Panel dataset description for econometric analysis of the ISP-OTT relationship in the years 2008-2013

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Abstract

The latest technological advancements in the telecommunications domain (e.g., widespread adoption of mobile devices, introduction of 5G wireless communications, etc.) have brought new stakeholders into the spotlight. More specifically, Over-the-Top (OTT) providers have recently appeared, offering their services over the existing deployed telecommunications networks. The entry of the new players has changed the dynamics in the domain, as it creates conflicting situations with the Internet Service Providers (ISPs), who traditionally dominate the area, motivating the necessity for novel analytical studies for this relationship. However, despite the importance of accessing real observational data, there is no database with the aggregate information that can serve as a solid base for this research. To that end, this document provides a detailed summary report for financial and statistic data for the period 2008-2013 that can be exploited for realistic econometric models that will provide useful insights on this topic. The document summarizes data from various sources with regard to the ISP revenues and Capital Expenditures (CAPEX), the OTT revenues, the Internet penetration and the Gross Domestic Product (GDP), taking into account three big OTT providers (i.e., Facebook, Skype, WhatsApp) and ten major ISPs that operate in seven different countries.

Keywords: Network Neutrality; Internet; Over-the-Top; Internet Service Providers; Panel Data; Econometrics.

1. Introduction

The introduction of next generation wireless communications (i.e., 4G and 5G) along with the vast proliferation of handheld smart mobile devices have motivated the appearance
of Over-the-Top (OTT) providers that offer their services over the existing telecommunications networks, operated mainly by the Internet Service Providers (ISPs). The conflicted interests among these entities (e.g., same customer base, similar services, use of the same network infrastructure, etc.) have triggered a series of discussions and interactions, aiming to clarify the boundaries of the formed relationships and the obligations of each party.

The aforementioned discussions have constituted the core of the network neutrality debate, which focuses on the Internet neutrality, i.e., the equal and fair treatment of all data, without any deliberate prioritization. Although there have been some important theoretical studies to analyze the relationship between OTT providers and ISPs [1, 2, 3, 4], empirical econometric researches could provide additional intriguing insights on the debate. However, econometric studies for this particular interaction were not possible until recently, as the main explosion of OTT services took place less than ten years ago and, hence, no data were available. Moreover, obtaining real data (regarding revenues, investments and costs) is often quite complicated due to privacy concerns of the involved companies.

In the light of the above context, this report provides a detailed summary of empirical data for several important variables (in the reference period 2008-2013) that affect the relationship between OTT companies and ISPs. More specifically, we have tried to collect data with regard to the i) ISP revenues, ii) Capital Expenditures (CAPEX) for the network investments of the ISPs, iii) OTT revenues, iv) Internet penetration, and v) real Gross Domestic Product (GDP) of different countries. Our data constitute a data panel and concern ten major ISPs and three huge OTT providers that operate in seven Organization for Economic Co-operation and Development (OECD) countries (Japan, USA, UK, France, Italy, Spain and Germany). It is worth noting that, for our study, we have referred to various sources and our main goal is to provide a compact document that summarizes data that can be exploited for empirical econometric studies. Although our data are, in most cases, accurate, in case of missing data we proceeded in some reasonable estimations through interpolation (taking into account the existing data) and a comparison with the available data gives errors lower than 20% (in particular, lower than 10% in the 95.45% of the cases and lower than 5% in the 77.27% of the cases). Moreover, in cases where specific data per country were not available (especially in case of OTT companies that operate worldwide), we resorted to some assumptions that provide a reasonable level of breakdown.

The remainder of this document is organized as follows. Section 2 provides the data regarding the ISP revenues and the CAPEX for the network investments. Section 3 provides the data for the OTT revenues. The Internet penetration and the GDP data are provided in Section 4 and 5, respectively. Finally, Section 6 concludes this report.

2. ISP revenues and CAPEX

Regarding the variables *ISP revenues* and *Capital Expenditures (CAPEX)*, our dataset refers to the following ten major ISPs, which have been identified as the most popular in
the seven countries of interest: i) NTT DoCoMo (Nippon Telegraph & Telephone), ii) Softbank, iii) AT & T, iv) Verizon, v) BT Group, vi) Vodafone, vii) Telecom Italia, viii) Orange (formerly France Télécom), ix) Telefónica, x) Deutsche Telecom.

Tables 1-10 illustrate the time series of ISP revenues and Capital Expenditures (in millions of US dollars) of each of the aforementioned ISP companies in the considered countries, over the reference period 2008-2013. In particular, the first column contains the year, the second includes the country where the company has generated its revenues and has invested CAPEX, which are presented in the third and in the fourth column, respectively, and, finally the fifth column illustrates the data sources related to both time series of ISP revenues and Capital Expenditures. It is worth mentioning that the values of revenues and CAPEX generated by NTT DoCoMo, Softbank, BT Group, Vodafone, Telecom Italia, Orange, Telefónica and Deutsche Telecom have been converted into US dollars by employing the exchange rates acquired from [5].

Table 1: NTT DoCoMo revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX | Reference |
|------|---------|-----------------|-------|-----------|
| 2008 | Japan   | 43022.208       | 7134.348 | [6]       |
| 2009 | Japan   | 45787.244       | 7336.682 | [6]       |
| 2010 | Japan   | 48133.829       | 7617.005 | [6]       |
| 2011 | Japan   | 53194.864       | 9118.810 | [6]       |
| 2012 | Japan   | 56006.741       | 9442.704 | [6]       |
| 2013 | Japan   | 45709.984       | 7204.287 | [6]       |

Table 2: Softbank revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX | Reference |
|------|---------|-----------------|-------|-----------|
| 2008 | Japan   | 25854.403       | 2506.036 | [7]       |
| 2009 | Japan   | 29532.403       | 2382.283 | [8]       |
| 2010 | Japan   | 34236.620       | 4792.459 | [8]       |
| 2011 | Japan   | 40177.600       | 6478.415 | [8]       |
| 2012 | Japan   | 40124.991       | 9436.452 | [8]       |
| 2013 | Japan   | 68307.250       | 12758.970 | [8]       |

Please note that all references in this report have been accessed on July, 30th 2015.
Table 3: AT & T revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX | Reference |
|------|---------|----------------|-------|-----------|
| 2008 | USA     | 123443         | 19631 | [9]       |
| 2009 | USA     | 122513         | 16554 | [10]      |
| 2010 | USA     | 124280         | 19530 | [10]      |
| 2011 | USA     | 126723         | 20110 | [10]      |
| 2012 | USA     | 127434         | 19465 | [10]      |
| 2013 | USA     | 128752         | 20944 | [10]      |

Table 4: Verizon revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX | Reference |
|------|---------|----------------|-------|-----------|
| 2008 | USA     | 97354          | 17133 | [11]      |
| 2009 | USA     | 107808         | 16872 | [12]      |
| 2010 | USA     | 106565         | 16458 | [12]      |
| 2011 | USA     | 110875         | 16244 | [12]      |
| 2012 | USA     | 115846         | 16175 | [12]      |
| 2013 | USA     | 120550         | 16604 | [12]      |

