

Oversimplified and Misleading International Price Comparisons Must Not Guide Policy and Regulatory Decisions

A Critical Review of Rewheel's
Digital Fuel Monitor Reports

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Disclosures

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Executive Summary

Since 2014, Finnish telecommunications consultancy Rewheel Oy (Rewheel) biannually publishes the “Digital Fuel Monitor” (DFM) that purports to be an international comparison of mobile wireless prices in the 28 member states of the European Union and the 34 member states of the Organisation for Economic Co-operation and Development. The study has received considerable attention from the media and public advocacy groups and interested market participants have proffered Rewheel’s

rankings as economic evidence in regulatory and policy debates around the globe. Even governments and regulators have taken notice of their country’s rank in the Rewheel study. However, uncertainty exists as to whether the parties citing Rewheel’s study have indeed purchased the entire study or if they are using the abbreviated Public versions, which consist of a few pages of largely unlabeled statistics and some commentary, as support for their arguments.

Rewheel’s DFM has never been subject to a comprehensive peer review. The present report fills this void by examining the proclaimed accuracy of a complete version of one of Rewheel’s studies, namely, Rewheel/research’s “The state of 4G pricing – 1H2018,” *Digital Fuel Monitor 9th release*, dated May 1, 2018, as a tool to compare international retail prices for mobile wireless services and as a measure of a country’s state of competition. It finds that Rewheel’s Digital Fuel Monitor is a highly simplistic international price comparison exercise that results in economically meaningless rankings.

The study assumes away the complexities of an international comparison by treating all plans, networks, and countries as identical. This apples-to-oranges comparison offers no economic insights, and governmental agencies cannot use it as the basis for proper regulatory and policy decisions. Decisions as important as these require an in-depth analysis based on facts and specific market circumstances.

Rewheel’s DFM compares countries based on two separate metrics. In its first set of rankings, Rewheel compares the one plan in each country that offers the

highest data allowance for a given hypothetical budget (e.g., €80). All plans with a minimum download speed of 3 Mbps and at least 1,000 voice minutes qualify for the one plan that represents a country. In a second set of rankings, Rewheel divides the monthly recurring charges of the plans in its database by the corresponding data allowance to arrive at what the consultancy refers to as fully allocated gigabyte prices. It then ranks countries by the one plan that represents the median fully allocated gigabyte price. Rewheel offers no explanation as to why these two metrics provide a meaningful basis for comparing international mobile wireless prices.

The fatal flaw of the Rewheel study is its methodology that assumes an unrealistic world where consumers only care about how much data they can get for a certain budget and all other competitive differentiators (i.e., plan and quality differences) and cost differences (e.g., size of network built) are irrelevant.

There is an easy way to demonstrate that Rewheel’s world differs starkly from the actual world. If consumers were to select mobile wireless plans based on monthly data allowances only, as assumed by Rewheel, then they would only purchase the plans offering the most data for a given budget. However, marketplace evidence clearly refutes this simplistic assumption because mobile wireless providers with the alleged data richest plans do not enjoy the largest market share. In fact, there is no indication of a positive correlation between providers offering data rich plans and market share, thus refuting the assumption that consumers only care about data allowances.

Moreover, market research has long revealed that consumers consider far more than data allowances in their purchase decision, including, among other things, network coverage, customer service, plan options, voice

allowances, and quality of service. Rewheel reduces a consumer’s purchase decision to a single variable (data allowance) and thus treats all smartphone plans that offer a voice allowance of at least 1,000 minutes and a download speed of at least 3 Mbps and all data-only plans with the same download requirement as identical. Illustrating the consultancy’s basic tenet, Rewheel assumes that a plan offering 1,000 voice minutes, 500 SMS, and 1 GB of data with a download speed of 4 Mbps on a sparse or regional network in Slovakia is identical to a plan offering unlimited voice, unlimited SMS, 1 GB of data with a download speed of 40 Mbps on a nationwide network in Canada. Consequently, the consultancy incorrectly interprets a potentially higher price for the Canadian plan relative to the Slovakian plan as evidence of excessive price levels and a lack of competition in Canada.



In Rewheel's utopian world, all network investments are futile because the study does not consider differences in network characteristics including download speeds beyond 3 Mbps, coverage, and LTE reach.



In addition to assuming away the complexities of a proper international comparison, the metrics by which Rewheel ranks the countries are of no economic value.

This raises the question of why providers invest billions of dollars in network upgrades when supposedly consumers only care about the price of data and not service quality. Rewheel's assumption is at odds with the facts and basic economic principles. For instance, as recently recognized by OpenSignal, an independent market research firm, Canada is home to some of the fastest and most advanced wireless networks in the world. Yet, based on its simplistic ranking exercise, Rewheel labels that country as noncompetitive and laggard. Quite simply, a market cannot both be noncompetitive and offer some of the best mobile wireless services in the world.

Rewheel also assumes that all networks cost the same by ignoring all cost differences in deploying mobile wireless networks. Thus, Rewheel assumes that building a network in Finland (which Rewheel highlights as a competitive market) must cost the same as building a network in Canada (which Rewheel highlights as a noncompetitive

market) even though Finland has a population one-sixth the size of Canada and a landmass that is one-twenty ninth the size of Canada.

Rewheel ignores differences in regulatory regimes, particularly the difference between calling party pays and wireless party pays, incorrectly includes taxes in its prices, and fails to adjust for purchasing power parity. Rewheel also omits all family and prepaid plans, thereby eliminating from its price comparison most plans selected by consumers in several study countries. The study only records the monthly recurring charges, thereby ignoring other price components, including overage and roaming charges, and fails to adjust for the fact that in several, but not all, countries a subscriber has more than one mobile wireless plan (i.e., multiple SIM cards). Quite simply, a subscriber that pays two \$25 monthly recurring charges does not pay less than a subscriber that pays only one \$45 monthly charge.

As Rewheel's own data reveal, there is no correlation between the average mobile data consumption and Rewheel's ranking metrics. Rewheel's fully allocated gigabyte price blindly divides the monthly recurring charge by the monthly data allowance even though the monthly recurring charge is the sum of the prices of all service elements (e.g., voice, SMS, data allowances, and quality of service). There simply is no reason to believe that all, or even most, subscribers purchase the plan with the maximum data allowance or the plan with the median fully allocated gigabyte price.

The Rewheel study methodology is beyond repair and requires a complete redesign. Consistent with other international price comparisons, such a redesign would correct for Rewheel's data collection errors (e.g., exclude all taxes) and employ an econometric model that considers, or normalizes, the differences in plans, networks, country-specific cost structures, and other dissimilarities.

Absent these corrections, the Rewheel study results provide no meaningful insight into prices – let alone competition and should not be relied upon as a basis for regulatory decisions.

I. Introduction

A

Background

The “Digital Fuel Monitor” (DFM) published by Rewheel Oy (Rewheel), a Finnish telecommunications consulting firm, is a highly simplistic international price comparison exercise that results in economically meaningless rankings. The study ignores the differences in mobile wireless plans offered by the mobile wireless providers it studies, the quality variations in their respective networks, and the disparities among the countries in which they offer their services. It misses many of the most popular retail plans, glosses over the impact of different regulatory regimes, incorrectly records prices and total consumer expenditures, and ranks countries by metrics that bear no competitive significance.

Not surprisingly, the marketplace evidence refutes Rewheel’s findings. Unfortunately, the simplicity of Rewheel’s rankings and the consultancy’s strategy to make only select findings available as part of its free content have hidden the study’s flaws from governments, the media, and the public. Some of these parties, however, rely on Rewheel’s Public version of the DFM, which is just a few pages of largely unlabeled data and some commentary, for their contention that there exists a lack of

competition in several mobile wireless markets, especially in Canada. It is important that governmental, especially regulatory and competition agencies, recognize the weaknesses of the DFM so as not to use the study as the basis for any regulations and/or policies. This report uses the complete version of Rewheel’s *Digital Fuel Monitor 9th release*, dated May 1, 2018, to unveil the many methodological and practical limitations of the Rewheel study and demonstrates that simple is not always better.

The DFM, which Rewheel has been publishing since 2014, is a biannual research report that purports to analyze and rank retail prices for 4G mobile wireless services in the 28 member states of the European Union (EU) and the 34 member states of the Organisation for Economic Co-operation and Development (OECD).¹ The DFM reports two metrics for each of the 41 study countries. First, Rewheel reports the maximum gigabytes of data that consumers in each study country can buy at one or more monthly price points (i.e., €5, €10, €15, €20, €25, €30, €40, €50, €60, €70, and €80). Second, Rewheel divides the monthly recurring charges (MRCs) for said plans by the monthly data allowances included in the same to arrive at what the consultancy calls “fully allocated gigabyte prices.”² It then ranks the 41 countries according to the *one plan* that offers the *maximum* monthly gigabyte allowance at each price point and the *one plan* that represents the *median* fully allocated gigabyte price.

