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DIGITAL FUEL MONITOR
MONITORING MOBILE CONNECTIVITY COMPETITIVENESS
By Rewheel

4G&5G prices are 2x to 4x lower in markets with four MNOs

What are the factors that determine mobile prices? Market concentration (no. of MNOs) has a statistically significant effect on 4G&5G monthly and gigabyte prices. The higher the no. of MNOs the lower the price.

Rewheel research PRO econometric study, December 2020

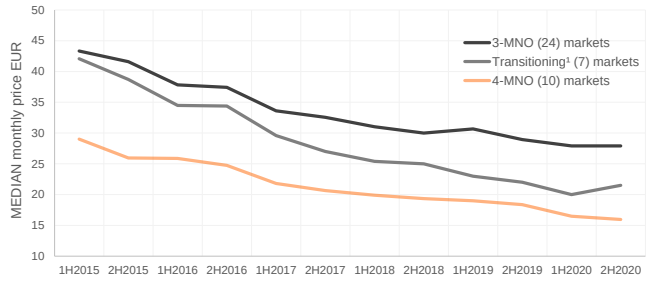
What are the competition factors that significantly affect mobile prices?

- Market concentration (Herfindahl-Hirschman Index HHI) has a statistically significant effect on 4G&5G monthly and gigabyte prices. The higher the market concentration the higher the price.
- The number of mobile network operators present (no. of MNOs) has an even stronger statistically significant effect on 4G&5G monthly and gigabyte prices. The higher the no. of MNOs the lower the price.
- The presence of a mobile network operator from a maverick group (e.g. Iliad) has a significant effect on 4G&5G prices.

How much lower are prices in 4-MNO vs. 3-MNO markets?

- Monthly and gigabyte prices are much lower in 4-MNO than in 3-MNO markets and have been falling faster.
- In 2H2020 the MEDIAN monthly price in 4-MNO markets was nearly 2x lower than in 3-MNO markets.
- In 2H2020 the MEDIAN gigabyte price in 4-MNO markets was 4x lower than in 3-MNO markets.

MEDIAN monthly price in 3-MNO vs. 4-MNO markets - EU & OECD
of 4G&5G smartphone plans with at least 1000mins



¹ EU & OECD markets that have been transitioning from 4 to 3 or 3 to 4 MNOs (e.g. Germany).
Prices in markets with national currencies other than EUR were converted to EUR using flat exchange rates.

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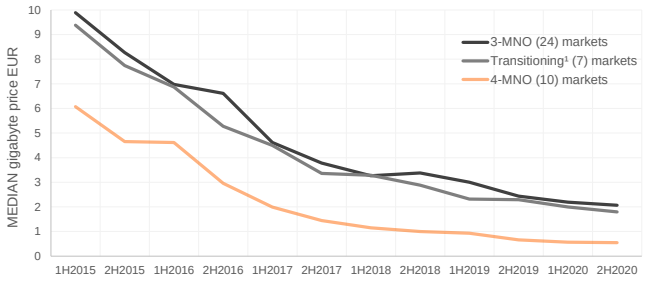
MEDIAN gigabyte price in 3-MNO vs. 4-MNO markets - EU & OECD
of 4G&5G smartphone plans with at least 1000mins



¹ EU & OECD markets that have been transitioning from 4 to 3 or 3 to 4 MNOs (e.g. Germany).
Prices in markets with national currencies other than EUR were converted to EUR using flat exchange rates.

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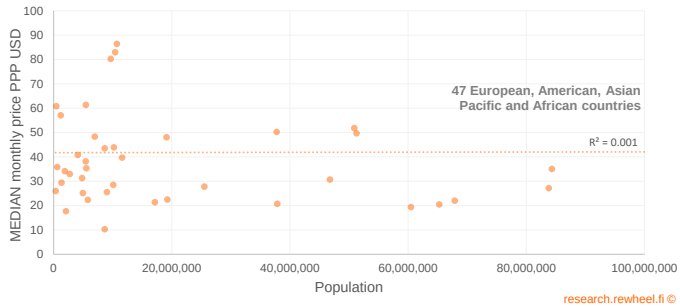
What are the factors that DO NOT significantly affect mobile prices?

- The is no link between the country overall consumer price level and 4G&5G monthly or gigabyte prices.
- There is no link between the country population and 4G&5G monthly or gigabyte prices.
- There is no link between the country land area and 4G&5G monthly or gigabyte prices.
- There is no link between the country population density and 4G&5G monthly or gigabyte prices.
- There is no link between the country average download speed and 4G&5G monthly or gigabyte prices.