Table 5: BT Group revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX | Reference |
|------|---------|----------------|-------|-----------|
| 2008 | UK      | 31476.190      | 5039.780 | [13]      |
| 2009 | UK      | 26109.204      | 3759.725 | [13]      |
| 2010 | UK      | 24828.439      | 3004.241 | [13]      |
| 2011 | UK      | 24959.936      | 3219.832 | [13]      |
| 2012 | UK      | 23400.951      | 3135.727 | [14]      |
| 2013 | UK      | 21978.125      | 2945.069 | [14]      |
| Year | Country | Annual revenues | CAPEX   | Reference |
|------|---------|----------------|---------|-----------|
| 2008 | UK      | 9934.066       | 1421.032| [15]      |
| 2009 | UK      | 8411.856       | 1211.831| [15]      |
| 2010 | UK      | 7766.615       | 1081.374| [15]      |
| 2011 | UK      | 8447.115       | 1144.900| [16]      |
| 2012 | UK      | 8553.090       | 1172.855| [16]      |
| 2013 | UK      | 8046.875       | 1134.474| [16]      |
| 2008 | Italy   | 8122.711       | 1161.924| [15]      |
| 2009 | Italy   | 8653.666       | 1246.666| [15]      |
| 2010 | Italy   | 9315.301       | 1297.004| [15]      |
| 2011 | Italy   | 9169.872       | 1242.861| [15]      |
| 2012 | Italy   | 8966.719       | 1229.575| [16]      |
| 2013 | Italy   | 7429.688       | 1047.461| [16]      |
| 2008 | Spain   | 9272.894       | 1326.454| [15]      |
| 2009 | Spain   | 9067.083       | 1306.224| [15]      |
| 2010 | Spain   | 8829.985       | 1229.431| [15]      |
| 2011 | Spain   | 8225.962       | 1114.926| [16]      |
| 2012 | Spain   | 7548.336       | 1035.077| [16]      |
| 2013 | Spain   | 6100.000       | 859.998 | [16]      |
| 2008 | Germany | 12575.092      | 1798.822| [15]      |
| 2009 | Germany | 12241.810      | 1763.582| [15]      |
| 2010 | Germany | 12377.125      | 1723.313| [15]      |
| 2011 | Germany | 12660.256      | 1715.939| [16]      |
| 2012 | Germany | 13047.544      | 1789.164| [16]      |
| 2013 | Germany | 12276.563      | 1730.790| [16]      |
Table 7: Orange revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX  | Reference |
|------|---------|-----------------|--------|-----------|
| 2008 | France  | 41812.865       | 6176.331| [17]      |
| 2009 | France  | 32831.944       | 3775.674| [18]      |
| 2010 | France  | 30871.523       | 3735.454| [19]      |
| 2011 | France  | 31293.463       | 3974.270| [20]      |
| 2012 | France  | 27506.427       | 3685.861| [21]      |
| 2013 | France  | 26586.985       | 3758.300| [22]      |
| 2008 | Spain   | 4970.760        | 734.249 | [17]      |
| 2009 | Spain   | 5398.611        | 620.840 | [18]      |
| 2010 | Spain   | 5060.927        | 612.372 | [19]      |
| 2011 | Spain   | 5549.374        | 704.771 | [20]      |
| 2012 | Spain   | 5141.388        | 688.946 | [21]      |
| 2013 | Spain   | 5378.486        | 746.348 | [22]      |

Table 8: Telecom Italia revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX  | Reference |
|------|---------|-----------------|--------|-----------|
| 2008 | Italy   | 33957.602       | 5347.953| [23]      |
| 2009 | Italy   | 30087.500       | 4881.944| [24]      |
| 2010 | Italy   | 26580.132       | 4113.907| [25]      |
| 2011 | Italy   | 26413.074       | 5820.584| [26]      |
| 2012 | Italy   | 22987.147       | 3948.586| [27]      |
| 2013 | Italy   | 21480.744       | 4019.920| [27]      |
### Table 9: Telefónica revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX  | Reference |
|------|---------|-----------------|--------|-----------|
| 2008 | UK      | 10309.942       | 1048.246 | 28 |
| 2009 | UK      | 9044.444        | 836.111  | 28 |
| 2010 | UK      | 9537.748        | 949.669  | 29 |
| 2011 | UK      | 9632.823        | 1018.081 | 30 |
| 2012 | UK      | 9051.414        | 961.440  | 30 |
| 2013 | UK      | 8887.118        | 1839.309 | 30 |
| 2008 | Spain   | 30464.912       | 3228.070 | 28 |
| 2009 | Spain   | 27365.278       | 2587.500 | 28 |
| 2010 | Spain   | 24782.781       | 2676.821 | 29 |
| 2011 | Spain   | 24029.207       | 4050.070 | 30 |
| 2012 | Spain   | 19275.064       | 2174.807 | 30 |
| 2013 | Spain   | 17209.827       | 2030.544 | 30 |
| 2008 | Germany | 5255.848        | 1350.877 | 28 |
| 2009 | Germany | 5202.778        | 1105.556 | 28 |
| 2010 | Germany | 6392.053        | 2724.503 | 29 |
| 2011 | Germany | 7002.782        | 776.078  | 30 |
| 2012 | Germany | 6700.514        | 782.776  | 30 |
| 2013 | Germany | 6525.896        | 884.462  | 30 |

### Table 10: Deutsche Telecom revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX  | Reference |
|------|---------|-----------------|--------|-----------|
| 2008 | USA     | 21866.959       | 3713.450 | 31 |
| 2009 | USA     | 21487.500       | 3702.778 | 31 |
| 2010 | USA     | 21307.285       | 2809.272 | 31 |
| 2011 | USA     | 20599.444       | 2730.181 | 32 |
| 2012 | USA     | 19757.069       | 3290.488 | 32 |
| 2013 | USA     | 24642.762       | 4354.582 | 32 |
| 2008 | Germany | 38596.491       | 4441.520 | 31 |
| 2009 | Germany | 35309.722       | 4386.111 | 31 |
| 2010 | Germany | 33304.636       | 6311.258 | 31 |
Finally, Table 11 illustrates the aggregate series of ISP revenues and CAPEX (in millions of US dollars) in the considered countries, over the reference period 2008-2013, obtained by summing the ISP revenues and Capital Expenditures available for every single ISP company.

Table 11: ISP revenues and CAPEX (in millions of US dollars)

| Year | Country | Annual revenues | CAPEX    |
|------|---------|-----------------|----------|
| 2008 | Japan   | 68876.61        | 9640.38  |
| 2009 | Japan   | 75319.65        | 9718.97  |
| 2010 | Japan   | 82370.45        | 12409.46 |
| 2011 | Japan   | 93372.46        | 15597.22 |
| 2012 | Japan   | 96131.73        | 18879.16 |
| 2013 | Japan   | 114017.23       | 19963.26 |
| 2008 | USA     | 242663.96       | 40477.45 |
| 2009 | USA     | 251808.50       | 37128.78 |
| 2010 | USA     | 252152.28       | 38797.27 |
| 2011 | USA     | 258197.44       | 39084.18 |
| 2012 | USA     | 263037.07       | 38930.49 |
| 2013 | USA     | 273944.76       | 41902.58 |
| 2008 | UK      | 51720.20        | 7509.06  |
| 2009 | UK      | 43565.51        | 5807.67  |
| 2010 | UK      | 42132.80        | 5035.28  |
| 2011 | UK      | 43039.87        | 5382.81  |
| 2012 | UK      | 41005.46        | 5270.02  |
| 2013 | UK      | 38912.12        | 5918.85  |
| 2008 | France  | 41812.87        | 6176.33  |
| 2009 | France  | 32831.94        | 3775.67  |
| 2010 | France  | 30871.52        | 3735.45  |
| 2011 | France  | 31293.46        | 3974.27  |
| 2012 | France  | 27506.43        | 3685.86  |
### 3. OTT revenues

Among the numerous OTT suppliers at play, our dataset focuses on the most popular ones, who offer similar services (e.g., voice and instant messaging) to those of the ISPs: i) Skype, ii) Facebook, iii) Whatsapp. Therefore, the *OTT revenues* refer to the revenues generated by the three aforementioned OTT providers in the considered countries over the reference period 2008-2013.