Based on these rankings, Rewheel then draws various economic conclusions with respect to the relative affordability of mobile wireless service and the level of competition in a country. For instance, Rewheel opines that €30 is “mass affordable” as the amount “is most likely a pricing point that most consumers and business (sic) could afford....”³ The consultancy also proclaims, “how many gigabytes each operator sells ... is easy to understand even by consumers” and “well characterizes

the overall price competitiveness of a given market....”⁴ Similarly, Rewheel claims that its rankings demonstrate that prices in Canada and the United States are “exorbitant” and that Greece, Cyprus, Malta, and Canada are “laggard countries” with “non-competitive markets.”⁵

Possibly because of the proclaimed simplicity, the Rewheel rankings attract wide press coverage. The *HuffPost* reports that Rewheel “found Canadian wireless customers are getting less for their money than consumers almost anywhere else.”⁶ The *Toronto Star* cites to Rewheel’s ranking of Canada as the “fifth-lowest in the study” with respect to “how much monthly data consumers could get for 30 euros (roughly \$46 Canadian).”⁷ Rewheel’s rankings of the U.S. mobile wireless sector also received coverage from *FierceWireless* that reported, “The price U.S. residents pay for mobile broadband on their smartphones is among the highest in the world....”⁸ The *Miami Herald* cites to the DFM in assessing the proposed merger of U.S. mobile wireless providers T-Mobile and Sprint, “Price levels in the U.S. could get even worse if Sprint and T-Mobile, two of the country’s four giant mobile carriers, end up merging, according to Rewheel.”⁹ The blog site *4G.DE* explains to its readers, “[I]n the [Rewheel] study of October 2018, Germany scores badly in a Europe-wide comparison.”¹⁰ Rewheel’s DFM rankings also received media coverage in Austria, the United Kingdom, the Czech Republic, and Italy.¹¹

1. See Rewheel/research, “The state of 4G pricing – 1H2018,” *Digital Fuel Monitor 9th release*, May 1, 2018, p. 1 (hereinafter DFM 9th release).

2. *Ibid.*, p. 3.

3. *Ibid.*, p. 8.

4. *Ibid.*

5. *Ibid.*, pp. 4, 20.

6. Daniel Tencer, “Canadians Get Some Of World’s Worst Deals On Wireless Data, Study Finds,” *HuffPost*, updated May 8, 2018, https://www.huffingtonpost.ca/2018/05/08/wireless-data-prices-canada_a_23429799/.

7. Josh Rubin, “Wireless firms rein in data price wars,” *The Star*, Dec. 3, 2018, <https://www.thestar.com/business/technology/2018/12/03/wireless-firms-rein-in-data-price-wars.html>.

8. Matt Kapko, U.S. mobile broadband is among the most expensive in the world, new report finds,” *FierceWireless*, Nov. 19, 2018, <https://www.fiercewireless.com/wireless/u-s-mobile-broadband-among-most-expensive-world-new-report-finds>.

9. Jared Gilmour, “Americans pay way more for data than others, and it could get worse, experts warn,” *Miami Herald*, Dec. 14, 2018, <https://www.miamiherald.com/news/nation-world/national/article223087025.html>.

10. Marius Pieruschka, “LTE tariffs in comparison: Germans get little data volume,” *4G.DE*, <https://www.4g.de/news/lte-tarife-vergleich-datenvolumen-11547/> [Translation by Google Translate].

11. See, e.g., Handelsblatt, <https://app.handelsblatt.com/unternehmen/it-medien/auswirkungen-auf-o2-und-e-plus-mobilfunkfusion-treibt-preise-in-oesterreich>; Financial Times, <https://www.ft.com/content/3ba4a3ea-b128-11e3-9548-00144feab7de>; mobile.iDNES.CZ, https://www.idnes.cz/mobil/mobilni-operatori/babis-ceny-mobilnich-dat-A19Q114_122238_mobilni-operatori_im; MondoMobileWeb, <https://www.mondomobileweb.it/136180-gli-analisti-di-rewheel-sulla-sostenibilita-di-iliad-necessari-prezzi-piu-alti-e-contratti-di-rete-fissa/>.

Moreover, several parties in their submissions to regulators and enforcement agencies have used Rewheel's rankings as evidence of a lack of competition. For example, a report prepared on behalf of the Canadian mobile wireless provider Ice Wireless Inc. cites Rewheel's DFM in its claim, "Compared to other OECD countries, many of which offer unlimited data allowances, gigabyte allowances in Canada are much smaller and among the lowest in the OECD..."¹² The consumer group Competition Advocates relied on the Rewheel study in its appeal to the U.S. Federal Communications Commission (FCC) to hold a hearing on the proposed merger of Sprint and T-Mobile, "[A]s a Rewheel research report recently found, U.S. consumers already pay the highest prices for mobile broadband among the 41 [EU and OECD] countries, and mobile wireless markets that have recently consolidated from four firms to three have seen less aggressive price competition."¹³ DISH Network Corp. also cited a Rewheel DFM report in opposition to the proposed merger, "[T]he US has the 5th highest gigabyte

prices in smartphone plans and is the most expensive market in mobile broadband among the 41 EU28 & OECD countries."¹⁴

Even some regulators and competition authorities have trusted the proclaimed accuracy of the Rewheel rankings. For instance, Germany's Monopolies Commission used Rewheel in a competition review of the German telecommunications sector and reproduced Rewheel's ranking for the €30 price point.¹⁵ Similarly, the British regulator Ofcom cites to Rewheel in an "analysis of the effect of disruptive firms on mobile pricing."¹⁶

Rewheel has positioned its DFM rankings as a tool for assessing competition around the world and has gained the attention of the media, several market participants, consumer advocacy groups, and in certain instances regulators and government agencies. These parties trust the accuracy of the study even though it has never been thoroughly peer reviewed.¹⁷

B

Purpose and Structure of this Report

The purpose of this report is to examine the proclaimed accuracy of the Rewheel study as a tool to compare international retail prices for mobile wireless services and as a measure of a country's state of competition. As such, this report serves as a peer review of the Rewheel study to ensure that the media, market participants, government agencies, and regulators rely on accurate economic evidence when forming their opinions. The present report uses the *Digital Fuel Monitor 9th release* (1H2018) as an example and focuses its discussion on the Canadian sample case.

The structure of this report is as follows. Section II provides an overview of the Rewheel methodology and its results. Section III examines the study's purported accuracy as an international pricing comparison. Section IV describes why Rewheel's ranking metrics are economically meaningless. Section V explains why the DFM does not and cannot serve as a measure of competition. Section VI explains the redesign required to turn the Rewheel study into a proper study. Section VII presents the conclusions.

12. Markus von Wartburg, "Economic Review of Mandated Wholesale Access for Wi-Fi First Service Providers, Investment and Competition in the Mobile Wireless Telecommunications Industry in Canada," prepared on behalf of and submitted by Ice Wireless Inc. in *Reconsideration in Telecom Decision, 2017-56 Regarding Final Terms and Conditions for Wholesale Mobile Wireless Roaming Services*, CRTC 2017-259, October 27, 2017, ¶ 39.

13. Phillip Berenbroick (Public Knowledge) letter to Marlene H. Dortch (FCC), Re: Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 18-197, December 20, 2017.

14. Pantelis Michalopoulos (Steptoe) letter to Marlene Dortch (FCC), Re: Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 18-197, December 4, 2018, pp. 20-21.

15. See Sondergutachten der Monopolkommission, "Telekommunikation 2017: Auf Wettbewerb bauen!" 2017, ¶ 34 and Figure 2.9.

16. Ofcom, "A cross-country econometric analysis of the effect of disruptive firms on mobile pricing," Mar. 15, 2016, n. 40, https://www.ofcom.org.uk/data/assets/pdf_file/0019/74107/research_document.pdf.

17. Some of Rewheel's work has been criticized previously. See Robert Kenny & Tom Broughton, "A critical analysis of the Rewheel paper, EU27 mobile data cost competitiveness report - May 2013," *Communications Chambers*, June 17, 2013; see also Solchaga Recio & Associates, "Rebuttal of the mobile internet prices analysis using the incremental gigabyte," *Telefonica*, April 2015; Frontier Economics, "Mobile prices in Austria, What Has Happened After the Mobile Merger in Austria," May 2015.

II. The Rewheel price study is a simple two-metric ranking

A

The Rewheel Methodology

Rewheel's DFM provides two general sets of country rankings. In its first set of rankings, Rewheel compares the *one* plan in each country that offers the *highest* data allowance for a given hypothetical budget (e.g., €30). All smartphone plans with a minimum download speed of 3 Mbps and at least 1,000 voice minutes qualify for the one plan that represents a country. In a second set of rankings, Rewheel divides the MRCs of the smartphone plans in its database by the corresponding data allowance to arrive at what the consultancy refers to as "fully allocated gigabyte prices."¹⁸ It then ranks countries by the one plan that represents the *median* fully allocated gigabyte price. Thus, Rewheel ranks countries based on two representative plans: (1) one plan that allegedly offers the most mobile data given a hypothetical budget

and (2) one plan that represents the median "price" per megabyte. Rewheel offers no explanation as to why these two metrics provide a meaningful basis for comparing international mobile wireless prices.

To complete its two ranking exercises, Rewheel reportedly visited the websites of 137 operators and 47 major MVNOs in 41 European Union or other OECD countries.¹⁹ In each country, Rewheel presumably recorded the MRCs and monthly data allowances of the one plan offered by each of the 184 providers that contained the largest data allowance for a given hypothetical budget (€5, €10, €15, €20, €25, €30, €40, €50, €60, €70, and €80).²⁰ To arrive at the fully allocated gigabyte prices, Rewheel simply divided the MRCs by the monthly data allowances.

18. DFM 9th Release. The version for the second half of 2018 tracked 141 operators and 43 "major MVNOs" in 41 European Union or other OECD countries. (See Rewheel/research, "The state of 4G pricing - 2H2018," *Digital Fuel Monitor 10th release*, October 2018, Methodology.)

19. See Rewheel 9th Methodology, p. 2; see also Rewheel/research, "The state of 4G pricing - 2H2018," *Digital Fuel Monitor 10th release*, October 2018, October 26, 2018 (hereinafter DFM 10th release Public version), http://research.rewheel.fi/downloads/The_state_of_4G_pricing_DFMonitor_10th_release_2H2018_PUBLIC.pdf. The DFM 10th release tracked 141 operators and 43 major MVNOs in 41 European Union or other OECD countries.