Country population vs. country MEDIAN monthly price
of 4G&5G smartphone plans with at least 1000mins



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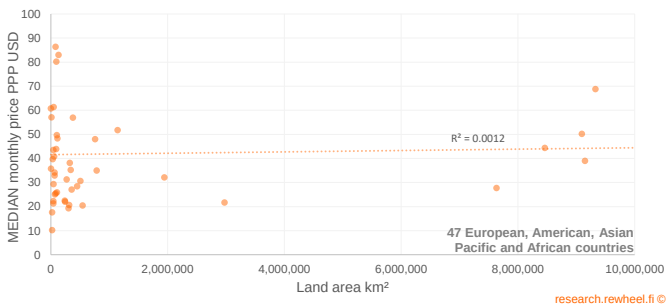
Country land area vs. country MEDIAN monthly price
of 4G&5G smartphone plans with at least 1000mins



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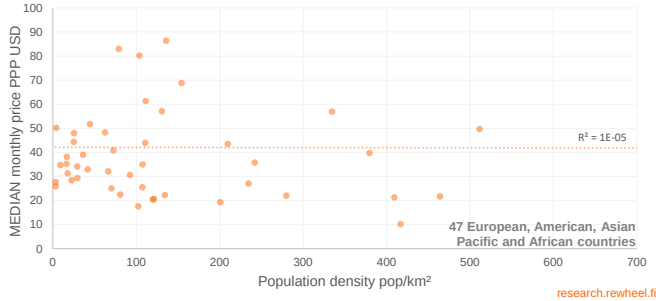
Country population density vs. country MEDIAN monthly price
of 4G&5G smartphone plans with at least 1000mins



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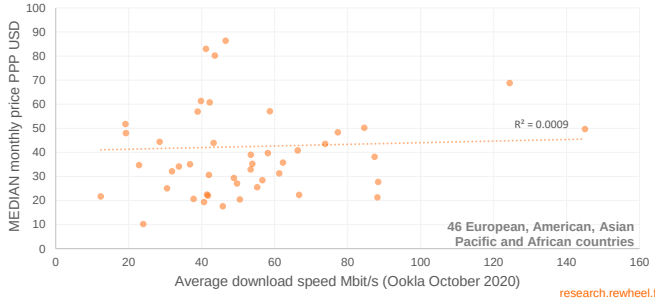
Country average mobile speed vs. country MEDIAN monthly price
of 4G&5G smartphone plans with at least 1000mins



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Founded in 2009 and incorporated in Finland, Rewheel is a privately owned independent telecom research firm and boutique management consultancy. Our clients are mobile network operators, telco groups, MVNO groups, competition authorities, telecom sector regulators, governments, global internet firms, mobile data-centric start-ups, PE and VC investors.

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1 Context and methodology

1.1 Study context

What are the factors that determine mobile prices?

In January 2019 in a study[1] titled "*4G prices as a function market concentration, number of MNOs, operator subscriber share, position, group affiliation and country general price level*" we showed that mobile monthly prices are mostly affected by the number (lower in 4-MNO vs. 3-MNO markets) and type (lower for challenger/maverick operators vs. fixed-line incumbents) present in a market. Therein, we concluded that the single most important factor that leads to significantly lower prices is neither the country overall consumer price level nor the market concentration as measured by the Herfindahl-Hirschman Index (HHI) but rather the presence of a 4th mobile network challenger/maverick operator such as Iliad, Hutchison, etc. Our 2019 study was based on October 2018 smartphone plan prices from 141 mobile network operators present in the 41 EU28 and OECD countries (Digital Fuel Monitor's 10th release[2] 2H2018).

The January 2019 study was not our first study that concluded that mobile prices are predominantly determined by competition related factors and are not linked to other exogenous macroeconomic factors such as the country overall consumer price level, GDP per capita, disposable income, etc. Our first study[3] that showed that mobile prices are predominantly determined by the degree of effective competition (i.e. number and type of mobile network operators present in a market) was released eight years ago, in December 2012. The dependency of mobile prices on effective competition (i.e. number and type of MNOs present) was reaffirmed in our "*Tight oligopoly mobile markets*" 2015[4] and 2016[5] studies.

When presented with studies (e.g. Ofcom's UK econometric 2015 study[6]) showing that mobile prices are higher in markets where fewer mobile network and/or no maverick operators are present industry lobbyists make every effort to muddy the waters by claiming that the higher prices are instead a result of higher overall consumer price levels, higher taxes, or higher costs of building and maintaining mobile networks in some markets due to large population, large land area, challenging terrain, low population density, high population density (paradoxically), higher average mobile network speeds, etc.

