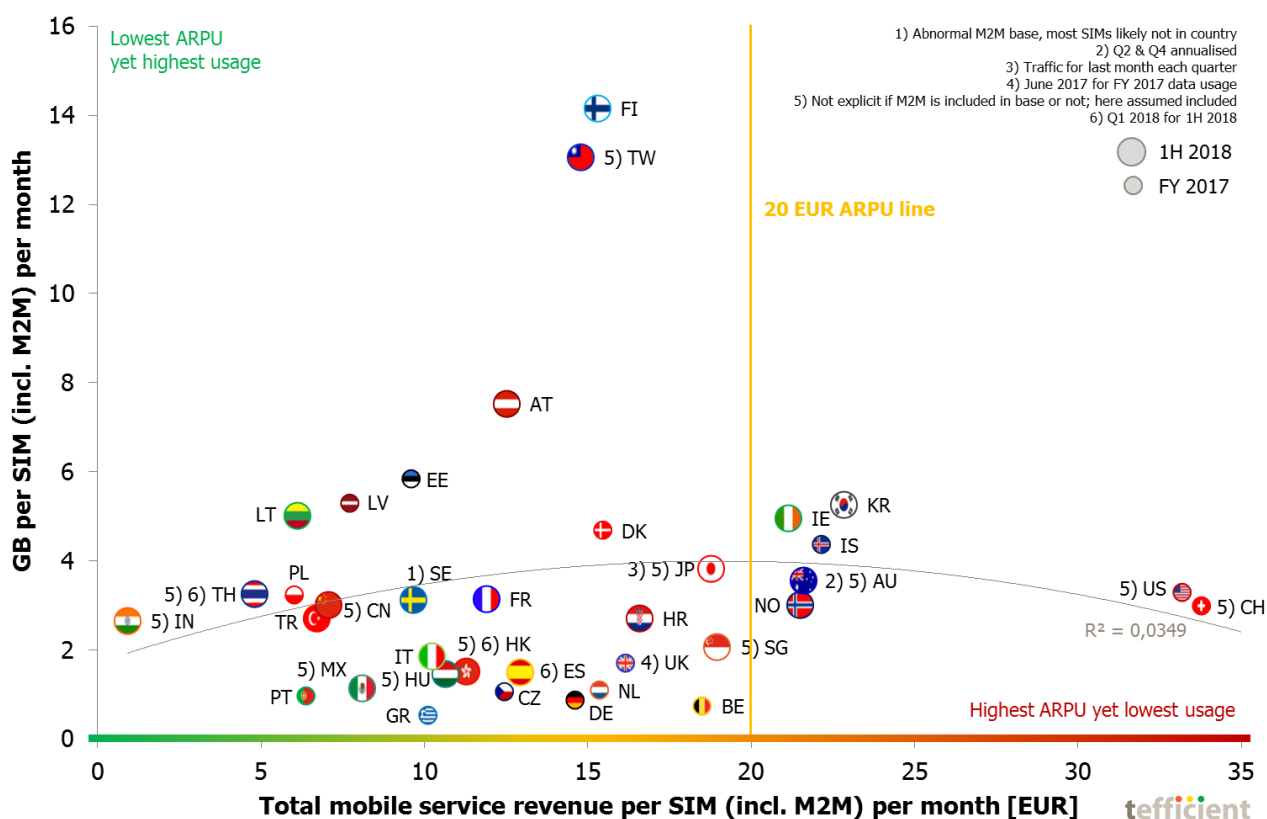


Figure 16. Mobile data usage vs. total mobile service revenue per SIM

Of our studied markets, there are two where operators derive ARPUs much higher than elsewhere:

Switzerland and the **USA**¹³.

Operators in the upper left corner – **Finland, Taiwan, Austria, Estonia, Latvia, Lithuania, Thailand** and **India** – are being the most generous with mobile data considering their ARPU. These countries form a nice string suggesting that operators could expect to get rewarded with higher ARPU when usage grows.

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

¹³ Canada removed from this chart; see footnote 12

Conclusion

Mobile data usage is still growing in all of the 39 countries covered by this analysis. The growth rates are very different and so are the usage levels. As usual, **Finland** tops the charts – with 14.2 GB per average SIM per month in the first half of 2018. If excluding M2M, the average usage in Finland grows to 16.0 GB per month. But in spite of **65%** of non-M2M SIMs being **unlimited**, the data usage isn't particularly fast there – it grew 22% in the first six months of 2018. **China** grew 102% and **India** 82%. This growth meant that **China** and **India** passed mature markets like Hong Kong, Spain, Italy and Singapore in average usage in 1H 2018.

Our analysis shows strong correlation between the **data-only penetration** of a country's SIM base and the average data usage. **Austria** and **Finland** are the two data-only powerhouses of the world. Austria's usage is higher, but Finland's penetration higher.

The **4G** share of total mobile data traffic has already effectively reached 100% in **Korea** even though the 4G adoption is less than that; 82%. The rest of the world (except Taiwan) is behind Korea in 4G adoption, but Korea's data usage isn't the highest. For other mature markets this means that the data usage upside by an increasing 4G adoption in itself is limited. **5G** could change this.

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 **India, Finland, Taiwan, Lithuania, Latvia, Thailand, Estonia** and **Austria**. These countries are mobile data paradises for users.

Belgium, Greece and **Germany** represent the other end. The total revenue per gigabyte here is roughly 50 times higher than in India and 15 times higher than in Finland. And consequently, mobile usage is very low.

Low data usage doesn't necessarily mean that the ARPU is low, though. **Switzerland** and **USA** have the highest ARPU levels among the countries in our analysis. [We'll come back to Canada once the official statistics eventually are reported].