20. Rewheel 9th Methodology, p. 2.

In collecting its data points, Rewheel records the prices of postpaid plans only and includes the value-added tax (VAT).²¹ This indicates that the study does not cover prepaid plans and includes price components (e.g., taxes) not controlled by the provider.

Short of a few “very rare” exceptions, Rewheel also opts to include “SIM-only tariffs” thus excluding all plans that provide handset subsidies. Rewheel records general commercial promotions (e.g., two months free if purchased online) offered at the time of data collection but not those aimed at special customer groups (e.g., family plans or plans for seniors). The study also excludes bundled plans (e.g., fixed broadband and mobile service) that typically provide a discount in exchange for purchasing multiple services, and group or family plans.

In addition, the price information does not account for one-time fees such as activation. Rewheel further reveals that it does not adjust for purchasing power parity (PPP) between countries but instead adjusts non-Euro prices by the exchange rate on the day it collected the tariff information. Rewheel’s data collection efforts resulted in a database consisting of 955 smartphone plans and 693 data-only plans for its DFM 9th release. Figure 1 summarizes the Rewheel methodology.

21. Rewheel tracked tariff plans from the main brands of all 137 operators, 51 sub-brands owned by operators, and 47 MVNOs.

Figure 1 Rewheel Study Methodology



B

The Rewheel Competition Claims

Rewheel draws sweeping and incorrect conclusions about the level of competition in its study countries based on its ranking methodology. It also makes some equally incorrect broad suppositions about the relative market performances of countries having three and four facilities-based providers. Rewheel even attempts to use its rankings to opine on consumer ramifications of proposed mergers. Specifically, with respect to competition, Rewheel argues that its rankings demonstrate the following.

- “In Canada and the United States operators continue to charge exorbitant mobile broadband gigabyte prices.”²²
- “[H]ow many gigabytes each operator sells for a mass market affordable retail price point i.e. €30 is a key metric that well characterizes the overall price competitiveness of most EU28 & OECD markets.”²³
- “[H]ow many gigabytes €30 buy (sic) is representative of the competitiveness intensity that characterizes a given a (sic) market.”²⁴
- “There is a group of laggard countries such as Greece, Cyprus, Malta (sic) Canada, etc. (non-competitive markets) whereby the gigabyte allowance does not increase that much.”²⁵

Furthermore, Rewheel claims that its rankings show the following with respect to market structure.

- “In EU28 & OECD markets with 4 MNOs consumers could buy in (sic) average 3 times more gigabytes for €20 and nearly 2 times more for €30 compared to markets with 3 MNOs.”²⁶
- “In the German and Austrian 4 to 3 consolidated mobile markets consumers must pay 4 and 3 times more respectively to buy 50 gigabytes than in the 4-MNO French market.”²⁷
- “The country median gigabyte prices in Korea, Canada, United States, Germany and Japan continue to be a universe apart compared to the country median price (€0.8/GB) of the competitive 4-MNO French market.”²⁸
- “The higher the mobile network operator market position (1st vs. 2nd vs. 3rd vs 4th) the higher its price.”²⁹

Rewheel even opines on the competitive impact of mergers, “Judging from the excessive gigabyte prices, US operators are charging today for 4G mobile broadband ... merger promises concerning affordable 5G home broadband should be critically reviewed and if verified must be made binding.”³⁰ Other than its simple two-metric ranking, Rewheel does not perform any analysis to substantiate its competition claims and, as demonstrated herein, its ranking exercise cannot and does not provide any economic evidence, let alone evidence on competitive market conditions or the impact of market consolidation.

22. DFM 9th release, p. 4 (emphasis added).

23. Ibid., p. 22 (emphasis added).

24. Ibid., p. 8 (emphasis added).

25. Ibid., p. 20 (emphasis added).

26. Ibid., p. 1.

27. Ibid.

28. Ibid., p. 3.

29. Rewheel/research, “4G prices as a function market concentration, number of MNOs, operator subscriber share, position, group affiliation and country general price level,” January 2019, http://research.rewheel.fi/insights/2019_jan_pro_4G_prices_as_a_function_of/.

30. DFM 10th release Public version, p. 4.

III. The Rewheel Study Methodology is Unscientific

Rewheel touts that its rankings are indicative of competitiveness, affordability, and provide direct insights into market structures and the consumer ramifications of mergers. Rewheel releases a few pages of its study free of charge. This teaser document contains a “Free summary, key findings, table of contents (9 pages, pdf)” of the full report.³¹ Consequently, several parties chose to rely on the teaser document and thus did not have a full understanding of how Rewheel compiled the results and did not realize the significant limitations of the study.³² The following section explains why the Rewheel study offers no meaningful insights into the competitive dynamics of mobile wireless markets in the study countries and why it should not serve as a source to support policy and regulatory decisions.

The most fundamental flaw of the Rewheel study is the consultancy’s assumption that consumers only care about how much data they can get for a certain budget and that all other competitive differentiators (i.e., plan and quality differences) and cost differences (e.g., size of network built) are irrelevant. To illustrate the consultancy’s basic tenet, Rewheel incorrectly assumes that a plan with 1,000 voice minutes, 500 SMS, and 1 GB of data with a download speed of 4 Mbps on a sparse or regional network in Slovakia is identical to a plan with unlimited

voice, unlimited SMS, 1 GB of data with a download speed of 40 Mbps on a nationwide network in Canada. Consequently, the consultancy incorrectly interprets a potentially higher price for the Canadian plan relative to the Slovakian plan as evidence of excessive price levels and a lack of competition in Canada. There are several reasons why Rewheel’s assumption of a univariate purchase decision (where only mobile data allowances matter) is irrational.

31. See, for instance, Rewheel/research, Research reports, “The state of 4G pricing – 2H2018 – Digital Fuel Monitor 10th release, October 2018, http://research.rewheel.fi/insights/2018_oct_pro_2h2018_release/.

32. For instance, Competition Advocates cite the nine-page 2H2018 DFM preview in an ex-parte filing with the FCC. Similarly, a report prepared on behalf of Canadian mobile wireless provider Ice Wireless Inc. only cites data from the 1H2017 DFM report that can be found in the preview. (See Phillip Berenbroick (Public Knowledge) letter to Marlene H. Dortch (FCC), n. 4; see also Markus von Wartburg, “Economic Review of Mandated Wholesale Access for Wi-Fi First Service Providers, Investment and Competition in the Mobile Wireless Telecommunications Industry in Canada,” fig. 2, p. 19.)

A

Marketplace Evidence Refutes Rewheel’s Study Results

Unlike assumed by Rewheel, consumers consider far more plan characteristics (attributes) than only how much monthly data a mobile wireless plan offers. There is an easy way to demonstrate this basic point and therefore refute the basic building block of Rewheel’s DFM. If consumers were to select mobile wireless plans based on monthly data allowances only, then they would only purchase the plans offering the most data for a given budget. However, marketplace evidence clearly refutes this simplistic assumption. Consider a Canadian consumer with a hypothetical budget equivalent to €50 (i.e., CAD

75). According to Rewheel’s DFM 9th release, the most data this subscriber can consume with a smartphone plan is 12 GB per month.³³ Rewheel does not disclose its database (despite not containing any confidential data), and providers’ plans change rapidly in the current environment. Thus, it is unknown which mobile provider and plan Rewheel elected to represent Canada. However, Freedom Mobile (Freedom) offers a plan at CAD 60 (CAD 65 without a discount) with 12 GB of data that aligns with Rewheel’s findings in its report. Figure 2 reproduces Freedom’s plan.

Figure 2 Freedom’s Smartphone Plan at €50

Big Gig + Talk 10GB

- 12GB (10GB + 2GB bonus data*) with no data overage fees!
- Unlimited Canada-wide calling
- Unlimited global text

12GB
(10GB + 2GB bonus data*)
for
\$60/mo.!
with Digital Discount*
Regular price: \$65/mo.†

Big Binge Bonus: Enjoy up to **50GB** of bonus data when you activate a new line or upgrade your existing service with MyTab.*

[View Plan Details](#)

[Buy Now](#)

Source: Freedom, <https://www.freedommobile.ca/plans-and-devices/plans>.

If this plan represents the Canadian plan that offers the most data for €50 and if consumers only considered data as part of their purchase decision, Freedom’s plan would be the most popular or at least one of the most popular choices of Canadian consumers. However, Freedom only serves 4.3 percent of the nationwide market.³⁴ Even in Freedom’s home network, which includes selected parts of British Columbia, Alberta, and Ontario, it is not the largest provider. Conversely, if Rewheel’s basic assumption held true, it would mean that Canadian consumers would never purchase plans with data allowances less than the richest data plan. Again, marketplace evidence

contradicts this assumption as in Canada and many other countries the richest data plans are not offered by the market leaders but by discount brands. This revealed preference demonstrates that consumers consider more plan characteristics than just the monthly data allowance. In fact, there is no indication of a positive correlation between providers offering data rich plans and market share, thus refuting the assumption that consumers only care about data allowances. Therefore, Rewheel’s basic assumption is false. This alone significantly limits the economic significance of the ranking exercise.

33. See DFM 9th release, p. 12.

34. Telegeography, GlobalComms, Canada, September 2018.



B Rewheel Ignores Most Purchase Drivers

Consistent with marketplace evidence, there is ample market research demonstrating that consumers consider more than just the monthly data allowance. For instance, a U.S. market research firm studying the reasons why consumers switch mobile wireless providers found price the leading cause of churn followed by data, coverage, customer service, plan options, voice allowances, reliability, and service. As summarized in Table 1, the market research firm identified 15 factors that cause subscribers to leave their mobile wireless provider.

