ΣΧΟΛΗ ΧΡΗΜΑΤΟΟΙΚΟΝΟΜΙΚΗΣ ΚΑΙ ΣΤΑΤΙΣΤΙΚΗΣ

ΤΜΗΜΑ ΧΡΗΜΑΤΟΟΙΚΟΝΟΜΙΚΗΣ ΚΑΙ ΤΡΑΠΕΖΙΚΗΣ ΔΙΟΙΚΗΤΙΚΗΣ

ΠΜΣ "ΧΡΗΜΑΤΟΟΙΚΟΝΟΜΙΚΗ ΚΑΙ ΤΡΑΠΕΖΙΚΗ"
με ειδίκευση στις «Χρηματοδοτήσεις και Επενδύσεις»

Title

Economic performance in European telecommunications, 1998-2019 a comparative study

MXAN1817

Αλεξάνδρα Μαχαίρα

Τριμελής Επιτροπή

Επιβλέπων: Καθηγητής Ν. Κουρογένης,

Μέλη: Καθηγητής Α. Αντζουλάτος,

Επικ. Καθηγητής Μ. Ανθρωπέλος

Σεπτέμβριος 2020

Abstract

Telecommunications is a major sector of advanced economies. The market of telecommunications presents major changes during the last years, due to the technological, economic and social changes. In Europe these changes are major and evident during the last decades. In addition to the global advances in technology and economy, a main factor that has driven changes in the European telecommunications landscape is the privatization of the telecom operators imposed by the European Commission directives in European counties, members of the EU, requiring market liberalization. The present dissertation is a study of the European Telecommunications and the performance of telecom companies in Europe. The aim of the research is to identify trends in the performance of selected European telecom companies with regard to their stock price and profitability. The research is based on secondary data obtained from Thomson Reuters database for the last 22 years (1998-2019). The results of the econometric analysis show a declining trend for most of the companies, following the blooming period of the beginning of the new Millennium.

Keywords: Telecommunication, economic performance, European Union, European Commission, econometric analysis, market trends.

Περίληψη

Οι τηλεπικοινωνίες είναι ένας σημαντικός τομέας για τις προηγμένες οικονομίες. Η αγορά των τηλεπικοινωνιών παρουσιάζει σημαντικές αλλαγές τα τελευταία χρόνια, λόγω των τεχνολογικών, οικονομικών και κοινωνικών αλλαγών. Στην Ευρώπη αυτές οι αλλαγές είναι σημαντικές και εμφανείς τις τελευταίες δεκαετίες. Εκτός από τις παγκόσμιες εξελίξεις στην τεχνολογία και την οικονομία, ένας βασικός παράγοντας που οδήγησε σε αλλαγές στο ευρωπαϊκό τοπίο τηλεπικοινωνιών είναι η ιδιωτικοποίηση των φορέων τηλεπικοινωνιών που επιβάλλονται από τις οδηγίες της Ευρωπαϊκής Επιτροπής σε ευρωπαϊκές χώρες, μέλη της ΕΕ, που ζητούν απελευθέρωση της αγοράς. Η παρούσα εργασία είναι μια μελέτη των ευρωπαϊκών τηλεπικοινωνιών και της επίδοσης των εταιρειών στον τομέα των τηλεπικοινωνιών στην Ευρώπη. Ο στόχος της έρευνας είναι να εντοπίσει τις τάσεις στην επίδοση επιλεγμένων ευρωπαϊκών εταιρειών τηλεπικοινωνιών σε σχέση με την τιμή των μετοχών και την κερδοφορία τους. Η έρευνα βασίζεται σε δευτερογενή δεδομένα που αποκτήθηκαν από τη βάση δεδομένων της Thomson Reuters τα τελευταία 22 χρόνια (1998-2019). Τα αποτελέσματα της οικονομετρικής ανάλυσης δείχνουν μια πτωτική τάση για τις περισσότερες εταιρείες, μετά την περίοδο άνθισης που υπήρχε στην αρχή της νέας χιλιετίας.

Λέξεις κλειδιά: Τηλεπικοινωνίες, οικονομική απόδοση, Ευρωπαϊκή Ένωση, Ευρωπαϊκή Επιτροπή, οικονομετρική ανάλυση, τάσεις της αγοράς.

Table of contents

1. Introduction

The sector of telecommunications provides products and services related to transmission of voice and data, including, text, sound images and video, with wired or wireless means. It is an industry with high development and expansion as well as evolution of the business organization of the market, with new competitor entering the sector in the last decades. In addition, it is a sector that has evolving supply of new technologies, coupled with analogous demand. Further, the development of market and technology has weakened the boundaries of the business and the technological aspects between telecommunications and other sectors, like electronic, computer and similar (European Commission, 2009).

The characteristics of the telecommunication sector in the last decades are portrayed by new technologies, such as optic fibers, new generation smartphones, as well as liberisation of the market, including privatization of networks, deregulation and high competition.

Telecommunications in Europe and in most of the developed countries is one of the most growing sectors of the economies. According to "statista.com[1]", the total revenue in Europe for 2019 was 277 billion Euros, a considerable contribution to the total European GDP. Advances in the mobile telecommunications have been a major factor that has driven the sector in the last decades. Already, from the beginning of the 21st century the number for mobile telephone users in Europe shows a remarkable increasing trend. At the same time, the landscape pictured by the sector raised discussions on the prons and cons of the market regulations perspectives (Newman, Rierson, 2004).

Before the 1990s' in most of the European countries the telecommunication companies were mainly state owned, with exemption of UK, where British Telecommunications was separated in 1981 from the Post Office and was established as a distinct public corporation. Later, in 1984, the company was made private and around the same time a new telecommunications competitor appeared, Mercury Communications. In the beginning of the next decade liberisation continued, with removal of most restrictions and the regulation of the telecom services was uptaken by a regulatory office (OFTEL) (Dassler, Parker &Saal, 2002).

The situation was different in other countries where the deregulation and reform of the telecommunications landscape started in the 90s. Before, the telecom services were held

by monopolies, mainly state regulated having one organization in each country, managing in practice every activity in the telecom industry. (Mayer-Schönberger and Strasser, 1999).

The main forces that pushed these changes were technology advances needing private investments, which governments could not devote, as well as the directives of the European Commision expressing a neutral position on privatization of the sector (Dassler, Parker &Saal, 2002).The results of the deregulation of the markets in the telecom industry are characterized by advances in technology, competition, and lower prices due to market laws (Stiglitz, 1999).