#### 3.1. Skype

As the Skype revenues per country are not available, a rough estimation which employs the *Skype total users*, the *Skype users by country* and the *Skype total revenues* has been made.

Table 12 illustrates the *Skype total users* over the reference period 2008-2013. In particular, the first column contains the year, the second column includes the number of *Skype total users* in millions of people, while the third one illustrates the sources from which data has been obtained.

| Year | Country | Total Users | Total Revenues |
|------|---------|-------------|----------------|
| 2013 | France  | 26586.99    | 3758.30        |
| 2008 | Italy   | 42080.31    | 6509.88        |
| 2009 | Italy   | 38741.17    | 6128.61        |
| 2010 | Italy   | 35895.43    | 5410.91        |
| 2011 | Italy   | 35582.95    | 7063.45        |
| 2012 | Italy   | 31953.87    | 5178.16        |
| 2013 | Italy   | 28910.43    | 5067.38        |
| 2008 | Spain   | 44708.57    | 5288.77        |
| 2009 | Spain   | 41830.97    | 4514.56        |
| 2010 | Spain   | 38673.69    | 4518.62        |
| 2011 | Spain   | 37804.54    | 5869.77        |
| 2012 | Spain   | 31964.79    | 3898.83        |
| 2013 | Spain   | 28688.31    | 3636.89        |
| 2008 | Germany | 56427.43    | 7591.22        |
| 2009 | Germany | 52754.31    | 7255.25        |
| 2010 | Germany | 52073.81    | 10759.07       |
| 2011 | Germany | 51938.42    | 7368.23        |
| 2012 | Germany | 48971.71    | 6965.26        |
| 2013 | Germany | 48596.62    | 7145.13        |
Table 12: Skype total users (in millions of people)

| Year | Users | Reference |
|------|-------|-----------|
| 2008 | 75    | [33]      |
| 2009 | 105   | [33]      |
| 2010 | 145   | [33]      |
| 2011 | 200   | [34]      |
| 2012 | 280   | [35]      |
| 2013 | 300   | [36]      |

Table 13 illustrates the *Skype users by country*. Specifically, the first and the second columns contain the reference year and country, respectively, while the third and the fourth columns illustrate the country smartphone penetration rate, a proxy of the Skype penetration rate by country, based on the assumption that smartphone users are also Skype users, and the reference from which the data have been acquired. It is worth mentioning that due to the absence of available data for 2008 and 2009, the corresponding values (in red) in Table 13 have been obtained by interpolation\(^2\), while the blue values in the table correspond to forecasts made by [37].

Table 13: Skype users by country

| Year | Country | Users | Reference |
|------|---------|-------|-----------|
| 2008 | Japan   | 0.007 | -         |
| 2009 | Japan   | 0.021 | -         |
| 2010 | Japan   | 0.065 | [37]      |
| 2011 | Japan   | 0.180 | [37]      |
| 2012 | Japan   | 0.330 | [37]      |
| 2013 | Japan   | 0.490 | [37]      |
| 2008 | USA     | 0.093 | -         |
| 2009 | USA     | 0.188 | -         |
| 2010 | USA     | 0.269 | [37]      |
| 2011 | USA     | 0.392 | [37]      |
| 2012 | USA     | 0.477 | [37]      |
| 2013 | USA     | 0.555 | [37]      |

\(^2\)A comparison with the available data gives errors lower than 20% (in particular, lower than 10% in the 95.45% of the cases and lower than 5% in the 77.27% of the cases).
| Year | Country | Value | Comments |
|------|---------|-------|----------|
| 2008 | UK      | 0.003 | -        |
| 2009 | UK      | 0.106 | -        |
| 2010 | UK      | 0.200 | [37]     |
| 2011 | UK      | 0.300 | [37]     |
| 2012 | UK      | 0.368 | [37]     |
| 2013 | UK      | 0.455 | [37]     |
| 2008 | France  | 0.099 | -        |
| 2009 | France  | 0.124 | -        |
| 2010 | France  | 0.170 | [37]     |
| 2011 | France  | 0.245 | [37]     |
| 2012 | France  | 0.330 | [37]     |
| 2013 | France  | 0.450 | [37]     |
| 2008 | Italy   | 0.007 | -        |
| 2009 | Italy   | 0.072 | -        |
| 2010 | Italy   | 0.130 | [37]     |
| 2011 | Italy   | 0.240 | [37]     |
| 2012 | Italy   | 0.314 | [37]     |
| 2013 | Italy   | 0.410 | [37]     |
| 2008 | Spain   | 0.039 | -        |
| 2009 | Spain   | 0.077 | -        |
| 2010 | Spain   | 0.130 | [37]     |
| 2011 | Spain   | 0.200 | [37]     |
| 2012 | Spain   | 0.280 | [37]     |
| 2013 | Spain   | 0.380 | [37]     |
| 2008 | Germany | 0.003 | -        |
| 2009 | Germany | 0.049 | -        |
| 2010 | Germany | 0.100 | [37]     |
| 2011 | Germany | 0.185 | [37]     |
| 2012 | Germany | 0.270 | [37]     |
| 2013 | Germany | 0.360 | [37]     |
Table 14 illustrates the *Skype total revenues*. Specifically, the first column contains the reference year, while the second and the third columns illustrate the total annual revenues, and the reference from which the data have been acquired. Due to the absence of available data about the Skype annual revenues in 2012, the respective value (in red) has been obtained by interpolation, while, regarding the year 2011, the value in blue corresponds to an estimation made by [38].

Table 14: Skype total revenues (in millions of US dollars)

| Year | Annual revenues | Reference |
|------|-----------------|-----------|
| 2008 | 551.36          | [39]      |
| 2009 | 718.90          | [39]      |
| 2010 | 859.82          | [39]      |
| 2011 | 1000.00         | [38]      |
| 2012 | 1478.33         | -         |
| 2013 | 2000.00         | [40]      |

Finally, Table 15 illustrates the *Skype revenues by country*. In particular, the first and the second columns contain the reference year and country, respectively, while the third one illustrates the total annual revenues by country approximated by the following formula:

\[
Skype \ revenues \ by \ country \approx \frac{Skype \ total \ revenues \times Skype \ users \ by \ country}{Skype \ total \ users}. \tag{1}
\]