We have invalidated many of these unsubstantiated claims. For example, in our March 2020 study[7] commissioned by the Greek national competition authority titled "*Review of mobile data connectivity competitiveness in Greece within the wider context of digital economy competitiveness*" we showed that Greek mobile prices are among the highest in EU & OECD markets even after the Greek mobile telephony special tax is excluded. In our September 2019 study[8] titled "*Root cause of weak competition in the Canadian wireless market*" we showed that Canadian wireless prices are among the highest in EU & OECD markets due to the absence of effective network-based competition (i.e. Canada is a de-facto network duopoly).

In November 2020, in our study[9] titled "*4G&5G connectivity competitiveness 2020*", using DFMonitor's 14th release 2H2020 data (September 2020 prices), we showed that Canada was the country with overall the least competitive monthly prices among 48 European, American, Asian Pacific and African countries while Greece was the EU country with overall the least competitive monthly prices.

Herein, using DFMonitor's 14th release[10] 2H2020 data (September 2020 prices) we set out to re-examine the dependency of mobile monthly and as well gigabyte prices (i.e. unit price of mobile data volume: monthly retail price divided by the included gigabyte allowance) upon market concentration and as well examine for the first time a number of non-competition related factors that we have not previously analysed.

[1] http://research.rewheel.fi/downloads/4G_prices_vs_number_MNOs_postition__share_concentration_PUBLIC.pdf
[2] http://research.rewheel.fi/downloads/The_state_of_4G_pricing_DFMonitor_10th_release_2H2018_PUBLIC.pdf
[3] http://research.rewheel.fi/downloads/Rewheel_EU27_smartphone_tariff_competitiveness_report_December_2012_HIGHLIGHTS.pdf
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[9] http://research.rewheel.fi/downloads/4G_5G_connectivity_competitiveness_2020_PUBLIC_VERSION.pdf
[10] http://research.rewheel.fi/downloads/The_state_of_4G_5G_pricing_DFMonitor_14_release_2H2020_PUBLIC.pdf

After re-affirming, using two Comparative Price Level Indexes compiled by OECD and Eurostat, that mobile prices are not in any significant way linked to the country overall consumer price level we show that likewise there is no link between mobile prices and country population, country land area and country population density.

Moreover, using two sets of country average download mobile network speed global rankings published by Ookla and Opensingal, we show that there is no link between mobile prices and country average mobile network download speed.

In the next step we re-affirm that market concentration has a significant effect on gigabyte and in particular monthly prices. The link between 4G&5G monthly and gigabyte prices is even stronger when market concentration is expressed as a function of the number of mobile network operators present (e.g. 4 vs. 3 MNOs) than when market concentration is measured by the Herfindahl-Hirschman Index (HHI).

We conclude by presenting the historic development of 4G&5G monthly and gigabyte prices in 3-MNO, 4-MNO and markets that are transitioning from 3 to 4 (e.g. Germany) and 4 to 3 MNOs (e.g. Netherlands). As we have been reporting in many of our previous studies[11][12] 4G&5G monthly and gigabyte prices are much lower in 4-MNO than in 3-MNO markets and have been falling faster. In 2H2020 the median monthly price in 4-MNO markets was nearly 2x lower than in 3-MNO markets while the median gigabyte price in 4-MNO markets was 4x than lower than in 3-MNO markets.

1.2 Methodology

Rewheel's Digital Fuel Monitor (DFMonitor) bi-annual releases have been tracking 4G&5G broadband prices in 48 European, American, Asia Pacific and African countries since the first half of 2014. In the 14th release[13] 2H2020 DFMonitor tracked and analysed the state of 4G&5G broadband pricing during the second half of 2020 (September 2020 prices) and as well the historic development of prices dating back to the first half of 2014. The 14th release 2H2020 included prices from 168 mobile network operators (that are part of 92 operator groups), 79 operator sub-brands and 70 major MVNOs that were present in the 48 European, American, Asia Pacific and African countries.

DFMonitor uses a number of competitiveness metrics (such as *MIN monthly price for UNLIMITED data, MEDIAN monthly price for UNLIMITED data, % of plans with UNLIMITED data, MEDIAN monthly price, MEDIAN gigabyte price, MAX gigabytes that 5, 10, 20, 25, 30, 40, 50, 60, 70 and 80 EUR bought and MIN monthly price for 1, 5, 10, 50, 100, 300, 500 and 1000 gigabytes)* to analyse the 4G&5G broadband prices and rank the 48 countries included in the international comparison.

In this study we examine the dependency of mobile prices upon country overall consumer price level, country population, country land area, country population density, country average mobile network download speed and market concentration (HHI and as well no. of MNOs present) using three 4G&5G smartphone plan price metrics.