In this respect, the new free market has driven the telecom industry to least costly communication in a national and international scale, and has facilitated commerce transactions, as well as exchange of information for all players in the field, including enterprises, consumers / citizens and governments (Jungmittag and Welfens, 2009). Another result of the liberalization of the market is intense fragmentation, as many new operators entered the market, and the range of services has also been widen.

From the consumer point of view, there are indications that the public shows an increasingly positive awareness and adaptation, also by expressing satisfaction from telecommunications products and services. This is positive for the industry, since it is observed that investments made in new technological advancements have satisfactory returns. Some of the telecoms companies are among the firms with high accountability indices, due to the policies and practices regarding data protection and confidentiality, having gained the trust of the (Gropelli, 2019).

The present analysis examines the economic performance in European telecommunications, in the period between 1998-2019, conducting a comparative study based on the traded stock prices of major European companies. Before the time series analysis, a description of the present situation (also including elements from the last years) is given, based on measures and facts obtained by the European Commission and the Organization for Economic Co-operation and Development (OECD). This information includes connectivity measures, penetration market trends and movements,

2. Telecommunication landscape in European Countries

As mentioned above, the new era of telecommunications market in the EU is charachterized by the liberalization imposed by the European Union and the Commission. The number of telecom operators in Europe is rather high, despite several acquisitions that have taken place during the last years. Mobile services operators count more than 100 (Thomas, 2013, Bender and Raice, 2015). The client base of the sector includes more 230 million fixed lines, more than 800 million mobile subscribers, 670 million broadband mobile subscribers, as of 2019 figures, which are estimated higher after then (ITU/ICT Indicators Database. 2019). In general terms the entry of new companies and the exit of the market constitute a difficult task for the entrance, since the sector of telecommunications requires a high amount of capital to be invested, as well as high fixed costs (Tirole and Laffont, 2000).

2.1. Facts reported by the European Commission

The electronic communications landscape for each country is portrayed by the Digital Economy and Society Index (DESI) issued by the European Commission[2], for 2019. This gives an overview for indicators such as network coverage, usage of services, and technologies. This index and the accompanying reports per country provides information for the overall telecommunication strategy, the coverage per offering (Fixed broadband coverage, 4G coverage, Fast broadband (NGA) coverage, Ultrafast broadband coverage as percentage of households and 5G readiness Assigned spectrum as a % of total harmonised 5G spectrum). In addition, the reports provide information for the market status of each country with regard to consumption and offering trends, where available and to mergers and acquisitions.

In the sections to follow, a short summary of these reports per country are presented and at the end of the chapter, a consolidated table that presents the status of each country compared to the EU average.

Austria:

In Austria the current policy for broadband connections is valid since 2012. The target of the national coverage is to have a percentage of 70% ultrafast-broadband (100 Mbps downstream), in the urban areas and an almost catholic coverage (99%) for the household consumers. The offerings for the households are to a great extent hybrid, combining static and mobile services, which is a feature that increases coverage.

In terms of average fixed and broadband coverage and rural areas coverage, Austria is above the European Union average, but in terms of ultrafast coverage, and fibre connections (fibre – to – the – premises) it is at average below the EU average. In the plans of the Ministry for Transport, Innovation and Technology is funding on infrastructure for the further geographic expansions of networks, modernization of facilities and better broadband networks. Fibre networks are included in the plans, for cost reduction and support of SMEs (Small and Medium Enterprises). In this respect the country prepares for the regulatory framework and cooperation of operators for 5G networks.

Regarding the market development during the last years, significant mergers and acquisitions have taken place (T- Mobile has acquired UPC and Tele2 was taken by Hutchison 3 Austria). There is a concentration of the market, with the three largest telecommunications companies having approximately the 90% of the broadband market.

Belgium:

The plans for Belgian telecommunications are rather ambitious targeting to cover by 2020 half of the country connections with 1 Gbps capacity. As of 2019, Belgium state of telecommunications is above the EU average for fixed broadband coverage, Fast broadband and Ultrafast broadband. On the other hand, Belgium is behind EU average regarding 5G readiness and plans, as there is not a common line among the stakeholders, and barriers related to electromagnetic field exposure limits.

The telecom market in Belgium is a highly consolidated sector, especially as far as the fixed segment is concerned, with Proximus and the local operators accounting for more than 95%. The vast majority of the Belgian citizens use fixed lines for internet use, while less (67%), use mobile internet, with an increasing trend, which does not compete the fixed usage. Quadruple play is the segment with highest growth, a fact that is indicative of the convergence of fixed and mobile technologies.

Bulgaria:

In Bulgaria, the connectivity is among the lowest in EU, reaching the 25th rank regarding overall state of connectivity. The coverage of 30Mbps in the households is 75%, which is below the 83% EU average, while total fixed coverage is 96%, close to European

average. In addition, there is a rather long way to reach European average in 4G coverage, while in the European Commission reports review used in the present description[3], 5G is not mentioned. On the other hand, mobile broadband take-up (Subscriptions per 100 people), is slightly above EU average, reaching 96%.

In contrast with what was noticed in the two preceding countries (Austria and Belgium), in Bulgaria the fixed and the mobile markets are rather distinct, and there are not adequate analyses to determine whether there is a unique product market for the two segments. There is an increasing trend in the internet access and the number of subscriptions in the two (fixed and mobile markets), but information is not enough to say that there is a shift from the fixed to the mobile one.

Croatia:

In Croatia the overall fixed broadband coverage reaches 100% of the households in all (metropolitan and peripheral) areas. The ultrafast networks improved in the last year, but is below EU average, with less coverage in rural areas. As far as fibre (fibre – to – the – premises - FTTP) also demonstrates increase, but it is still under EU average, and there are no investments in this part of the telecom market, as there is no significant interest in the market. Policies support 5G development, by reducing the fee for radiofrequencyspectrum use, but a total plan has not been put forward.

The telecom industry in Croatia is highly consolidated, as during the last years several acquisitions took place (HT acquired Iskon and management of Optima Telekom, A1 merged with Amis Telekom and got Metronet, Optima merged with H1 Telekom, Croatian incumbent HT has taken over management of Optima Telekom and more).