Table 15: Skype revenues by country (in millions of US dollars)

| Year | Country | Annual revenues |
|------|---------|-----------------|
| 2008 | Japan   | 0.051           |
| 2009 | Japan   | 0.146           |
| 2010 | Japan   | 0.385           |
| 2011 | Japan   | 0.900           |
| 2012 | Japan   | 1.742           |
| 2013 | Japan   | 3.267           |
| 2008 | USA     | 0.685           |
| 2009 | USA     | 1.284           |
| 2010 | USA     | 1.595           |
| 2011 | USA     | 1.960           |
| 2012 | USA     | 2.518           |
| Year | Country   | Facebook Revenue |
|------|-----------|------------------|
| 2013 | USA       | 3.700            |
| 2008 | UK        | 0.025            |
| 2009 | UK        | 0.727            |
| 2010 | UK        | 1.186            |
| 2011 | UK        | 1.500            |
| 2012 | UK        | 1.943            |
| 2013 | UK        | 3.033            |
| 2008 | France    | 0.726            |
| 2009 | France    | 0.847            |
| 2010 | France    | 1.008            |
| 2011 | France    | 1.225            |
| 2012 | France    | 1.742            |
| 2013 | France    | 3.000            |
| 2008 | Italy     | 0.053            |
| 2009 | Italy     | 0.490            |
| 2010 | Italy     | 0.771            |
| 2011 | Italy     | 1.200            |
| 2012 | Italy     | 1.658            |
| 2013 | Italy     | 2.733            |
| 2008 | Spain     | 0.290            |
| 2009 | Spain     | 0.531            |
| 2010 | Spain     | 0.771            |
| 2011 | Spain     | 1.000            |
| 2012 | Spain     | 1.478            |
| 2013 | Spain     | 2.533            |
| 2008 | Germany   | 0.023            |
| 2009 | Germany   | 0.336            |
| 2010 | Germany   | 0.593            |
| 2011 | Germany   | 0.925            |
| 2012 | Germany   | 1.426            |
| 2013 | Germany   | 2.400            |

### 3.2. Facebook

As the Facebook revenue per country is not available for each of the considered countries, in the absence of data, a rough estimation which employs the Facebook total users, the Facebook users by country and the Facebook total revenues has been made.
Table 16 illustrates the Facebook total users over the reference period 2008-2013. In particular, the first column contains the year, the second includes the number of Facebook total users (in millions of people), while the third one illustrates the sources from which data have been obtained.

Table 16: Facebook total users (in millions of people)

| Year | Users | Reference |
|------|-------|-----------|
| 2008 | 145   | [41]      |
| 2009 | 360   | [41]      |
| 2010 | 608   | [41]      |
| 2011 | 845   | [41]      |
| 2012 | 1056  | [41]      |
| 2013 | 1230  | [41]      |

Table 17 illustrates the Facebook users by country. Specifically, the first and the second columns contain the reference year and country, respectively, while the third and the fourth columns illustrate the number of Facebook users by country and the reference from which the data have been acquired. As it is possible to notice by Table 17, there is no value related to Facebook users in Japan in 2008. This is due to the fact that the Japanese version of Facebook has been launched in 2008 [42, 43], therefore there are no available data before 2009. Moreover, it is worth mentioning that due to the absence of available data about UK Facebook users in 2010, the respective value (in red) in Table 17 has been obtained by interpolation, while the blue values correspond to adjustments made by interpolation in the case in which the collected values were related to the months of July and September and not to the end of the year such as all the other values.

Table 17: Facebook users by country (in millions of people)

| Year | Country | Users  | Reference |
|------|---------|--------|-----------|
| 2008 | Japan   | -      | -         |
| 2009 | Japan   | 1.00   | [41]      |
| 2010 | Japan   | 6.00   | [45]      |
| 2011 | Japan   | 13.50  | [45]      |
| 2012 | Japan   | 23.20  | [46]      |
| 2013 | Japan   | 25.30  | [46]      |
| 2008 | USA     | 33.00  | [47]      |
| 2009 | USA     | 103.00 | [48]      |
| Year | Country | Value  |
|------|---------|--------|
| 2008 | USA     | 138.60 |
| 2009 | USA     | 149.40 |
| 2010 | USA     | 169.00 |
| 2011 | USA     | 180.00 |
| 2008 | UK      | 12.00  |
| 2009 | UK      | 18.46  |
| 2010 | UK      | 23.41  |
| 2011 | UK      | 25.60  |
| 2012 | UK      | 28.30  |
| 2013 | UK      | 29.90  |
| 2008 | France  | 6.54   |
| 2009 | France  | 14.45  |
| 2010 | France  | 22.00  |
| 2011 | France  | 23.00  |
| 2012 | France  | 25.62  |
| 2013 | France  | 26.00  |
| 2008 | Italy   | 4.90   |
| 2009 | Italy   | 12.71  |
| 2010 | Italy   | 18.19  |
| 2011 | Italy   | 21.70  |
| 2012 | Italy   | 23.20  |
| 2013 | Italy   | 23.00  |
| 2008 | Spain   | 2.30   |
| 2009 | Spain   | 11.50  |
| 2010 | Spain   | 15.00  |
| 2011 | Spain   | 16.00  |
| 2012 | Spain   | 17.59  |
| 2013 | Spain   | 18.00  |
| 2008 | Germany | 1.20   |
| 2009 | Germany | 9.48   |
| 2010 | Germany | 18.00  |
| 2011 | Germany | 22.00  |
| 2012 | Germany | 25.33  |
| 2013 | Germany | 25.00  |
Table 18 illustrates the *Facebook total revenues*. Specifically, the first column contains the reference year, while the second and the third columns illustrate the total annual revenues and the reference from which the data have been acquired, namely the company’s reports.

| Year | Annual revenues | Reference |
|------|-----------------|-----------|
| 2008 | 272             | 68        |
| 2009 | 777             | 69        |
| 2010 | 1974            | 69        |
| 2011 | 3711            | 69        |
| 2012 | 5089            | 69        |
| 2013 | 7872            | 69        |

Finally, Table 19 illustrates the *Facebook revenues by country*. In particular, the first and the second columns contain the reference year and country, respectively, while the third one illustrates the total annual revenues by country approximated by the following formula:

\[
Facebook \text{ revenues by country} \approx \frac{Facebook \text{ total revenues} \times Facebook \text{ users by country}}{Facebook \text{ total users}}. \tag{2}
\]

In the specific case of the USA, the available Facebook revenues generated in the USA have been collected from the references reported in the fourth column of Table 19. However, due to the absence of available data for the years 2008 and 2009, the related values, represented in red in Table 19, have been obtained by interpolation.

| Year | Country | Annual revenues | Reference |
|------|---------|-----------------|-----------|
| 2008 | Japan   | -               | 16        |
| 2009 | Japan   | 2.16            |           |
| 2010 | Japan   | 19.48           |           |
| 2011 | Japan   | 59.29           |           |
| 2012 | Japan   | 111.80          |           |
| 2013 | Japan   | 161.92          |           |
| 2008 | USA     | 207.15          |           |
| Year | Country | Value  |
|------|---------|--------|
| 2008 | USA     | 688.75 |
| 2009 | USA     | 1223.00|
| 2010 | USA     | 2067.00|
| 2011 | USA     | 2578.00|
| 2012 | USA     | 3613.00|
| 2013 | USA     | 39.85  |
| 2008 | UK      | 22.51  |
| 2009 | UK      | 39.85  |
| 2010 | UK      | 76.01  |
| 2011 | UK      | 112.43 |
| 2012 | UK      | 136.38 |
| 2013 | UK      | 191.36 |
| 2008 | France  | 12.27  |
| 2009 | France  | 31.19  |
| 2010 | France  | 71.43  |
| 2011 | France  | 101.01 |
| 2012 | France  | 123.47 |
| 2013 | France  | 166.40 |
| 2008 | Italy   | 12.27  |
| 2009 | Italy   | 12.27  |
| 2010 | Italy   | 59.06  |
| 2011 | Italy   | 95.30  |
| 2012 | Italy   | 111.80 |
| 2013 | Italy   | 147.20 |
| 2008 | Spain   | 4.31   |
| 2009 | Spain   | 24.82  |
| 2010 | Spain   | 48.70  |
| 2011 | Spain   | 70.27  |
| 2012 | Spain   | 84.77  |
| 2013 | Spain   | 115.20 |
| 2008 | Germany | 2.25   |
| 2009 | Germany | 20.46  |
| 2010 | Germany | 58.44  |
| 2011 | Germany | 96.62  |
| 2012 | Germany | 122.07 |
| 2013 | Germany | 160.00 |
3.3. WhatsApp