Notably, although the data plan is the most important purchase consideration after price, only 29 percent of U.S. consumers that changed their mobile wireless plan indicated that the data plan was among their reasons for switching providers. The DFM 9th release not only assumes that 100 percent of consumers switch because of the monthly data allowance but also that they have no other reason for switching. Clearly, the empirical evidence contradicts this simplistic assumption.

Table 1 Reasons for Switching Mobile Providers in the United States (July 2017)

37%	Pricing/Value
29%	Data Plan
25%	Coverage
15%	Customer Service
15%	Plan Options
13%	Free Minutes Plan
13%	Reliability (Fewer dropped calls)
12%	Service
12%	Other (please specify)
11%	Internet/Web Access
11%	Technology
7%	Handset Variety
6%	Text Messaging Plans
5%	Music Downloads
3%	Video Services

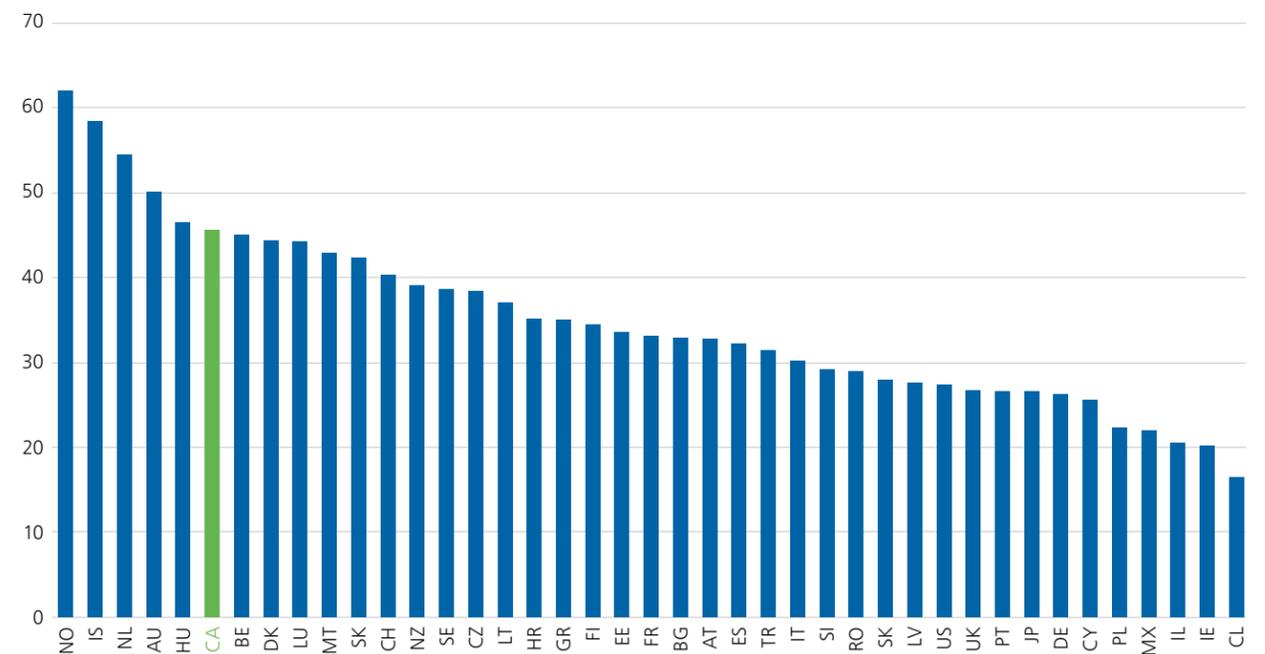
Source: IAB, "Media Influence on Telecom Purchases Among Multicultural Consumers," October 2017, slide 11.

C Rewheel Incorrectly Assumes that Investments are Futile

In addition to ignoring all differences in plan attributes, Rewheel ignores all network quality differences, thereby implicitly assuming that subscribers are unwilling to pay for improved network quality as long as the network offers a download speed of 3 Mbps. Again, the marketplace evidence refutes this assumption as mobile wireless providers around the world invest massive amounts of capital to improve the quality of their networks. For instance, during 2013–2017, Canadian wireless providers invested on average CAD 2.2 billion *per year* in wireless infrastructure.³⁵ Similarly, U.S. mobile wireless provider

T-Mobile announced that it would invest USD 3.5 billion to upgrade its infrastructure to 5G that offers subscribers significantly faster download speeds.³⁶ Rewheel not only ignores these investments but also the different investment levels among countries and thereby implicitly assumes that all these investments were futile. This is unrealistic. As shown in Figure 3, the mobile wireless providers' differing investment levels yield, among other things, significantly different data download speeds, ranging from less than 20 Mbps to over 60 Mbps.

Figure 3 Download Speeds by Study Country



Source: Ookla Speedtest Global Index, February 2018. <https://www.speedtest.net/global-index>.

35. See CRTC, "Communications Monitoring Report 2018, Retail Mobile Sector," open data, Table 6.11, Wireless investments made in plant and equipment (\$ billions).
36. See T-Mobile Newsroom, "T-Mobile and Ericsson Sign Major \$3.5 Billion 5G Agreement," September 11, 2018.



However, as indicated by the vertical line in the figure, the Rewheel study glances over any performance differences beyond its artificial 3 Mbps threshold.

To make matters worse, Rewheel incorrectly attributes higher prices for higher performing (e.g., faster) networks as evidence of a lack of competition. For instance, Rewheel labels Canada as a “laggard” and “non-competitive” country when in fact it has one of the highest download speeds of all study countries for which data download speeds are available. OpenSignal, which is an independent market research firm that analyzes consumer mobile experiences, recently concluded:

As the 5G era approaches, Canada has become a standard bearer for the power of 4G network – and it continues to impress in our metrics. Bell, Rogers and TELUS all averaged download speeds greater than 35 Mbps across their mobile broadband networks in our analysis, and in some cities those operators were pushing the speed envelope well beyond 60 Mbps. Upload speeds are also high, and Canada has achieved an impressive level of 4G reach.³⁷

Rewheel’s conclusions and labels defy basic economic theory because in a noncompetitive, laggard market, providers would have no incentive to invest in faster networks and to increase coverage.

The reason Canada has such high download speeds and broad 4G reach is because the providers are competing fiercely for new subscribers who value network quality as part of the purchasing decision – directly contradicting Rewheel’s generic labeling.

37. OpenSignal, “Canada Mobile Network Experience Report February 2019,” <https://opensignal.com/reports/2019/02/canada/mobile-network-experience>.

D

Rewheel Incorrectly Assumes that All Networks Cost the Same

Rewheel also incorrectly assumes that a mobile network costs the same in all study countries, thereby implying that building a network in Belgium costs the same as building a network in Canada. This is unrealistic as the two countries differ significantly, for example, in terms of size, labor costs, population density, and weather. These differences directly affect costs that, in turn, affect prices. A large mountainous country with a rural population requires more cost per capita to build a nationwide network than a smaller flat or densely populated country. Higher labor costs increase both capital and operating expenditures, whereas low-density geographies require more investment per capita. Even weather can impact prices as extreme temperatures might require specialized equipment

and drive up operating expenditures through higher maintenance costs. Despite this, Rewheel assumes that building a network in Finland (which Rewheel highlights as a competitive market) must cost the same per capita as building a network in Canada (which Rewheel highlights as a noncompetitive market) even though Finland has a population one-sixth the size of Canada and a landmass that is one-twenty ninth the size of Canada. Rewheel again ignores these differences. Rather, the consultancy incorrectly assumes that despite these drastic differences Canadian prices (and the prices of all other study countries) should be identical to Finnish prices, and inexplicably attributes all price differences to a lack of competition.

E

Rewheel Ignores Wireless Party Pay Regimes

Rewheel’s methodology also does not take into account that all the measured countries except for Canada and the United States use calling party pays (CPP), whereas Canada and the United States operate on the concept of wireless party pays (WPP).³⁸ In CPP countries, mobile wireless subscribers pay for outgoing calls but do not pay for incoming calls, whereas in WPP countries mobile wireless subscribers pay for both outgoing and incoming calls. As noted by another price comparison study:

Differences in rating regimes (i.e., CPP versus RPP) can significantly affect both wireline and wireless service price comparisons between the countries, which must be borne in mind when comparing wireless (as well as wireline) rates in Canada and the U.S. with those in other OECD countries.³⁹

Again, Rewheel’s simplistic ranking makes no adjustment for this important difference. This further distorts Rewheel’s ranking results as the MRC (which serves as the numerator for the fully allocated gigabyte price metric) reflects the different regulatory regimes.

38. According to a study comparing RPP and CPP regimes, “After allowing for various economic and technical [factors] average revenue (price) per call is significantly lower with RPP, average minutes of usage per subscriber are significantly higher and the mobile penetration rate is not significantly different. Handset subsidies seem to be lower in the US (with RPP) than in the UK (with CPP).” (S.C. Littlechild, “Mobile termination charges: Calling Party Pays versus Receiving Party Pays,” *Telecommunications Policy* 30 (2006): 242–277.)

39. Wall Communications Inc., “An Examination of Alternative Approaches for Conducting Prices Comparisons of Wireline, Wireless, Wireless and Internet Services in Canada and with Foreign Jurisdictions,” May 5, 2008, p. 3. Although Wall incorrectly labels WPP as RPP, its reference is to WPP.