Cyprus:

In Cyprus, all the main telecom companies have a direction towards investments in ultra-high speed networks. One major telecom company in Cyprus, CYTA, started a 100 ml euros program for the next 10 years to implement a FTTH (fiber-to-the-home) network, wich is indented for the metropolitan areas. In parallel, other operators like Cablenet are also developing FTTH networks in rural and urban areas, or plan to start shortly (telecom companies MTN and Primetel). Regarding overall fixed network coverage, Cyprus has reached 100% and is at a rate of EU average (94%) regarding 4G coverage, while the country is under the EU average as far as ultrafast broadband coverage is concerned.

Some mergers in the telecom market in Cyprus aim to improve the competitive advantage of the palyers, by offering mixed servicesIn Cyprus, the telecom operators are willing to have and maintain their own infrastructure, and they are in a rather good way in implementing these plans. A characteristic of the investment activities is that they do not proceed to co-investments, with only occasional co-operations (for example CYTA withCablenetjoint investment).

Czechia:

In Czechia the connectivity coverage in 2019 is slightly below the EU average. The country is very close to the targeted coverage for the sector of the fixed broadband, while ne new generation access (NGA) is over the average of the Union. The urban areas of the country are the ones that have better fixed coverage with an overall 74% of the households covered. Further, the ultrafast coverage of the country is over the European average.

In 2018, CETIN(wholesale officer) endured the upgrade of DSL to VDSL, that had started previous years, as part of the overall telecom development investments and. In addition, T-Mobile, which is the 3rdprovider of fixed services also announced investment plans related to fibre infrastructure. As for the 5G plans, it is at auction stage at the end of 2019. Multiple services coverage is very low in Czechia, reaching 1% for 4-play and 6% for 3-play, being at the lowest range in EU.

In the Czech market a number of mergers and acquisitions took place during the last years. Kaprain Industrial Holding, owner of Nej.cz obtained RIO Media in 2018, and COMA s.r.o. merged with PODA in the same year.

Denmark:

The policy For telecommunications in Demark supports that this is done in free market conditions and the State is only involved in poor local areas. In 2018 all political parties supported a plan to totally cover with broadband of 100/30 Mbps downstream/upstream for all households and enterprises by 2020 and also have a mobile coverage of a good level.

The coverage of Denmark is within the best in Europe, achieving an Ultrafast broadband a percentage of 93%, while the EU average is 60%. Additionally, the NGA coverage is among the best in Europe, reaching 95%, with rural areas having lower coverage (70.6%). In several areas of the country local energy providers start to offer fiber high speed telecom services. In general, the urban areas have a better coverage, while there are some white spots, mainly in the rural ones, but the country policy supports expansion to the latter, also with grants for high – speed broadband rollout.

Two characteristics distinguish in the Danish telecom market. It has a high degree of digitisation and low level of prices. These factors boost the h take-up of broadband.

In market terms, in Denmark, the sector of telecoms has declining rate of turnover and increasing rate of investments. Some mergers took place during the last years including the acquisition in 2018 of TDC by a DK Telekommunikation – acting on behalf of Macquarie and three Danish pension funds, (PFA, ATP and PKA).

Finland:

In Finland the state strategy is promoting 5G and optical fiber infrastructures for the mobile and the fixed connections respectively. Within the plans is that by 2015, all households in the country should have access to at least 100 Mbps connections, with possibility to upgrade this speed to 1 Gbps. In Finland the FTTP coverage is 37.5 % is over the EU average (29.6 %)., but the FTTP coverage in rural areas is below the EU average (9.3 % compared to 14.2 % for the EU). For the support of the better coverage of the sparsely populated areas, there are two programs: The national State aid and the European Union (European Agricultural Fund for Rural Development).These funds aim to expand fiber network for 24K km.

There is a clear tendency in Finland fro fixed-to-mobile substitution for voice calls, as only 3% of the voice calls are made by fixed lines. The major telecom companies, Elisa, Telia and DNA are moving from fixed telephone subscriptions to TV and content services. Telia announced that the company would not provide any longer new fixed phone subscriptions and will progressively terminate existing ones. Regarding acquisitions, Telia acquired Bonnier Broadcasting, in the agreement a number of TV channel brands were included.

Estonia:

The national target of Estonia for telecommunications is to be aligned with the European (Gigabit society) objectives. The plans include provision to all citizens access to 30 Mbps and over 100 Mbps to at least 60% of the households. In the areas of fixed and broadband coverage, Estonia is below EU average, though the county has achieved an improvement during the last years. However, the coverage of ultrafast network is 83%, far above the 60% of the EU average. In rural areas, this is considerable lower (32.8%), but increasing. The prices for broadband in Estonia are higher than the EU average, which slows down the penetration in the broadband and ultra-fast networks.

A plan (EstWin) started in 2009 aiming to achieve by 2020 specific targets of ensuring that 98% of households and companies will be within 1.5 km from the wideband network is a key measure of connectivity for the country. The project is mainly funded (85 %) by the European Regional Development Fund (ERDF) and 15 % by network operators. Further, in 2018 a new plan for 1 Gbps download network was initiated, with support of the state.

The last merger in the country was in 2017, when Elisa group acquired AS Starman, while since the beginning of 2018 they operate under the common name Elisa. There is an increase of mobile broadband data per user transferred in the last years. One out of three users make use of bundled services and the mobile operators they all offer bundled OTT TV services with their mobile pack.

France:

In France the fixed broadband coverage is 100% present in all areas, including rural ones, while Next Generation Access (NGA) is under the EU average. The ultrafast coverage for the households is 49.3%, and 10.2% for the peripheral ones. The plan for the country foresees that total coverage of homes and companies with ultra fast connections for 2022, including a mix of technologies with a large percentage of fiber (FTTH).

This plan has been estimated to involve an investment of € 20 bn in a time horizon of 10 years, funded by the State, regional collectivities and telecom operators. The overall FTTP coverage for France is 37.8 %, which is over the EU average, though the rural FTTP coverage is reaches 9.3 %, being under the European average. For the expansion of FTTP Orange and SFR (French telecom companies) participate actively (Orange for 2,978 municipalities and SFR committed for 641 municipalities). The government also supports vulnerable households to gain high-speed connectivity.

The state authorities are preparing for 5G rollout, and plans include commercialization of the service in one major city in 2020 and the coverage of all the main routes by 2025. The major operators in the French telecommunications market are Orange, SFR, Bouygues and Free, with very intense competition in the sector of the mobile communications. There is a trend for increase of mobile revenues and a decline of the fixed ones.