Similarly to Skype, as the WhatsApp revenue per country is not available, a rough estimation which employs the WhatsApp total users, the WhatsApp users by country and the WhatsApp total revenues has been made.

Table 20 illustrates the WhatsApp total users over the reference period 2008-2013. In particular, the first column contains the year, the second includes the number of WhatsApp total users in millions of people, while the third one illustrates the sources from which data has been obtained. As it can be noticed in Table 20, there is no value related to WhatsApp users in 2008. This is due to the fact that WhatsApp has been established in 2009 [70, 71]. Moreover, due to the absence of available data for the year 2011, the related value, represented in red in Table 20, has been obtained by interpolation.

Table 20: WhatsApp total users (in millions of people)

| Year | Users | Reference |
|------|-------|-----------|
| 2008 | -     | -         |
| 2009 | 1.00  | [72]      |
| 2010 | 10.00 | [72]      |
| 2011 | 106.50| -         |
| 2012 | 250.00| [73]      |
| 2013 | 400.00| [74]      |

Table 21 illustrates the WhatsApp users by country. Specifically, the first and the second columns contain the reference year and country, respectively, while the third and the fourth columns illustrate the country smartphone penetration rate, a proxy of the WhatsApp penetration rate by country, based on the assumption that smartphone users are also WhatsApp users, and the reference from which the data have been acquired. It is worth mentioning that due to the absence of available data for 2008 and 2009, the related values, represented in red in Table 21, have been obtained by interpolation, while the blue values in the table correspond to forecasts made by [37].

Table 21: WhatsApp users by country

| Year | Country | Users | Reference |
|------|---------|-------|-----------|
| 2008 | Japan   | -     | -         |
| 2009 | Japan   | 0.021 | -         |
| 2010 | Japan   | 0.065 | [37]      |
| 2011 | Japan   | 0.180 | [37]      |
| 2012 | Japan   | 0.330 | [37]      |
| Year | Country | Value |
|------|---------|-------|
| 2013 | Japan   | 0.490 |
| 2008 | USA     | -     |
| 2009 | USA     | 0.188 |
| 2010 | USA     | 0.269 |
| 2011 | USA     | 0.392 |
| 2012 | USA     | 0.477 |
| 2013 | USA     | 0.555 |
| 2008 | UK      | -     |
| 2009 | UK      | 0.106 |
| 2010 | UK      | 0.200 |
| 2011 | UK      | 0.300 |
| 2012 | UK      | 0.368 |
| 2013 | UK      | 0.455 |
| 2008 | France  | -     |
| 2009 | France  | 0.124 |
| 2010 | France  | 0.170 |
| 2011 | France  | 0.245 |
| 2012 | France  | 0.330 |
| 2013 | France  | 0.450 |
| 2008 | Italy   | -     |
| 2009 | Italy   | 0.072 |
| 2010 | Italy   | 0.130 |
| 2011 | Italy   | 0.240 |
| 2012 | Italy   | 0.314 |
| 2013 | Italy   | 0.410 |
| 2008 | Spain   | -     |
| 2009 | Spain   | 0.077 |
| 2010 | Spain   | 0.130 |
| 2011 | Spain   | 0.200 |
| 2012 | Spain   | 0.280 |
| 2013 | Spain   | 0.380 |
| 2008 | Germany | -     |
| 2009 | Germany | 0.049 |
| 2010 | Germany | 0.100 |
| 2011 | Germany | 0.185 |
| 2012 | Germany | 0.270 |
| 2013 | Germany | 0.360 |
Table 22 illustrates the WhatsApp total revenues. Specifically, the first column contains the reference year, while the second and the third columns illustrate the total annual revenues and the reference from which the data have been acquired. Due to the absence of available data about the WhatsApp annual revenues in 2009, 2010 and 2011, the related values (in red) have been obtained by interpolation.

Table 22: WhatsApp total revenues (in millions of US dollars)

| Year | Annual revenues | Reference |
|------|----------------|-----------|
| 2008 | -              | -         |
| 2009 | 0.000037       | -         |
| 2010 | 0.004549       | -         |
| 2011 | 0.641049       | -         |
| 2012 | 3.820000       | 75        |
| 2013 | 10.210000      | 75        |

Finally, Table 23 illustrates the WhatsApp revenues by country. In particular, the first and the second columns contain the reference year and country, respectively, while the third one illustrate the total annual revenues by country approximated by the following formula:

\[
WhatsApp\ revenues\ by\ country = \frac{WhatsApp\ total\ revenues \times WhatsApp\ users\ by\ country}{WhatsApp\ total\ users} \quad (3)
\]

Table 23: WhatsApp revenues by country (in millions of US dollars)

| Year | Country | Annual revenues |
|------|---------|----------------|
| 2008 | Japan   | -              |
| 2009 | Japan   | 0.000001       |
| 2010 | Japan   | 0.000030       |
| 2011 | Japan   | 0.001083       |
| 2012 | Japan   | 0.005042       |
| 2013 | Japan   | 0.012507       |
| 2008 | USA     | -              |
| 2009 | USA     | 0.000007       |
| 2010 | USA     | 0.000122       |
| Year | Country | Value   |
|------|---------|---------|
| 2011 | USA     | 0.002360|
| 2012 | USA     | 0.007289|
| 2013 | USA     | 0.014166|
| 2008 | UK      | -       |
| 2009 | UK      | 0.000004|
| 2010 | UK      | 0.000091|
| 2011 | UK      | 0.001806|
| 2012 | UK      | 0.005623|
| 2013 | UK      | 0.011614|
| 2008 | France  | -       |
| 2009 | France  | 0.000005|
| 2010 | France  | 0.000077|
| 2011 | France  | 0.001475|
| 2012 | France  | 0.005042|
| 2013 | France  | 0.011486|
| 2008 | Italy   | -       |
| 2009 | Italy   | 0.000003|
| 2010 | Italy   | 0.000059|
| 2011 | Italy   | 0.001445|
| 2012 | Italy   | 0.004798|
| 2013 | Italy   | 0.010465|
| 2008 | Spain   | -       |
| 2009 | Spain   | 0.000003|
| 2010 | Spain   | 0.000059|
| 2011 | Spain   | 0.001204|
| 2012 | Spain   | 0.004278|
| 2013 | Spain   | 0.009700|
| 2008 | Germany | -       |
| 2009 | Germany | 0.000002|
| 2010 | Germany | 0.000045|
| 2011 | Germany | 0.001114|
| 2012 | Germany | 0.004126|
| 2013 | Germany | 0.009189|

3.4. *OTT revenues: the aggregate variable*

With regard to the aggregate variable *OTT revenues*, Table 24 illustrates the time series of *OTT revenues* in millions of US dollars in the considered countries, over the reference
period 2008-2013, obtained by summing the OTT revenues determined for every single OTT company.