F Rewheel Misses the Most Popular Plans

The study is further limited as it records prices of plans for single lines only, which omits all family plans. Consequently, Rewheel misses the most popular plans and ends up with a price database that is not representative of the plans available to and selected by subscribers. Consider for instance, U.S. provider Verizon Wireless (Verizon). As depicted in Figure 4, the company offers an unlimited voice, text, and data *family plan* for USD 160 per month for four lines or USD 40 per line.

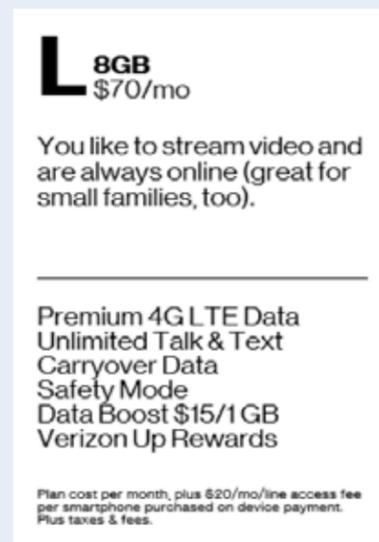
Figure 4 Verizon Unlimited Family Plan



Source: Verizon, <https://www.verizonwireless.com/plans/>.

Rewheel ignores this plan and all other family plans and instead records only the single-line plans. In Verizon's case, it has no unlimited voice, text, and data *single-line* plan. Rather, as shown in Figure 5, the largest single-line plan offers 8 GB per month at a cost of USD 70.

Figure 5 Verizon's Largest Single-Line Plan



Source: Verizon, <https://www.verizonwireless.com/plans/>.

Thus, even though U.S. consumers can obtain an unlimited voice, text, and data plan for as little as USD 40 per line, Rewheel ignores this, records a USD 70 plan, and reports that the U.S. has no unlimited plans. Rewheel then incorrectly concludes, "Even though there are 4 MNOs in the US market, price competition is weak and €30 (~\$35) buys US consumers at most only 10 gigabytes!"⁴⁰

This is clearly wrong as U.S. consumers can and do purchase unlimited data plans for \$40. In fact, in 2015, 68 percent of U.S. smartphone subscribers were on a group or family plan.⁴¹ Rewheel completely ignores these 68 percent of subscribers and thus misses the prices of the plans selected by most subscribers. Rewheel's limited focus on single-line plans implies that the study cannot serve as an indicator for U.S. prices or prices in any other country for that matter because consumers can and do purchase in increments other than single line.⁴²

Rewheel also ignores all prepaid subscribers as it exclusively focuses on postpaid plans and thereby further narrows the relevant product market. The consultancy offers no explanation as to why prepaid plan options are ignored when evaluating price levels across countries. This omission introduces a further bias into the Rewheel study. Depending on the country, the consultancy includes only plans that are attractive to a small portion of subscribers. This tells us very little, if anything, about the prices *actually* paid by subscribers. Table 2 shows the percentage of subscribers that purchased a prepaid plan in select study countries. Consider, for instance, Mexico where an estimated 83 percent of subscribers selected a prepaid plan. By its decision to ignore all prepaid plans, Rewheel measures the data allowances of plans that historically have been selected by less than 20 percent of subscribers, thereby failing to provide a meaningful price indicator for Mexico. The same problem applies to other countries.

Table 2 Prepaid vs. Postpaid Subscriber Percentages

Country	Prepaid Percentage	Year
Australia	33%	2018
Belgium	36%	2018
Canada	12%	2017
Chile	63%	2016
Denmark	10%	2017
Germany	26%	2017
Finland	9%	2017
Mexico	83%	2018
Luxembourg	36%	2018
Netherlands	24%	2018
Norway	13%	2017
Sweden	21%	2017

Source: Statista. Data originally from the following sources: We Are Social/Hootsuite (Australia, Belgium, Denmark, Finland, Luxembourg, Netherlands, Norway, Sweden); Sutel, Estadísticas del Sector de Telecomunicaciones 2017 (Chile); CMR 2018, Retail Mobile Sector, p. 16 (Canada); Survey, VuMA 2018 (Germany); Instituto Federal de Telecomunicaciones de México; Consejo Nacional de Población de México: Segundo Informe Trimestral Estadístico 2018 (Mexico).

40. DFM10th release Public version, p. 1

41. See Aaron Smith, "U.S. Smartphone Use in 2015," Pew Research Center, April 1, 2015, p. 14, <http://www.pewinternet.org/2015/04/01/chapter-one-a-portrait-of-smartphone-ownership/>.

42. Consistent with the approach used by the FCC and other regulators, it is acceptable to *start* with a narrow product market definition (e.g., a product market that contains single lines only). However, the study must not *end* with this definition. If a narrow market definition indicates competition problems, one must examine whether such results were caused by the narrow market definition by expanding the product market (e.g., include family plans). Had Rewheel followed this standard protocol, it would have quickly realized that its results are heavily influenced by its narrow and incorrect product market definition.

G

Rewheel Incorrectly Captures Prices

Although Rewheel measures how much data a consumer can purchase with a certain budget, the consultancy only considers the MRC of a plan. However, mobile wireless providers typically offer their plans under multipart pricing schemes. Rewheel ignores all these other price components including, but not limited to, activation fees, domestic and international roaming fees, and overage fees. To illustrate this shortcoming, consider again the Freedom plan in Figure 2 above. Although this plan offers 12 GB of data for CAD 60 per month, this data allowance applies to the “Home Network” only. If the subscriber leaves Freedom’s limited home network, the subscriber

is on the “Away Canada Network” where the subscriber only has 1 GB of “full-speed data.” The subscriber pays extra for additional domestic roaming, which Freedom offers for \$10 per month. In contrast, the MRCs of Canada’s nationwide operators (TELUS, Bell, and Rogers) have no domestic roaming charges. Thus, Rewheel misses significant price aspects of some providers allowing the study to penalize those providers that include several pricing components in their MRC. Rewheel also excludes activation fees. These fees are often not trivial and can add several dollars to the MRC when prorated over the average lifetime value to a subscriber.

H

Rewheel Fails to Consider Consumer Expenditures

Rewheel’s simplistic ranking exercises assume that all subscribers purchase one plan only. However, there is ample evidence that in many countries subscribers have more than one subscription. In these countries, the price of one plan only represents a portion of the subscriber’s monthly expense. As summarized in Table 3, consider for instance Canada with a mobile penetration rate of 86.5 percent or less than one SIM card per person. In contrast, with an average of 1.7 SIM cards per person, Austria has approximately twice the amount of SIM cards. This implies that Canadian consumers on average incur less than one MRC per month, whereas Austrian consumers incur 1.7 MRCs per month. By focusing exclusively on the price of a single plan, the Rewheel study fails to recognize that in many of its study countries consumers purchase more than one plan and thus spend more on mobile wireless

service per month. To illustrate this point, consider a hypothetical subscriber ‘A’ that pays \$50 per month for a plan that satisfies the full extent of his mobile wireless demand. In contrast, hypothetical subscriber ‘B’ lives in a country where termination charges are such that it is cheaper to purchase two plans to avoid high off-net termination charges.⁴³ Even if the per-plan prices faced by subscriber ‘B’ are lower than those offered to subscriber ‘A’, subscriber ‘B’ might still pay more as he must purchase two plans. Absent any controls for this problem, Rewheel cannot conclude that Canada is noncompetitive because it is quite possible that the sum of the two plans in Austria (and other countries with penetration rates in excess of 100 percent) could result in a higher MRC than the charge for one plan in Canada.

Table 3 SIM Cards per 100 Inhabitants (2017)

Country	Penetration	Canada	Country	Penetration	Canada
Austria	170.8	2.0	United States	120.7	1.4
Lithuania	150.9	1.7	Netherlands	120.5	1.4
Estonia	145.4	1.7	Bulgaria	120.4	1.4
Italy	141.3	1.6	United Kingdom	119.5	1.4
Malta	140.4	1.6	Czech Republic	119.0	1.4
Cyprus	138.5	1.6	Slovenia	117.5	1.4
Luxembourg	136.1	1.6	Greece	115.9	1.3
New Zealand	136.0	1.6	Portugal	113.9	1.3
Japan	135.5	1.6	Romania	113.8	1.3
Germany	133.6	1.5	Hungary	113.5	1.3
Finland	132.3	1.5	Spain	113.3	1.3
Poland	132.2	1.5	Australia	112.7	1.3
Switzerland	130.8	1.5	Norway	107.9	1.2
Slovakia	130.7	1.5	France	106.2	1.2
Chile	127.5	1.5	Belgium	104.7	1.2
Israel	126.7	1.5	Croatia	103.0	1.2
Latvia	126.4	1.5	Ireland	102.9	1.2
Sweden	126.3	1.5	Turkey	96.4	1.1
Korea (Rep. of)	124.9	1.4	Mexico	88.5	1.0
Iceland	122.6	1.4	Canada	86.5	1.0
Denmark	121.7	1.4			

Source: ITU, Country ICT Data.

43. Termination charges are what one telecommunications operator charges to another for terminating calls on its network

I

Rewheel Fails to Account for Purchasing Power Parity

In Rewheel's world, a Euro has the same purchasing power (i.e., purchases the same amount of goods) in all study countries. There is ample empirical evidence that this assumption is incorrect. Although Rewheel converts all currencies into Euros, the consultancy fails to adjust for the varying purchasing power caused by, among other things, differing costs of living and inflation rates. To normalize for these differences, Rewheel would need to adjust its prices for what is known as purchasing power parity or PPP.