The three price metrics we use herein are;

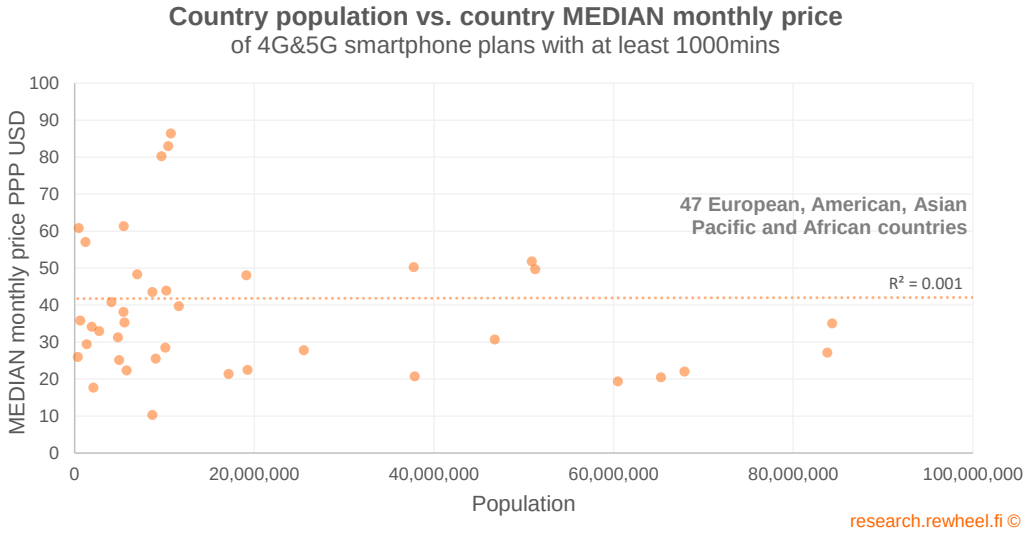
a. the *MEDIAN monthly price* of 4G&5G smartphone plans with at least 1000 minutes (to all domestic mobile & fixed networks)
b. the *MEDIAN gigabyte price* of 4G&5G smartphone plans with at least 1000 minutes (to all domestic mobile & fixed networks)
c. the *MIN monthly price* for a 4G or 5G smartphone plan with at least 1000 minutes (to all domestic mobile & fixed networks), 10 gigabytes and 10 Mbit/s

The *MEDIAN monthly price* is the median monthly retail price (including VAT and other applicable taxes) per country among all eligible tariffs logged in the DFMonitor database. The *MEDIAN gigabyte price* is the median gigabyte price (retail monthly price including VAT and other applicable taxes divided by the included gigabyte allowance) per country among all eligible tariffs logged in the DFMonitor database. *The MIN monthly price for 10 gigabytes* is the lowest monthly retail price (including VAT and other applicable taxes) per country among all eligible tariffs that were logged in the DFMonitor database that included at least 1000 minutes, 10 gigabytes and had a peak speed of at least 10 Mbit/s for High Definition (1080p) video.

[11] http://research.rewheel.fi/downloads/The_state_of_4G_pricing_DFMonitor_12th_release_2H2019_PUBLIC.pdf
[12] http://research.rewheel.fi/downloads/The_state_of_4G_pricing_DFMonitor_11th_release_1H2019_PUBLIC.pdf
[13] http://research.rewheel.fi/downloads/The_state_of_4G_5G_pricing_DFMonitor_14_release_2H2020_PUBLIC.pdf

In addition to the *MEDIAN monthly price* and *MEDIAN gigabyte price* metrics which incorporate all eligible tariffs from each operator we selected the *MIN monthly price for 10 gigabytes* because during September 2020 all 168 operators across the 48 European, American, Asia Pacific and African countries sold plans with at least 10 gigabytes. Details regarding the tariff collection and tariff eligibility rules can be found in the methodology section of DFMonitor 14th release[14].

We plot the three price metrics against each factor and examine the degree of linear relationship between the two variables. For example, the scatter plot below depicts the relationship between country population and the country *MEDIAN monthly price* in PPP USD. The sample size includes 47 European, America, Asian Pacific and African countries and the r (Pearson coefficient) and R^2 values are almost zero i.e. no interdependency between the two variables.



For factors that we observe statistically significant uniformly positive or negative correlations across the three price metrics, across the various groups of countries and across the various data sets (e.g. OECD and Eurostat CPL data sets or Open Signal and Ookla mobile network speeds data sets) we conclude that they are determinants of 4G&5G prices in mobile markets.

Among the factors we considered herein we found that only market concentration (Herfindahl-Hirschman Index HHI and in particular no. of MNOs present) is a determinant of 4G&5G prices in mobile markets.

[14] http://research.rewheel.fi/downloads/The_state_of_4G_5G_pricing_DFMonitor_14_release_2H2020_PUBLIC.pdf