Table 24: OTT revenues (in millions of US dollars)

| Year | Country | Annual revenues |
|------|---------|-----------------|
| 2008 | Japan   | 0.05            |
| 2009 | Japan   | 2.30            |
| 2010 | Japan   | 19.87           |
| 2011 | Japan   | 60.19           |
| 2012 | Japan   | 113.55          |
| 2013 | Japan   | 165.20          |
| 2008 | USA     | 207.84          |
| 2009 | USA     | 690.03          |
| 2010 | USA     | 1224.60         |
| 2011 | USA     | 2068.96         |
| 2012 | USA     | 2580.53         |
| 2013 | USA     | 3616.70         |
| 2008 | UK      | 22.53           |
| 2009 | UK      | 40.57           |
| 2010 | UK      | 77.20           |
| 2011 | UK      | 113.93          |
| 2012 | UK      | 138.33          |
| 2013 | UK      | 194.40          |
| 2008 | France  | 12.99           |
| 2009 | France  | 32.04           |
| 2010 | France  | 72.44           |
| 2011 | France  | 102.24          |
| 2012 | France  | 125.21          |
| 2013 | France  | 169.41          |
| 2008 | Italy   | 9.24            |
| 2009 | Italy   | 27.92           |
| 2010 | Italy   | 59.83           |
| 2011 | Italy   | 96.50           |
| 2012 | Italy   | 113.47          |
| 2013 | Italy   | 149.94          |
| 2008 | Spain   | 4.60            |
| Year | Country   | Value  |
|------|-----------|--------|
| 2008 | Germany   | 2.27   |
| 2009 | Germany   | 20.80  |
| 2010 | Germany   | 59.03  |
| 2011 | Germany   | 97.54  |
| 2012 | Germany   | 123.50 |
| 2013 | Germany   | 162.41 |
| 2009 | Spain     | 25.35  |
| 2010 | Spain     | 49.47  |
| 2011 | Spain     | 71.27  |
| 2012 | Spain     | 86.25  |
| 2013 | Spain     | 117.74 |

4. Internet penetration

With regard to the Internet Penetration, firstly, the time series called “Internet users (per 100 people)” (last updated date 01.07.2015) has been obtained from [76]. According to the description of the data (available in [76]), the latter consists of the Internet users, i.e., the number of people by country with access to the worldwide network, per 100 people. Therefore, in order to obtain the time series of the Total Internet users by country, the time series of the Total Population in the considered countries has been employed. In particular, the time series called “Total Population (in number of people)” (last updated date 01.07.2015) has been acquired from [77] and, in order to express the Internet users (per 100 people) in terms of Total Internet users, the unknown of the following proportion has been determined:

\[
\text{Internet users (per 100 people)} : 100 = x : \text{Total Population (in number of people)}, \quad (4)
\]

where \(x\) is the variable Total Internet users. Moreover, the series of Total Internet users resulting from (4) has been divided by 1 million in order to make it consistent with all the other variables of the dataset, which are expressed in millions. Table 25 illustrates the time series of the Internet Penetration, i.e., the Total Internet users (in millions of people) in the considered countries, over the reference period 2008-2013.
Table 25: Internet penetration (in millions of people)

| Year | Country | Internet penetration |
|------|---------|----------------------|
| 2008 | Japan   | 96.56                |
| 2009 | Japan   | 99.88                |
| 2010 | Japan   | 100.16               |
| 2011 | Japan   | 101.04               |
| 2012 | Japan   | 110.02               |
| 2013 | Japan   | 109.83               |
| 2008 | USA     | 225.03               |
| 2009 | USA     | 217.81               |
| 2010 | USA     | 221.77               |
| 2011 | USA     | 217.36               |
| 2012 | USA     | 249.09               |
| 2013 | USA     | 266.49               |
| 2008 | UK      | 48.45                |
| 2009 | UK      | 52.04                |
| 2010 | UK      | 53.35                |
| 2011 | UK      | 54.01                |
| 2012 | UK      | 55.73                |
| 2013 | UK      | 57.60                |
| 2008 | France  | 45.50                |
| 2009 | France  | 46.31                |
| 2010 | France  | 50.25                |
| 2011 | France  | 50.85                |
| 2012 | France  | 53.45                |
| 2013 | France  | 54.00                |
| 2008 | Italy   | 26.20                |
| 2009 | Italy   | 28.86                |
| 2010 | Italy   | 31.82                |
| 2011 | Italy   | 32.30                |
| 2012 | Italy   | 33.24                |
| 2013 | Italy   | 35.21                |
| 2008 | Spain   | 27.39                |
| 2009 | Spain   | 28.93                |
| 2010 | Spain   | 30.65                |
| 2011 | Spain   | 31.60                |
Regarding the Gross Domestic Product (GDP), firstly, the time series called “GDP (current $)” (last updated date 28.07.2015) has been obtained from [78]. According to the description of the data (available in [78]), the latter is expressed in nominal terms, since the GDP is expressed in current US dollars. Therefore, the downloaded variable has been made real by employing the Consumer Price Index (CPI). In particular, the time series called “Consumer price index (2010 = 100)” (last updated date 29.07.2015) has been acquired from [79] and, in order to express the nominal GDP in real terms, the time series of nominal GDP has been divided by the time series of CPI:

$$\text{real GDP} = \frac{\text{nominal GDP}}{\text{CPI}}.$$  

Moreover, the series of real GDP resulting from (5) has been divided by 1 million in order to make it consistent with all the other variables of the dataset, which are expressed in millions. Table 26 illustrates the time series of real GDP in millions of US dollars in the considered countries, over the reference period 2008-2013.

### Table 26: Real GDP (in millions of US dollars)

| Year | Country | Real GDP   |
|------|---------|------------|
| 2008 | Japan   | 47494.46   |
| 2009 | Japan   | 49986.51   |
| 2010 | Japan   | 54953.86   |
| 2011 | Japan   | 59222.15   |
| 2012 | Japan   | 59735.92   |
| 2013 | Japan   | 49175.96   |
| Year | Country | Value   |
|------|---------|---------|
| 2008 | USA     | 149064.03 |
| 2009 | USA     | 146546.79 |
| 2010 | USA     | 149643.72 |
| 2011 | USA     | 150425.80 |
| 2012 | USA     | 153510.86 |
| 2013 | USA     | 156960.15 |
| 2008 | UK      | 29457.44  |
| 2009 | UK      | 23848.33  |
| 2010 | UK      | 24078.57  |
| 2011 | UK      | 24808.73  |
| 2012 | UK      | 24340.93  |
| 2013 | UK      | 24307.26  |
| 2008 | France  | 29707.00  |
| 2009 | France  | 27351.28  |
| 2010 | France  | 26469.95  |
| 2011 | France  | 28030.77  |
| 2012 | France  | 25755.61  |
| 2013 | France  | 26761.73  |
| 2008 | Italy   | 24469.31  |
| 2009 | Italy   | 22199.83  |
| 2010 | Italy   | 21267.48  |
| 2011 | Italy   | 22173.34  |
| 2012 | Italy   | 19601.60  |
| 2013 | Italy   | 19941.66  |
| 2008 | Spain   | 16595.50  |
| 2009 | Spain   | 15260.86  |
| 2010 | Spain   | 14316.73  |
| 2011 | Spain   | 14481.64  |
| 2012 | Spain   | 12823.80  |
| 2013 | Spain   | 12993.57  |
| 2008 | Germany | 38001.18  |
| 2009 | Germany | 34505.87  |
| 2010 | Germany | 34122.12  |
| 2011 | Germany | 36754.28  |
| 2012 | Germany | 33931.07  |
| 2013 | Germany | 35294.36  |
6. Conclusion