As shown in Appendix A, Table A-1, the failure to adjust for PPP introduces further biases into the study. The table compares standard exchange rates with PPP-adjusted currency conversion rates. Column 2 of the table shows the PPP-adjusted currency conversion rate for 2017, that is, the amount of local currency needed to achieve the same purchasing power as one Euro. Column 3 shows the exchange rate for 2017, that is, how much of the local currency can be purchased for one Euro. Column 4 shows the percent difference between these two rates, using the PPP conversion rate as a baseline. A negative number in column 4 reveals that by only adjusting for the exchange rates, Rewheel *understates* the true currency conversion and therefore *overstates* prices by the percentage reported in column 5. Conversely, a positive number in column 4 implies that Rewheel compares prices of plans that are priced higher than a hypothetical budget and thus *understates* prices by the percentage reported in column 5.

Consider, for instance, Rewheel's comparison at € 30. Using the simple exchange rate of 1.47 for Australia, Rewheel incorrectly records the prices of Australian smartphone plans that are priced at $€30 \times 1.47 =$ AUD 44.11 when the consultancy should be recording Australian smartphone plans that are $€30 \times 1.98 =$ AUD 59.40. Since, plans at AUD 44.11 tend to offer fewer services (e.g., lower voice, SMS, and data allowances) than plans priced at AUD 59.40, Rewheel compares not only the incorrect plans but makes Australian plans appear 25.9 percent more expensive or less data rich than they are.

Similarly, using a simple exchange rate, €30 converts to $€30 \times 1.46 =$ CAD 43.80. Rewheel alleges that a Canadian consumer can purchase only 2 GB of data at CAD 43.80 when in fact €30 equates to a budget of $€30 \times 1.72 =$ CAD 51.60, a difference of 15 percent.

As Table A-1 reveals, Rewheel's failure to adjust for PPP results in prices that are overstated by as much as 32.6 percent (Norway) and understated by as much as 117.9 percent (Turkey). Not surprisingly, among Rewheel's five highest ranked (allegedly cheapest) countries at €30, Rewheel *understates prices in four countries* (Estonia, Latvia, Slovakia, and Lithuania).

J

Rewheel Fails to Exclude Taxes from Its Study

Value added, sales, or any other applicable taxes are not part of the competitive outcome. Thus, to compare competitive outcomes across nations, Rewheel must subtract all taxes from the prices. Rewheel reveals that its prices include VAT.⁴⁴ This is not only incorrect but raises

the question of how Rewheel treated countries where the website prices did not include taxes or countries that do not have VAT but possibly other taxes (e.g., the United States).

44. See Rewheel 9th Methodology.

IV. The Rewheel Ranking Metrics Are Economically Meaningless

In addition to its flawed data collection and evaluation methodologies, the two metrics that underlie Rewheel's rankings bear little, if any, economic significance.

A

Maximum Data Allowances Are Not Indicative of Price Levels

Ranking countries according to the one plan that offers the highest monthly data allowance says little, if anything, about price levels. As explained above, mobile wireless plans are not homogenous products. Rather, they are bundles of services that combine voice, data, SMS, download speeds, and various other service aspects into an overall service plan. Comparing the plan bundles on one dimension only (e.g., monthly data allowance), as done by Rewheel, produces meaningless rankings. Furthermore, by focusing only on the MRC and the monthly data allowance contained in the MRC, Rewheel's "maximum data allowance" ignores the fact that mobile wireless plans are frequently subject to multipart pricing. This further undermines the economic validity of Rewheel's ranking metrics. Thus, Rewheel's first set of rankings provides no insight into price levels because the underlying metric incorrectly assumes that all mobile wireless plans are homogenous and subject to a single price point.

Even if the errors inherent in Rewheel’s first metric are ignored, a showing of a high or a low monthly data allowance is not indicative of price levels and especially not competitive conditions. Consider, for example, Finland and Latvia. Rewheel considers Finland’s mobile wireless market to be competitive based on its international ranking. According to Rewheel’s own data, Finnish mobile wireless subscribers consume some 23.8 GB of data per capita per month, which is the highest level of all study countries.⁴⁵ Rewheel considers Latvia more competitive than Finland as it allegedly has even lower plan prices than Finland. However, Latvians consume 8 GB of data per capita per month, which is significantly less than Finland.⁴⁶ This observation furnishes at least three implications with respect to the economic value of the Rewheel study. First, the fact that the alleged lower prices do not result in higher levels of consumption reveals that a higher international ranking does not promise an increase in social welfare. Second, the same lack of correlation between ranking and consumption levels indicates, once more, that the Rewheel ranking metric is far too simplistic to provide any insight on prices and competitive conditions. Third, this example illustrates that the Rewheel rankings reveal nothing about what subscribers pay because the price paid by a subscriber is a function of how much data that subscriber demands not simply how much data one Euro can buy.

To illustrate this third implication, consider again the case of Finland. Rewheel presents Finland as one of the cheapest and most competitive countries in its 41 study countries. Rewheel bases this conclusion on its understanding that Finland offers unlimited data at €25, ahead of most other countries. Rewheel’s own data, however, demonstrate that the average Finnish subscriber does not demand unlimited data. Instead, Rewheel reports that the average Finnish subscriber demands 23.8 GB of data per month, which Rewheel reports costs €25. At this average Finnish demand level, Finland is by far not the cheapest country because Austria, Australia, Romania, Ireland, Slovenia, Sweden, the United Kingdom, Israel, Poland, France, and the Netherlands all offer plans that meet and/or exceed the average Finnish demand level of 23.8 GB with price points cheaper than €25. Similarly, average Estonian subscribers pay a €10 MRC to meet their demand level. According to Rewheel, there are 14 other countries that offer 2 GB or more for €10 or less, thereby revealing little if anything about relative prices and competitive conditions. Rewheel touts that “€20 buys plans with unlimited gigabytes in the Slovak Republic, Latvia, Estonia and Denmark.”⁴⁷ However, as demonstrated in the case of Estonia, unlimited plans even at €20 are not indicative of competitive conditions if consumers do not demand unlimited data. As these examples demonstrate, a ranking of the most gigabytes of data is irrelevant because consumers do not purchase the plan that gives them the “most bang for the buck” but the plan that fits their needs.

45. See Rewheel/research, Mobile data network economics metrics – 2017, “Mobile data usage per capita per month in 2017 – Countries,” <http://research.rewheel.fi/networkeconomics>.

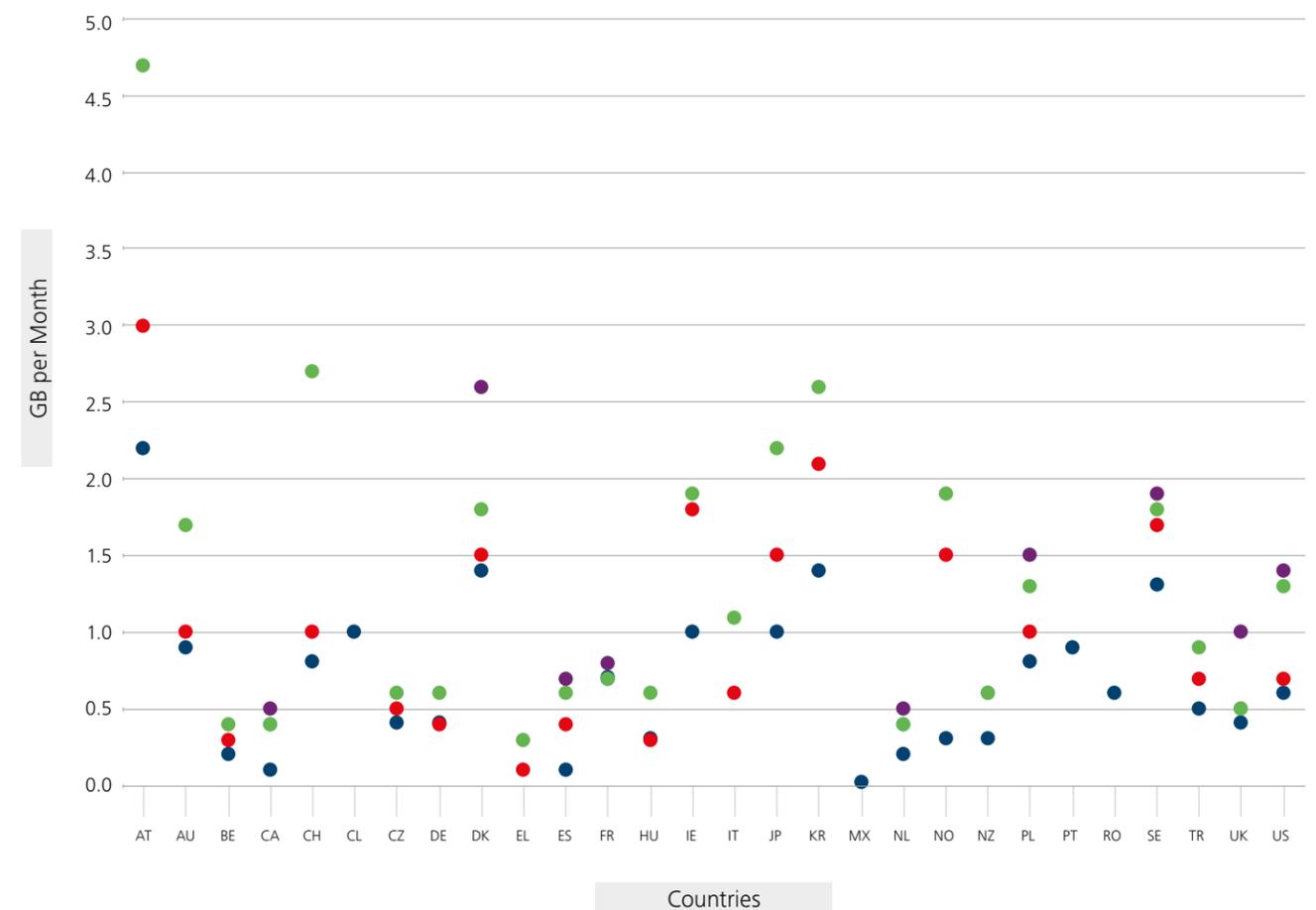
46. Latvia has lower plan prices than Finland at €10, €15, and €20 (at which it offers unlimited data), while Finland only offers unlimited data at €25.