Germany:

In Germany the strategy for the gigabit society includes a full coverage of gigabit ready networks till 2015. It is anticipated that three quarters of this will be realized due to commercial fiber networks, though it is not fully decided whether the new networks will be extended beyond the existing cable ones. The government also plans to roll out fiber connections to social and economic structures, such as schools, hospitals, and business centers, by 2021.

Germany is above the EU average in many of the coverage indicators, including Fixed broadband and take up (% of households), Fast broadband (NGA) and take up, Ultrafast broadband (but lower in take up), and 5G readiness. With reference to NGA coverage there is a difference between urban and rural areas. There is a plan, with state funding, for covering the rural white areas connections.

The main operator in Germany is Deutsche Telekom AG (DTAG). Other operators include DTAG, Telefonica, Liberty Global's and Vodafone. The growth of the market is rather flat, as there is already high penetration. One of the obstacles for the expansion of the networks and services is the lack of skilled professionals to support the structures.

Greece:

Greece is at the last rank of the EU regarding the overall connectivity score, which is 41.2%. It is at point zero (0% ready) as far as 5G readiness is concerned, Ultrafast broadband coverage is at 0.4% compared to 60% average of the Union. It also ranks 3rd from the end as for the Fast broadband (NGA) coverage and last for Fast broadband take-up, Ultrafast broadband coverage and take up, though it is in the middle rank for Fixed broadband coverage (96% as compared to 97% EU average) and take up (74% vs 97%).

Within the period between 2013 - 2018 Greece had only very low connections of FTTP. Delays of development occur mainly due to not timely activity to absorb cohesion funds for telecom improvement. Some of the imitated projects were abandoned, some were re-submitted and some are phasing out. However, there are two projects running for the Superfast Broadband and Ultra-fast connections, for urban and rural areas respectively for FTTB/FTTH access. The development plan of €700 m, is covered partly by the public (€300 m - € 265 m by ESPA 2014-2020 and € 35 m. from the 'Rural Development Programme) and partly by private (€400 m). The development plans are that by 2023 71% of the citizens will have access to 1 Gbps connections and the rest 29% to 30-100 Mbps networks.

The market in Greece is competitive, though the access of the competitors to the network is almost totally based on regulated access by OTE's, being the incumbent company. Also, the last years a market consolidation was noted, including acquisition of CYTA Hellas by Vodafone. Major players in Greece are OTE, Vodafone and Wind for the mobile and fixed services.

Hungary:

Hungary has made some improvement during the last years and has an overall score for the connectivity above the EU average. There was no change for the fixed broadband coverage in the last years (94 %) but the broadband coverage made an increase and was in 2019 87 %. Making improvements in the cable networks the county has a good coverage in ultra fast coverage (82%), which is above EU average.

The development programs are part of the country 2014-2020 national info-communication strategy, also incorporating the Superfast Internet Programme (SIP) and focusing on FTTH services. Within the targets of the Hungarian projects is the speed coverage of all households accounting for approximately 410,000 homes, a program which is supported by the EU Structural Funds, in addition to private investments for additional coverage and state funds.

Within the strategic goals of the country is the digital education, including educational institutions and government services. Main difficulties for the implementation of the connectivity targets is the scarcity of skilled human resources and poor geographical information for the country coverage. Plans for the 5G development include the 5G Coalition (5GC), a plan that sets Hungary a main European centre for 5G, with regard to testing and applications.

Regarding market conditions, Digi (big cable service provider) performed merging steps with ITV and Invitel (fixed connections company), which had some implications and a fine of €280,000 imposed to Digi, by Hungarian competition authority for giving misleading information.

Ireland:

The overall connectivity indicators of Ireland are well above EU average. The country is at the 5th rank for the coverage of fast broadband (96 %), 13 percentile units above the Union average. On the other hand, it is below the EU average with regard to the ultrafast broadband coverage (56% for Ireland and 60% for EU) and FTTP is also below EU. Fixed broadband and 4G coverage are above European coverage. In addition, 5G readiness is at 30%,while the EU average is 11%.

Due to the particularities of the geography and the distribution of the distribution private investments are not encouraged and the expansion of the network is based on the state involvement. Regarding market developments in Ireland, in 2018 the French Iliad got the major part of the incumbent operator eir, without other significant mergers or changes in the telecommunications sector.

Italy:

Italy coverage is at a very good level regarding the fixed broadband part, approaching a total (>99.5%) coverage. However, the fiber FTTP coverage is below the EU average, although it has increased the last years. As far as fast and ultrafast usage are concerned they have also increased the last years, but they are below the European average (fast broadband was 23.6 % vs 40.6 % of EU average and ultra-fast was 8.9 % in 2018 vs the 19.9 % of the European). High speed roll-out is under expansion by Infratel for white areas in Calabria, Puglia and Sardinia.

A field that Ital performs well is 5G readiness, Italy is far beyond EU average with an assigned spectrum of 60% (EU average is 14%). There have been tests in several areas for the 5G use including Health, smart mobility, virtual reality, etc. In some cities like Rome, Turin and Naples additional 5G trials are carried out by joint operations between municipalities and private agencies. Similarly, 5G trials are done in Rome and Genoa by Fastweb in collaboration with the municipalities.

In the country the incumbent operator is TIM. Due to competition the market share of TIM has decreased in 2018, in the retail broadband segment. The competition has been affected by the entering of Open Fiber in the market. Within 2018 the FTTC offerings increased by 56.9 %, and FTTH by 53.5%. Regarding co-operations, an agreement between Sky and Open Fiber was made for the provision of Sky's Pay TV (IPTV) over FTTH.

Latvia:

Latvia's has adopted EU broadband targets for 2013-2020. The country is from the most advanced within the Union with regard very high-speed technology. The FTTP coverage reaches 88% of the households, much higher than the EU average (30%). More than that, ultrafast broadband has reached 90 %, much higher than the European average of 60%. The FTTP coverage is more in the rural areas (73.6 %) scoring as the first within the EU for 2018, but a substantial percentage of 18% did not have fixed broadband infrastructure, a fact that makes the country be in the end of the rank in EU regarding overall fixed broadband coverage. The objective of the country is to bridge the distance between the rural and the urban coverage and infrastructure level.

In the market, there are frequent new entries of small companies. The fixed incumbent Lattelecom, and LMT, the mobile incumbent initiated a merger option, which was not approved by the government. Competition is high with mobile operators competing with Lattelecom on the fixed market, with TV and internet connection offerings.