In this report, we provided a summary for observational and estimated data regarding important variables (i.e., ISP revenues, CAPEX, OTT revenues, Internet penetration and GDP) that can be exploited for empirical econometric studies on the relationship between ISPs and OTT providers. Our data constitute a balanced panel of ten major ISPs and three popular OTT providers that provide their services in seven OECD countries for the period 2008-2013. In our future work, we plan to update and extend this dataset taking into account more companies (both ISPs and OTT providers) and countries.

References

[1] R. T. Ma, J. Lui, and V. Misra, “Evolution of the internet economic ecosystem,” IEEE/ACM Transactions on Networking (TON), vol. 23, no. 1, pp. 85–98, 2015.

[2] P. Coucheney, P. Maillé, and B. Tuffin, “Impact of competition between isps on the net neutrality debate,” IEEE Transactions on Network and Service Management, vol. 10, no. 4, pp. 425–433, 2013.

[3] D. Saucez, S. Secci, and C. Barakat, “On the incentives and incremental deployments of icn technologies for ott services,” IEEE Network, vol. 28, no. 3, pp. 20–25, 2014.

[4] C. Courcoubetis, K. Sdrolias, and R. Weber, “Revenue models, price differentiation and network neutrality implications in the internet,” ACM SIGMETRICS Performance Evaluation Review, vol. 41, no. 4, pp. 20–23, 2014.

[5] The World Bank, “Monthly Monetary and Financial Statistics (MEI): Exchange rates (USD monthly averages).” http://stats.oecd.org/index.aspx?DatasetCode=MEI_FIN [Online; Data extracted on 13.02.2015].

[6] NTT DoCoMo, “NTT DoCoMo annual report 2014.” https://www.nttdocomo.co.jp/english/corporate/ir/binary/pdf/library/annual/fy2013/docomo_ar2014_e.pdf 2015. [Online].

[7] Softbank, “Softbank annual report 2013.” http://cdn.softbank.jp/en/corp/set/data/irinfo/financials/annual_reports/pdf/2013/softbank_annual_report_2013_001.pdf 2014. [Online].

[8] Softbank, “Softbank annual report 2014.” http://cdn.softbank.jp/en/corp/set/data/irinfo/financials/annual_reports/pdf/2014/softbank_annual_report_2014_001.pdf 2015. [Online].

27
[9] AT & T, “At & T annual report 2010.” http://www.att.com/Common/about_us/annual_report/pdfs/ATT2010_Full.pdf 2011. [Online].

[10] AT & T, “At & T annual report 2013.” http://www.att.com/Investor/ATT_Annual/2013/downloads/ar2013_annual_report.pdf 2014. [Online].

[11] Verizon, “Verizon annual report 2010.” http://www.verizon.com/about/investors/annual-report 2011. [Online].

[12] Verizon, “Verizon annual report 2013.” http://www.verizon.com/about/investors/annual-report 2014. [Online].

[13] BTGroup, “Verizon annual report 2010.” https://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/BTGroupAnnualReport2010.pdf 2011. [Online].

[14] BTGroup, “Verizon annual report 2013.” http://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/2013_BT_Annual_Report_smart.pdf 2014. [Online].

[15] Vodafone, “Vodafone annual report 2010.” http://www.vodafone.com/content/dam/vodafone/investors/annual_reports/annual_report_accounts_2010.pdf 2011. [Online].

[16] Vodafone, “Vodafone annual report 2013.” http://www.vodafone.com/content/annualreport/annual_report13/downloads/vodafone_annual_report_2013.pdf 2014. [Online].

[17] Orange, “Orange annual report 2008.” http://www.orange.com/en/content/download/4570/65453/version/2/file/annual-report2008_en.pdf 2009. [Online].

[18] Orange, “Orange annual report 2009.” http://www.orange.com/en/content/download/4572/65461/version/2/file/FTEL_1005297_complet_GB.indd_RVB.pdf 2010. [Online].

[19] Orange, “Orange annual report 2010.” http://www.orange.com/en/content/download/4548/65268/version/3/file/2010annualreport.pdf 2011. [Online].

[20] Orange, “Orange annual report 2011.” http://www.orange.com/en/content/download/6366/93028/version/3/file/RA2011_EN.pdf 2012. [Online].

[21] Orange, “Orange annual report 2012.” http://www.orange.com/en/content/download/12910/269508/version/2/file/Orange-RA-2012-GB.pdf 2013. [Online].
[22] Orange, “Orange annual report 2013.” http://www.orange.com/en/content/download/23308/480043/version/2/file/the_little_Orange_book.pdf 2014. [Online].

[23] Telecom Italia, “Telecom Italia annual report 2009.” https://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports2009/2009Annual_Report.pdf 2010. [Online].

[24] Telecom Italia, “Telecom Italia annual report 2010.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports2010/AnnualReport2010.pdf 2011. [Online].

[25] Telecom Italia, “Telecom Italia annual report 2011.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports2011/TelecomItaliaGroupAnnualReport2011.pdf 2012. [Online].

[26] Telecom Italia, “Telecom Italia annual report 2012.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports2012/AnnualReport2012.pdf 2013. [Online].

[27] Telecom Italia, “Telecom Italia annual report 2013.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports2013/Annual-Report-2013.pdf 2014. [Online].

[28] Telefónica, “Telefónica annual report 2009.” http://www.telefonica.com/en/about_telefonica/pdf/informes/2009/Telefonica_IA09_Ing.pdf 2010. [Online].

[29] Telefónica, “Telefónica annual report 2010.” http://www.telefonica.com/en/about_telefonica/pdf/informes/2010/telefonica_ia10_eng.pdf 2011. [Online].

[30] Telefónica, “Telefónica annual report 2013.” http://www.telefonica.com/en/shareholders-investors/pdf/20140320_Consolidated_Annual_Accounts_311213.pdf 2014. [Online].

[31] Deutsche Telekom, “Deutsche Telecom annual report 2010.” http://www.telekom.com/investor-relations/publications/Financial-results/205540 2011. [Online].

[32] Deutsche Telekom, “Deutsche Telecom annual report 2013.” http://www.telekom.com/ar-2013 2014. [Online].

[33] G. Fujimoto, “Marketing I Skype HOMEpage.” http://www.slideshare.net/goc1126/skype-marketing-final-28623964 2013. [Online; published on 25.11.2013].
[34] J. Mercier, “Skype Numerology.” [Online; published on 19.01.2012].

[35] M. A. Athanasios Paraskelidis and M. T. P. M. Dewage, “Evaluating the Energy Efficiency of Modern VoIP Applications.” [Online; published on 20.12.2013].