47. DFM 9th release, p. 16.

Rewheel’s data misinterpretation is not limited to these two examples but is systemic, resulting in meaningless rankings. In fact, as revealed by Rewheel’s own data, the price of the plan with the highest data allowance is not representative of a country’s price level. Figure 6 uses Rewheel’s data and demonstrates that monthly data consumption often varies widely among providers in a country, directly disproving Rewheel’s assumption that only the price of the one plan that offers the most data matters. Consumers select a plan that fits their demand

profiles. For instance, in Austria (AT), the provider indicated in the figure by the blue dot, apparently focuses on plans with relatively smaller data allowances relative to the other two providers represented with red and green dots. This results in a data consumption spread of between 2.2 GB and 4.70 GB per month per person. However, Rewheel ranks Austria solely on the one plan that provides the most data, which presumably would be offered by the provider represented with the green dot.

Figure 6 Per Capita Mobile Data Consumption Levels by Provider – 2017



Note: Finland is not displayed.

Source: Rewheel/research, Mobile data network economics metrics – 2017, “Mobile data usage per capita per month 2017 – Operators,” <http://research.rewheel.fi/networkeconomics>.

B

Fully Allocated Prices Are Not Indicative of Price Levels

Rewheel's "fully allocated gigabyte price" comparison does not fare much better than its first ranking metric. First, the metric does not represent the price a consumer pays for a gigabyte of data as it divides the MRC, which contains the prices of all plan elements (voice, SMS and data), by the number of gigabytes in the bundle. Consider, for instance, Bouygues Telecom (Bouygues), which is a mobile wireless provider operating in the "competitive 4-MNO French market." Bouygues offers a plan at €7.99 per month that includes unlimited voice and SMS and 20 MB of data. Per Rewheel's methodology, the price per GB for this plan is €399.50. The same company offers an unlimited voice and SMS plan with 50 GB and unlimited calls to 120 destinations for €24.99, resulting in a purported fully allocated gigabyte price of €0.50. As this example demonstrates, the simple division of MRC and data allowance does not yield a meaningful ratio by which two plans can be compared. For a consumer seeking unlimited calling and texting but only a small amount of data, the €7.99 plan is clearly cheaper. Conversely, a subscriber seeking more data might purchase the €24.99 plan. In either case, the consumer would not rely on the fully allocated gigabyte price when making a decision. As this example illustrates, Rewheel's fully allocated gigabyte price metric is not even directionally correct in interpreting the competitive outcome because it defies basic economic theory. In a competitive market, prices do not range between €399.50 and €0.50 for an alleged identical

product, and France cannot be home to both some of the cheapest and the most expensive data prices in the world. It also raises the question of why Bouygues would offer a plan for €7.99 as presumably nobody would buy it. Most important, this example demonstrates that the Rewheel metric does not represent a price that can be compared nationally, let alone internationally.

Second, Rewheel ranks the study countries by the *median* gigabyte price. This is inconsistent with its first set of rankings that the consultancy bases on the *maximum* amount of data a subscriber can purchase for a given budget. It is also unclear what economic information, if any, the median "price" conveys. Consumers do not all purchase the median price but rather trade-off the attributes of a product and ultimately purchase the product that gives them the highest total value (utility).

Third, the results presented by Rewheel are also affected by the manner in which Rewheel calculates the metric, "[T]he country median fully allocated gigabyte operation is quite susceptible to the amount of tariffs included in the comparison for each country (prone to distortions from sample size)."⁴⁹ In particular, it is affected by the number of MVNOs Rewheel includes when calculating its median fully allocated cost because as Rewheel notes, "MVNOs have predominantly higher fully allocated gigabyte prices than MNOs or their sub-brands."⁵⁰

48. Ibid., p. 3.

49. Ibid., p. 34.

50. Ibid. Rewheel dropped 11 U.S. MVNOs (going from 20 to 9) in its 1st half 2018 analysis.



V. The Rewheel Study Offers No Reliable Economic Evidence

A

The Rewheel Rankings Do Not Inform on Market Structure

In addition to incorrectly claiming that its study provides information on price levels and competition, Rewheel touts that its study can assess the economic ramifications of markets with four versus three facilities-based mobile wireless providers. For instance, Rewheel proclaims, "In 4-MNO markets consumers could buy in (sic) average 3 times more gigabytes for €20 than in 3-MNO markets."⁵¹ Rewheel similarly claims that subscribers in 4-MNO countries can purchase 5.6 time more gigabytes for €15 than in 3-MNO countries.⁵² Rewheel arrives at this result by averaging the prices in countries with three facilities-based providers and using individual provider prices in countries with four or more facilities-based providers. For example, at €15 Rewheel finds that consumers in countries with three providers obtain 4.3 GB of data, whereas in countries with four or more providers the same amount affords 24.2 GB of data, or 5.6 times as much.⁵³ A closer examination of this result reveals that two factors drive it.

51. DFM 9th release, p. 1.

52. Ibid., (€15 measures the highest priced plans not including unlimited data).

53. Ibid., p. 2.

First, the finding that 4-MNO markets are less expensive is the result of data outliers and therefore cannot be generalized, thus making this claim inaccurate. Specifically, Rewheel lists Poland and Israel as providing 100 GB of data for €15 and Romania as providing 50 GB of data for €15 (all members of Rewheel’s four-plus countries). Taking these three outliers (as the next highest level is 20 GB) out of the calculation would reduce the difference between the three- and four-provider countries to 1.9 times. More important, implicit in Rewheel’s approach

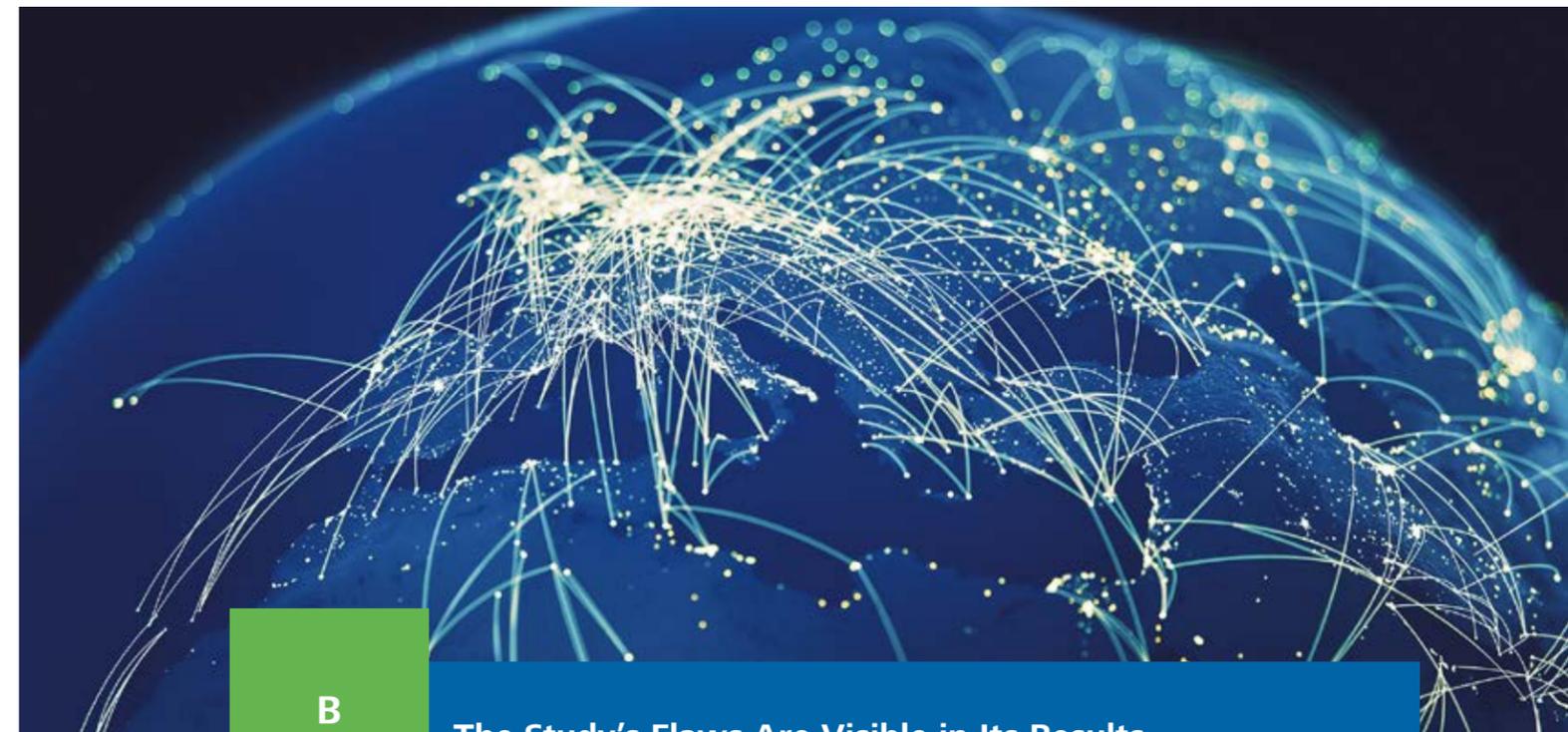
is the assumption that three-provider countries could perform like four-provider countries. By doing so, Rewheel introduces a bias in its results. Three-provider countries include countries like Malta and Cyprus. There is no evidence that such countries could perform like four-provider countries, and neither these countries’ regulators nor anyone else claims that they could. In fact, as shown in Table 4, the empirical evidence directly contradicts Rewheel’s claims because the 4-MNO countries have a similar range of ARPUs as do the 3-MNO countries.⁵⁴