Lithuania:

The telecommunication development plans in the country include Next Generation Access Infrastructure, which is approved by the European Commission in 2018. The project aims to provide broadband connections to rural areas and provision to the communication operators the access to the network in order to enable users to connect with at least 30 Mbps download speed. The network structure includes active and passive elements with telecom towers and cabinets. In line with the EU targets, Lithuania aims to balance the gap between rural and urban coverage. The plans for the expansion of the next generation access (NGA) foresees that the state company Plačiajuostis internetas will give lesale access to third party operators.

In terms of coverage rank, Lithuania is at the bottom of the EU list regarding fixed broadband coverage (85% vs 97% EU average) and take up (% of households). It is also far behind the average regarding NGA, but the development plans in the country aim to improve this. The 4G coverage (98%) is above the EU average, but 5G preparation has not started.

During the last years, the telecom market of the country is growing. . There is strong competition with relatively low prices. There are some mergers in the market, but in 2018 were less than 2017. An acquisition attempt from Telia Lietuva tried to acquire UAB Duomenų logistikos centras was withdrawn.

Luxemburg:

Luxemburg is among the most developed countries in EU in the field of telecommunications. It is above the EU averages in many of the key measurements: The country has a 100% fixed broadband coverage and a 99% of 4G coverage. In addition the fast NGA coverage is 98%, much higher than the EU average of 83% and in ultrafast coverage of 92% vs the European average of 60%.

However, the target of having a total coverage of 1 Gbps connection will not be met Also, 5G readiness is very low, while state funding for this purpose is planned. To this end, a trial in collaboration with Germany, Luxembourg and France is on going for automated driving on the motorway from Merzig (DE) through LU to Metz (FR) using 5G technology. In Luxemburg market, a major event is the closedown of MVNO JOIN Experience operations in Belgium.

Malta:

Malta ranks within the first places for the overall connectivity indicator, as it has excellent performance on fixed coverage (100%), fast (>99.5%) and ultrafast broadband coverage (>99.5%). However, it is in the middle of the rank, with regard to the 5G readiness, which is the plans for the future, mainly for uses for public safety and security. Regarding international connections, the MCA has started a State aid process to begin an incentive programme for the support for funding and investing in submarine cables, in an attempt to improve the economic reliability of the project.

In the competitive environment of the market, the most common connections in Malta are the triple – play ones, including fixed telephone lines, fixed broadband and pay TV. Merger plans initiated by Vodafone and Melita were withdrawn. On the other hand, Melita and GO went on an agreement to offer a sport package (football games).

Netherlands

is placed among the first places of the rank, having very good, ranking in overall coverage. It is in the first place for fixed broadband coverage (100%) and take up, in 4G coverage (>99.5%), second in fast NGA coverage (>99.5%) and ultrafast broadband coverage (97%).

The Netherlands communications status has nearly achieved the Digital Agenda Europe goals. The connectivity updated plan includes the actions needed to keep the country's telecom infrastructure at the top of the European developments, ensuring that everybody in the country has high speed connectivity (at least 100 Mbps) by 2023 and the majority of the connections to be 1 Gbps.

Regarding 5G connectivity the report shows a 0% readiness, but future plans incude a multiband frequency auction for 2020, for 700, 1400 and 2100 MHz bands for a 20 year period. Wider bands (3.4 - 3.8 GHz) are planned in a later stage for 2021 / 2022. The current 5G tests are in areas of in vertical industries, mobility, entertainment, smart cities, agriculture and health.

Several investments and mergers took place during the last years. Market developments in the Netherlands include investments in fibre rollout, by TINC and EQT Fiber (Swedish investor), who got Glasveze / Buitenaf. In addition, Arcus Infrastructure Partners hot hold of a big part of E-Fiber shares and investments from Scotland were also in the field of fibers. In the same direction in 2018, Delta Rijssen Fiber Optic Investments and KPN went on joint investments on fiber rollout. In the same year, Ancala (UK investor) obtained the majority stake of FORE Freedom.

Portugal

The communications coverage of Portugal is below the EU average regarding fixed broadband coverage (94%), fast broadband NGA coverage (76%). However, it is above EU average regarding 4G coverage (96%), and Ultrafast broadband (76%).

There has been an increase with regard to the FTTP coverage reaching in 2018 a 70.2% coverage from 63.6% that was in 2017. In rural areas there was also an increase of FTTP from 42.2% to 48.2% in the same time period. Developments in the connectivity and infrastructure include operations in five rural areas for NGA. In addition the Natinal authority Autoridade Nacional de Comunicações (ANACOM) reviewed wholesale prices and suggested reduction, which was accepted, after analysis, by the government.

Investments in the country are focusing in fibre optics, renewal of the mobile network and submarine connections for the connection of mainland Portugal with the Azores and Madeira. The Portugese market is rather stable during the last years, without entrants or mergers.

Poland

The broadband connection coverage for Poland is below the EU average in several of the indicators. Regarding the fixed broadband coverage, it is 79% and the rate-up is 60%, 4G coverage is 93% which is slightly below the EU Average, fast broadband (NGA) coverage is at a rate of 66% of households (European average is 83%) and Ultrafast broadband coverage is at a rate of 23% of households, which is above the 20% of the EU average. Within the household coverage, a percentage of 66.3 % of households use connection speeds of 30 Mbps or higher and a percentage of 22.9 % use internet speed of 100 Mbps or higher with 54.1 % being within the range of internet a bandwidth of at least 100 Mbps. These connections have the possibility of upgrading to gigabit speeds.

Poland started in 2018 the preparation of a National plan (by the Ministry of Digital Affairs) for the implementation of the of the gigabit society strategy, with a funding plan for this purpose. The funding has been planned to be covered from electronic communication fees, numbering fees and fines paid by the operators. As far as the socio-economic factors are concerned, Poland has put in place the National education network project which is a project to connect all schools of the country, with high speeds (at least 100 Mbps). By 2019 an initial number of schools, accounting for the 6% of the total, were already within this network.

Regarding 5G preparation, in 2018, the national regulatory authority has decided upon authorizing 5G trials in fourteen cities of the country. The operators included in these

authorizations are Nokia and Orange Polska, T-Mobile Polska and the Łódź Technical University in collaboration with Ericsson. The first companies that started 5G trials were T-Mobile Polska and Orange Polska.