[36] T. Warren, “Viber messaging app acquired by Japan’s Rakuten for $900 million.” [Online; published on 14.02.2014].

[37] eMarketer, “Three Out of Four UK Mobile Users to Own Smartphones by 2016.” [Online; published on 18.01.2013].

[38] O. Furrer, Corporate level strategy: Theory and applications. Routledge, 2016.

[39] Statista, “Skype’s annual revenue from 2006 to 2010 (in million U.S. dollars).” [Online; published on 19.02.2013].

[40] D. Bass, “Microsoft Skype Unit Approaching $2 Billion in Annual Sales.” [Online; published on 04.02.2014].

[41] A. Sedghi, “Facebook: 10 years of social networking, in numbers.” [Online; published on 04.02.2014].

[42] H. Tabuchi, “Facebook Wins Relatively Few Friends in Japan.” [Online; published on 09.01.2011].

[43] M. Hamada, “A facebook project for japanese university students: Does it really enhance student interaction, learner autonomy, and english abilities?,” in EUROCALL Conference, p. 104, 2012.

[44] B. Darwell, “Facebook reaches 10M in Japan, doubles users in 6 months.” [Online; published on 16.03.2012].

[45] Bloomberg, “In Japan Facebook wins the most users.” [Online; published on 22.03.2012].
[46] Statista, “Number of Facebook users in Japan.”  https://www.statista.com/statistics/304831/number-of-facebook-users-in-japan/  2014.

[47] SocialTimes, “Latest Data on US Facebook Age and Gender Demographics.”  http://www.adweek.com/socialtimes/latest-data-on-us-facebook-age-and-gender-demographics/213798  2008.  [Online; published on 18.09.2008].

[48] SocialTimes, “December Data on Facebook’s US Growth by Age and Gender: Beyond 100 Million.”  http://www.adweek.com/socialtimes/december-data-on-facebook%E2%80%99s-us-growth-by-age-and-gender-beyond-100-million/233478  2010.  [Online; published on 04.01.2010].

[49] E. Eldon, “Facebook US Demographic Data for September 2010: Nearly 5 Million More Users.”  http://www.adweek.com/socialtimes/facebook-us-demographic-data-for-september-2010-nearly-5-million-more-users/248737  2010.  [Online; published on 04.10.2010].

[50] A. Lee, “Facebook Users DROP In U.S.: Millions Left The Social Network In May 2011.”  http://www.huffingtonpost.com/2011/06/13/facebook-users-members-us-growth-drop-may-2011_n_875810.html  2011.  [Online; published on 13.06.2011].

[51] J. Kiss, “Facebook UK loses 600,000 users in December.”  https://www.theguardian.com/technology/2013/jan/14/facebook-loses-uk-users-december  2013.  [Online; published on 14.01.2013].

[52] D. Saul, “3 Million Teens Leave Facebook In 3 Years: The 2014 Facebook Demographic Report.”  https://isl.co/2014/01/3-million-teens-leave-facebook-in-3-years-the-2014-facebook-demographic-report/  2014.  [Online; published on 15.01.2014].

[53] Wikidot, “Social Media Statistics.”  http://socialmediastatistics.wikidot.com/facebook  [Online].

[54] N. Burcher, “Facebook usage statistics by country - July 2010 compared to July 2009 and July 2008.”  http://www.nickburcher.com/2010/07/facebook-usage-statistics-by-country.html  2010.  [Online; published on 02.07.2010].

[55] eMarketer, “Emerging Markets Drive Facebook User Growth.”  https://www.emarketer.com/Article/Emerging-Markets-Drive-Facebook-User-Growth/1009875  2013.  [Online; published on 09.05.2013].

[56] SocialTimes, “Bonjour! Inside Facebook France Launches Today en FranÃ§ais.”  http://www.adweek.com/socialtimes/bonjour-inside-facebook-france-launches-today-en-francais/216052  2009.  [Online; published on 04.01.2009].
[57] L. Rao, “Facebook Now Has 149M Active Users In The U.S.; 70 Percent Log On Daily.” https://techcrunch.com/2011/02/10/facebook-now-has-149m-active-users-in-the-u-s-70-percent-log-on-daily/, 2011. [Online; published on 10.02.2011].

[58] O. Yeates, “UK facebook statistics february 2012.” https://www.clicky.co.uk/2012/02/uk-facebook-statistics-february-2012/, 2012. [Online; published on 28.02.2012].

[59] The Internet Coaching Library: Telecommunications Research Reports, “Internet World Stats: Usage and Population Statistics.” http://www.internetworldstats.com/europa.htm [Online].

[60] J. Constine, “Facebook’s Cutesy Annual Report To Partners Reveals First Country-By-Country Mobile Stats.” https://techcrunch.com/2013/12/29/facebook-international-user-growth/ 2013. [Online; published on 29.12.2013].

[61] S. Mysore, “Facebook Growth Surges in Italy, Developers Look for Better Italian eCPMs.” http://www.adweek.com/socialtimes/facebook-growth-surges-in-italy-developers-look-for-better-italian-ecpms/215697 2008. [Online; published on 18.12.2008].

[62] L. Yung-Hui, “1 Billion Facebook Users On Earth: Are We There Yet?.” http://www.forbes.com/sites/limyunghui/2012/09/30/1-billion-facebook-users-on-earth-are-we-there-yet/#751363872a0e 2012. [Online; published on 30.09.2012].

[63] S. Mysore, “Facebook’s Footprint in Spain Up 600% in 2008.” http://www.adweek.com/socialtimes/facebook-germany-reaches-more-than-1m-users-gaining-ground-on-competitor-studivz/215540 2008. [Online; published on 18.12.2008].
[67] Socialnomics, “Facebook and Germany to like or not to like.” [Online; published on 24.04.2013].

[68] Facebook, Inc., “Facebook annual report 2012.” [Online].

[69] Facebook, Inc., “Facebook annual report 2013.” [Online].

[70] E. Flore, “5 Things You Can Learn From The Story Of WhatsApp.” [Online; published on 29.06.2015].

[71] A. Satariano, “WhatsApp’s Founder Goes From Food Stamps to Billionaire.” [Online; published on 20.02.2014].

[72] T. Bradshaw, “WhatsApp users get the message.” [Online; published on 14.11.2011].

[73] N. Lomas, “Skype Competitor Viber Hits 175 Million Users, Up From 140 Million+ In December.” [Online; published on 26.02.2013].

[74] D. Rowan, “WhatsApp: The inside story.” [Online; published on 19.02.2014].

[75] Statista, “Annual revenue of WhatsApp from 2012 to 1st half 2014 (in million U.S. dollars).” [Online].

[76] The World Bank, “World Development Indicators: Internet users (per 100 people).” [last updated date: 01.07.2015].

[77] The World Bank, “World Development Indicators: Total Population (in number of people).” [last updated date: 01.07.2015].
[78] The World Bank, “World Development Indicators: GDP (current USD).” [http://data.worldbank.org/indicator/NY.GDP.MKTP.CD](http://data.worldbank.org/indicator/NY.GDP.MKTP.CD) [last updated date: 28.07.2015].

[79] The World Bank, “World Development Indicators: Consumer price index (2010 = 100).” [http://data.worldbank.org/indicator/FP.CPI.TOTL](http://data.worldbank.org/indicator/FP.CPI.TOTL) [last updated date: 28.07.2015].