Table 4 Average Revenue per Active SIM (2015)

Country	Number of MNOs	ARPU per Active SIM (Euros)	Country	Number of MNOs	ARPU per Active SIM (Euros)
European Union	na	13.54	Luxembourg	3	22.72
United Kingdom	4	20.61	Ireland	3	22.68
Sweden	4	18.06	Netherlands	3	18.91
France	4	16.03	Belgium	3	16.99
Denmark	4	15.48	Malta	3	15.11
Spain	4	13.71	Cyprus	3	15.02
Italy	4	11.25	Austria	3	14.46
Slovakia	4	10.58	Germany	3	14.30
Poland	4	6.43	Finland	3	13.72
Bulgaria	4	5.34	Hungary	3	10.65
Romania	4	3.90	Greece	3	10.48
			Czech Republic	3	10.15
			Estonia	3	9.24
			Portugal	3	8.00
			Croatia	3	6.40
			Latvia	3	5.94
			Lithuania	3	4.82

Source: TeleGeography, GlobalComms Database (Netherlands MNOs); DFM 9th release, p. 37 (all other MNOs); European Commission, Digital Scoreboard, Average Revenue per User (ARPU) in the Retail Mobile Market (ARPU).

54. The four to three mergers in Ireland and Germany were approved in May 2014 and July 2014, respectively. The Netherlands is treated as a three MNO market as Tele 2 only initiated its commercial launch as a fourth network in November.



B The Study’s Flaws Are Visible in Its Results

The numerous problems in Rewheel’s “Digital Fuel Monitor” become more prominent when examining the study’s results over time. This time-series examination reveals unrealistic price fluctuations that are not the result of changing market conditions but directly stem from Rewheel’s deeply flawed methodology. For example, as noted by Rewheel, between the 1st half and the 2nd half of 2017, the maximum data allowance that a subscriber in Poland could buy for €30 dropped from 100 GB to 30 GB.⁵⁵ It remained at that level in the 1st half 2018 report before increasing to unlimited in the 2nd half 2018 report.⁵⁶ There is no evidence of such price fluctuations in Poland, particularly considering that Rewheel highlights Poland as one of the most competitive countries with the lowest prices. Rather, the price fluctuation is the result of the fact that a single (presumably the most data rich) plan represents Poland’s price level in the Rewheel study and that this single plan changed between report versions.

The flaws of the Rewheel study are also visible in other countries. For example, in Italy, the €30 plan offering the most smartphone data increased from 45 GB in the 2nd half 2017 to 100 GB in the 1st half 2018 then dropped to 60 GB in the 2nd half 2018.⁵⁷ In Turkey, the wireless broadband plan with the most GB of data reported by Rewheel dropped from 50 GB to 20 GB between the 2nd half 2017 and the 1st half 2018. Then, it increased to 100 GB in the 2nd half 2018, while in France it dropped from unlimited to 100 GB between the 2nd half 2017 and the 1st half 2018 then returned to 1,000 GB/unlimited in the 2nd half 2018.⁵⁸ These examples demonstrate that the Rewheel study is unscientific; therefore, it is not a valid tool for assessing competition or informing policy and regulatory decisions.

55. See DFM 9th release, p. 10.

56. Ibid. The Rewheel report garbles this by writing, “while in Poland they jumped back to 100 from 30.” See also Rewheel/research, “Unlimited goes viral, Europe’s mobile data divide widens,” *Digital Fuel Monitor 7th release* Public version, May 22, 2017; Rewheel/research, “The state of 4G pricing – 2H2017,” *Digital Fuel Monitor 8th release* Public version, December 1, 2017 (hereafter DFM 8th release); DFM 10th release Public version.

57. See DFM 8th release Public version, p. 1; see also DFM 9th release, p. 1; DFM 10th release Public version, p. 1.

58. See DFM 8th release Public version, p. 2; see also DFM 9th release, p. 2; DFM 10th release Public version, p. 4.

VI. The Rewheel Methodology Requires a Complete Redesign

As the foregoing demonstrates, Rewheel’s methodology:

- (1) ignores all plan differences except the monthly data allowance;
- (2) ignores all network quality and country cost differences;
- (3) distorts its results by omitting the most popular plans, including family and prepaid plans;
- (4) ignores several price elements including multiple plan requirements and activation fees;
- (5) fails to adjust for PPP; and
- (6) includes VAT.

Not surprisingly, this highly simplistic methodology yields an apples-to-oranges comparison that fundamentally compares different mobile wireless plans across countries and incorrectly attributes all price differences to a lack of competition rather than plan and other differences. Short of a complete redesign of the study’s methodology, there is no simple fix. Consistent with other international price comparisons, such a redesign would correct for Rewheel’s data collection errors (e.g., exclude all taxes) and employ an econometric model that considers, or normalizes, for the differences in plans, networks, country-specific cost structures, and other differences. Absent these corrections, the Rewheel study results provide no meaningful insight into prices – let alone competition.

VII. Conclusions

The Rewheel study is a highly simplistic ranking exercise that assumes away the complexities of an international comparison by treating all plans, networks, and countries as identical. This apples-to-oranges comparison offers no economic insights, and governmental agencies cannot use it as the basis for proper regulatory and policy decisions. Decisions as important as these require an in-depth analysis based on facts and a sound methodology that account for specific market circumstances.

Appendix A

Comparison Of Standard Exchange Rates With PPP-Adjusted Currency Conversion Rates

Table A-1 compares standard exchange rates with PPP-adjusted currency conversion rates. Column 2 of the table shows the PPP-adjusted currency conversion rate for 2017, that is, the amount of local currency needed to achieve the same purchasing power as one Euro. Column 3 shows the exchange rate for 2017, that is, how much of the local currency can be purchased for one Euro. Column 4 shows the percent difference between these two rates, using the

PPP conversion rate as a baseline. A negative number in column 4 reveals that by only adjusting for the exchange rates, Rewheel understates the true currency conversion and therefore overstates prices by the percentage reported in column 5. Conversely, a positive number in column 4 implies that Rewheel compares prices of plans that are priced higher than a hypothetical budget and thus understates prices by the percentage reported in column 5.

Table A1 Exchange Rate Comparison PPP vs. Non-PPP

	PPP Conversion Rate (EA19)	Exchange Rate (EA19)	Difference (%)		PPP Conversion Rate (EA19)	Exchange Rate (EA19)	Difference (%)
Australia	1.98	1.47	-25.9%	Iceland	189.16	120.40	-36.3%
Austria	1.07	1.00	-6.7%	Israel	5.16	4.06	-21.3%
Belgium	1.07	1.00	-6.8%	Italy	0.96	1.00	4.6%
Bulgaria	0.94	1.96	108.9%	Japan	140.74	126.40	-10.2%
Canada	1.72	1.46	-15.0%	Korea	1189.41	1273.87	7.1%
Switzerland	1.64	1.11	-32.3%	Lithuania	0.62	1.00	62.3%
Chile	552.61	731.17	32.3%	Luxembourg	1.18	1.00	-15.5%
Cyprus	0.87	1.00	15.2%	Latvia	0.67	1.00	48.4%
Czech Republic	17.21	26.34	53.1%	Mexico	12.42	21.33	71.8%
Germany	1.04	1.00	-3.5%	Malta	0.80	1.00	25.1%
Denmark	9.55	7.44	-22.1%	Netherlands	1.09	1.00	-7.9%
Euro Area	1.00	1.00	0.0%	Norway	13.83	9.32	-32.6%
Spain	0.88	1.00	13.5%	New Zealand	2.02	1.59	-21.5%
Estonia	0.74	1.00	35.9%	Poland	2.40	4.26	77.2%
European Union	0.97	1.00	3.1%	Portugal	0.80	1.00	25.5%
Finland	1.20	1.00	-17.0%	Romania	2.26	4.57	102.2%
France	1.07	1.00	-6.1%	Slovakia	0.66	1.00	51.1%
UK	0.95	0.88	-7.8%	Slovenia	0.79	1.00	26.5%
Greece	0.81	1.00	24.2%	Sweden	12.16	9.63	-20.8%
Croatia	4.63	7.46	61.2%	Turkey	1.89	4.11	117.9%
Hungary	186.88	309.26	65.5%	US	1.37	1.13	-18.0%
Ireland	1.09	1.00	-8.6%				

About the Author

Dr. Dippon is a Managing Director at NERA and a leading authority in complex litigation disputes and regulatory matters in the communications, Internet, and high-tech sectors. He is also the Chair of NERA's Global Energy, Environment, Communications & Infrastructure (EECI) Practice, where he leads over 100 experts in the areas of energy, communications, media, Internet, environment, auctions, transport, and water. Global Arbitration Review (2019) ranks Dr. Dippon among the world's leading commercial arbitration experts.

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