In the market of electronic communications in Poland, there is strong competition and prices are low. In 2018 an acquisition of Netia by Cyfrowy Polsat Group was approved by the Office of Competition and Consumer Protection, while another acquisition, of Multimedia by UPC did not succeed.

Romania:

In the last years, there has been an improvement trend, as far as the electronic communications coverage in Romania, which was not, however, continued in 2018, where a static picture was formed. In many of the indicators Romania ranks below the EU average, being last (28th rank) regarding 4G coverage and 26th with regard to Fixed broadband coverage. For Romania the difference between urban and rural coverage is not particularly wide, with fibre to the premises (FTTP) figures showing this situation: Rural areas coverage is around 30 % (which is much higher than the EU average of 14 %), with the aggregate coverage being at the rate of 63 %.

ERDF (European Regional Development Fund) and EAFRD (European Agricultural Fund for Rural Development) funding has supported the country and the RoNet project which aims to cover connection for the “white areas” in the country and improve the differences between urban and rural coverage. There are also plans for next-generation networks (NGN) expansion funding and the first moves were made during 2019.

With regard to 5G, coverage, there are targets set within the draft strategy, to offer the service in in several Romanian cities. The strategy has been decided based on combined consultation from institutions, also incorpotating local authority members. However, high reserve price for future licences fees for the renewal of existing licences are an obstacle for the 5G launch and development.

As far as the market status is concerned, the consumption trends in consumption presents an increase between 2017 and 2018 for both fixed connection and internet traffic per month per citizen and mobile broadband traffic. Within 2018 six new entrants took place with companies offering services in the fixed networks segment. Tow out of these six offered only fixed voice transit, without fixed telephony services, while another two entered in the business of retail broadband services for households and the last two for enterprises.

Slovakia:

In Slovakia the national broadband strategy of the county has started since 2011. As for the EU broadband plans for 2025 referring to the gigabit communication plans for rural and urban households coverage there has not yet been put in place a relevant at government level. The EU operation program funds from the European Regional Development Fund and European Agricultural Fund for Rural Development had not been absorbed till 2019 to be used for the improvement of the infrastructure for backhaul and access networks.

A problematic area is the high-speed broadband coverage for 'white spots', meaning the regions with coverage of less than 30 Mbps. There is a minor progress to this end, as the white spots have decreased from 400-500 in 2017 to 300 in 2018 and there is a plan to eliminate those white spaces till 2020. There are plans for the broadband coverage of 30 Mbps in all municipalities by 2020.

Compared to the EU averages, Slovakia is below the EU regarding Fixed broadband coverage (88%), 4G coverage (87%), but it is over the European average in terms of Fast broadband (NGA) coverage (86%) and Ultrafast broadband coverage (80%). Slovac government has made a feasibility study for the provision of free wifi coverage at municipal level, (the project is called 'WiFi for You', and 'WiFi4SK'), according to the principles of the WiFi4EU project, for which funding is by the operational programme integrated infrastructure with the same conditions WiFi4EU.

The market in Slovakia shows fixed-to-mobile substitution, reported by the Slovak national regulatory authority (NRA), which is a result of the offering of some operators who offer fixed connections through mobile networks. The majority of the offerings are combined services, incorporating multimedia services. During the last years there is growth in the markets of double-play, triple play and quad-play. In the merger area the two companies for fixed connections in Slovakia (SWAN and BENESTRA) merged in 2018. The new company aimed to integrate the two networks of the companies, since SWAN was covering mainly household users and BENESTRA enterprises.

Slovenia:

Slovenia has a good rank within EU Member States, having the 12th place regarding standard fixed broadband coverage. Numerous coverage indicators for the country are above EU average (including Fixed broadband coverage, 98%, 4G coverage 98%, Fast broadband (NGA) coverage, 86% and Ultrafast broadband coverage 80% almost 20

percentile units above the average). The Ultrafast broadband has a good coverage also for the rural areas, reaching 49.1 %, which is also 20 percentile units above the European average.

The country has a FTTP strategy that continued in 2018, that places the country much above the EU average for fibre networks, both overall, as well as for the rural areas. Regarding the plans for 2020 next-generation network (NGN), in March 2019, the Slovenian government decided the national way for the use of 700 MHZ frequency band, and has designated June 2020 as the deadline to assign the band. As far as the5G plans are concerned, in 2018, Slovenia has given testing licences for 5G (700 MHz and 3.5 GHz) to BTC, AMZS, Elektro Gorenjska, Internet Institute and Telekom Slovenije.

The telecom market in Slovenia shows an increase of bundled services, mainly because the provide TV/content services in the bundles. The 4-play services are growing and in 2019 had a market share of 36.2%, and 3-play connections have a market share of 43%. Within 2018, the acquisition of Teleing by Telemach took place. The incumbent operator in the country is Telekom Slovenije.

Sweden:

The overall plan of Sweden regarding broadband strategy had three highly set goals (a) by 2020, the majority of the households reaching 95% to have broadband access of at least 100 Mbps; (b) by 2023, the total country should have access to premium quality mobile services (c) by 2025, high-speed broadband should by in access by the whole country. This is a difficult plan and the country regulator PTS, predicts that it will not be fully met.

Regarding its ranking among EU Member States, Sweden is beyond EU regarding 4G coverage (96%), 5G readiness (22% double than the EU average), Fast broadband (NGA) coverage (86%), Ultrafast broadband coverage (84%). The country has Fixed broadband coverage equal to the EU average (97%) and below the average for the Fixed broadband take-up (76% of the households). During the last years in Sweden, there have been granted 14 trial licences for 5G, in 9 different areas in the bands of 3.4-3.8 GHz, 24.25-27.5 GHz and 2.3 GHz.

Funding of the rural development programme comes from the European Agricultural Fund for Rural Development (EARDF) and national co-funding, and for regional development, funding is covered by the European Regional Development Fund (ERDF) and regional and local co-funding.

A major merger between Tele2 (operator in the mobile telecommunications) and Com Hem (active in the fixed telecommunications and cable-TV) was approved in 2018. The merger was aiming to form a leading integrated operator in Sweden's telecommunications market.

Spain:

The overall connectivity in Spain for 2019 is the ninth place among EU Member States, having improved its connectivity status, during the last years. The country is above the EU average regarding Fast broadband (NGA) coverage (88%) and Ultrafast broadband coverage (87%), while it is equal to EU average for 4G coverage (94%) and below for the Fixed broadband coverage (96%). The exploitation of FTTP networks is a major positive of the Spanish telecom and covers 77.4 % of households, while for the rural areas of the country the coverage is 32.6 % of the households, placing the country in this sector over the EU rural and total FTTP coverage.

There is a national plan for 5G coverage that was published in 2017 for the period 2018-2020 including the use of specific frequency bands (26 GHz band up to 1 GHz per pilot project, and 3.6-3.8 GHz band up to100 MHz per pilot project), and a tender has been initiated for granting subsidies for two 5G pilots. After alterations and regulations, the Spanish National Frequency Allocation designated the bands of 3.6 GHz and 26 GHz for 5G uses. In 2018 the 3600-3800 MHz bands were assigned to three mobile operators (Vodafone 90 MHz, Orange 60 MHz and Telefónica 50 MHz) following an auction. The 5G developments have brought Spain in the eighth place among EU countries, scoring 30% compared to EU average of 14%.

The main national operators are Telefónica, Orange and Vodafone and they have the biggest market share (totally 88.6 % of lines). Between 2017 and 2018 they have lost almost three percent of their market share, due to the entry of Másmóvil, in the market in 2016, accompany which operates under several names (Yoigo, Pepemobile and Másmóvil). Another smaller operator in the country is Euskaltel (in the North of Spain), which was the third in market share, but surpassed by Másmóvil at the beginning of 2018.

With regard to commercial agreements and collaborations, in the beginning of 2018 Telefónica and Orange made an agreement regarding commercial wholesale access by which Telefónica would provide Orange with both regional bitstream and VULA access to its FTTH network. Another agreement at the same time was between Telefónica and

DIGI Mobil by which Telefónica agreed to provide DIGI, an MVNO, with commercial wholesale access to its FTTH network. Later in September 2018, Vodafone and Másmóvil came to a wholesale agreement for sharing access to 1.9 million housing units for implementation in the next 4 years.

United Kingdom:[4]

United Kingdom has a total Fixed broadband coverage of 100%, scoring first among the EU countries. It is also above the EU average with regard to 4G coverage (98%), Fast broadband (NGA) coverage (95%), but it is below the EU average as per Ultrafast broadband coverage (52%). Moreover, although total ultrafast coverage is eight percentile units below the EU average, in the rural areas it is almost nineteen percentage points below the EU average, due to certain geographical characteristics in the country having a great deal of remote and rural regions. This is coupled with fiber to the premises (FTTP) networks with coverage only 3.8 % of the population (compared to the 29.6 % of the EU). The exploration of gigabit networks in the country is based mainly on private investments, public investment to be present in less commercially viable regions of UK.

During 2018, there were no major changes in the market and no new companies entered. It was noticed that competition was decreased regarding service-based operations and it has started with an increasing trend for the infrastructure operations. Consumer trends showed that there is a decreasing use (number of minutes) for the fixed networks, a drop that was more than the mobile calls, which was also decreased. Regarding the number of lines (connections) the fixed ones demonstrated a decline between 2017 and 2018, while the mobile connections have increased during the same period. At the end of 2018, the percentage of UK households that have a mobile connection was 96 %, while the percentage of the households with fixed connections is 81 %.

.

2.2. Digital economy figures reported by the OECD

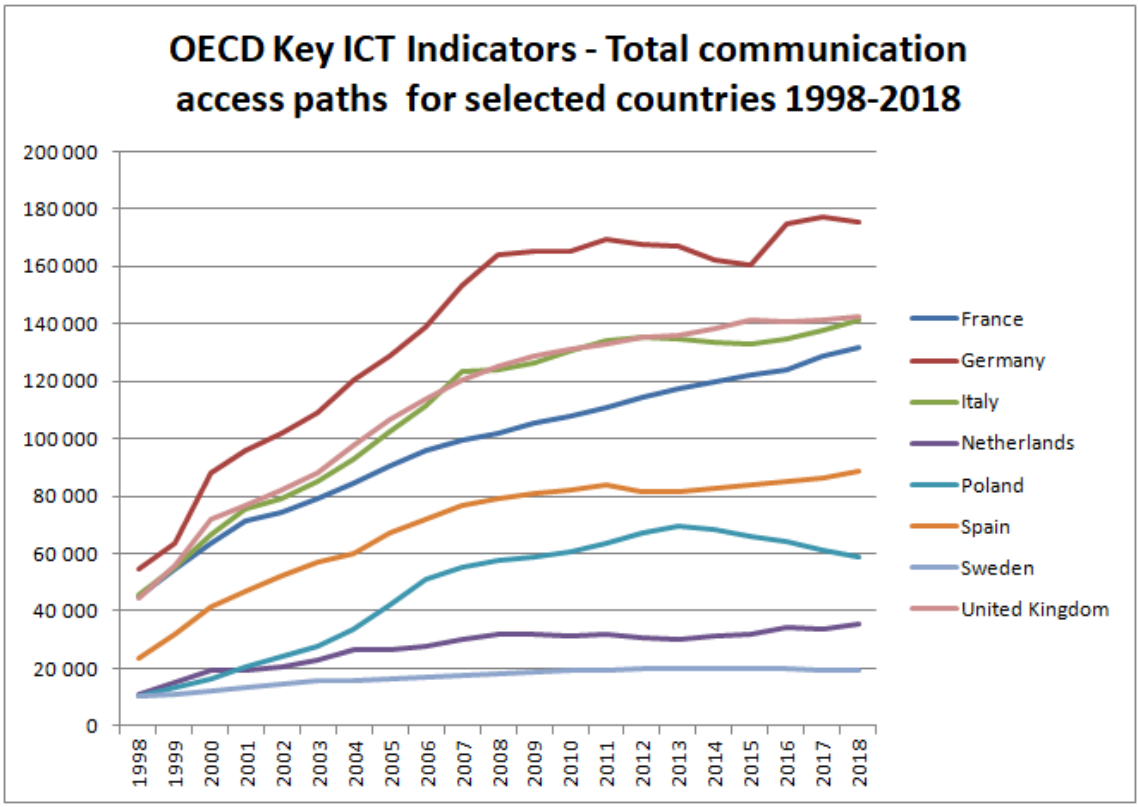
In addition to the presentation of the telecommunications' landscape described in the previous unit, the Organisation for Economic Co-operation and Development (OECD) also issues a number of indicators for its member countries (among which are most of the EU countries, not including Bulgaria, Croatia, Cyprus, Malta and Romania). The indicators referring to ICT (Information and Communication Technology) cover connectivity / access per 100 inhabitants, subscriptions, revenue and investment, added value, fibre connections, employment and changes in wages in the sector, business expenditure, exports, specialization and patents.

From the OECD indicators, a subset is presented below, including the EU member States, which are in parallel members of the organization.

Total communication access paths (per 100 inhabitants)

The total communication access paths account for the total fixed broadband lines, plus the mobile subscriptions. From the total group of EU countries within the OECD area, the major countries are selected (Germany, France, Italy, Netherlands, Poland, Spain, Sweden and UK). The total set for the 26 countries available is presented in Table A1 of the Appendix. From the information depicted in Graph 1, below, it can be seen that the leader in communication lines is Germany, followed by UK and Italy, with France being next. Germany has tripled the total access paths, from 54,350 in 1998 to 175,690 in 2018. France has also tripled the number of lines reaching the number of 132,037 lines in 2018, from 45,067 that were in 1998. Italy has approximately the same growth from 45,434 lines in 1008, to 141,480 in 2018 and UK from 44,443 to 142,504 total lines.

Graph 1. OECD Key ICT Indicators - Total communication access paths 1998-2018



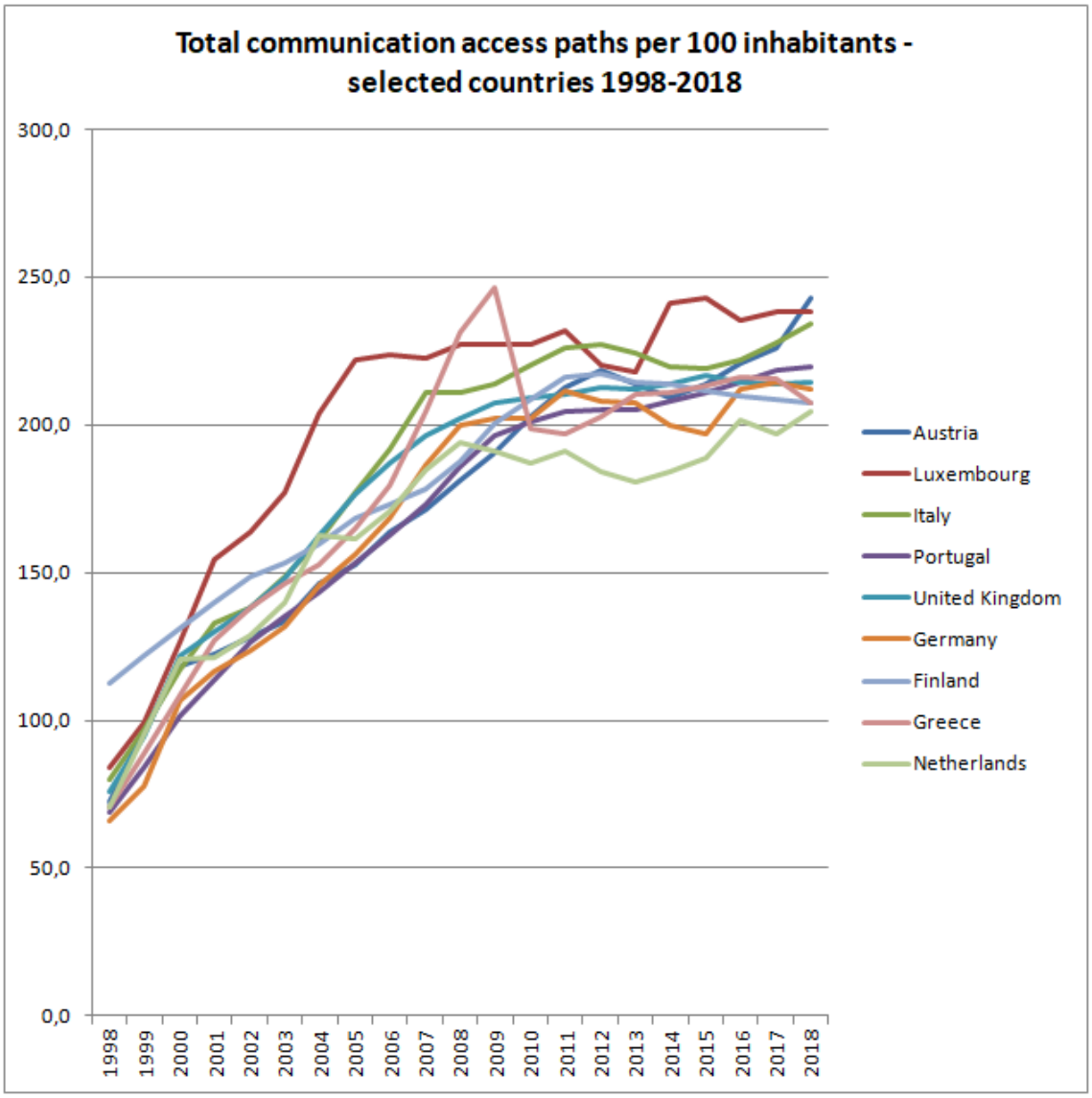
Source: OECD https://www.oecd.org/sti/broadband/oecdkeyictindicators.htm and format by the author

Total communication access paths (per 100 inhabitants)

The same figures per 100 inhabitants are presented in Table A2 of the appendix and the following Graph 2. The counties with the most access paths per 100 inhabitants are Austria, Luxembourg, Italy, Portugal, United Kingdom, Germany, Finland, Greece and the Netherlands.

The time series in Graph 2 show that the indicator showing the total number of communication lines per 100 inhabitants has been multiplied during the time period 1998-2018 studied. This is valid for all nine leading countries presented in the graph. In the beginning of the time period (1998) the number of connection per 100 people was between 50 and 100 (with exception of Finland, which was above 100), whereas in 2018 the number of connections is between 200 and 250. Luxemburg had the most rapid growth during the first years of the period, and it is rather stable after 2005. The Netherlands demonstrated a drop after 2008 and is the last of the presented group during the last decade.

Graph 2. Total communication access paths per 100 inhabitants - selected countries 1998-2018



Source: OECD https://www.oecd.org/sti/broadband/oecdkeyictindicators.htm and format by the author

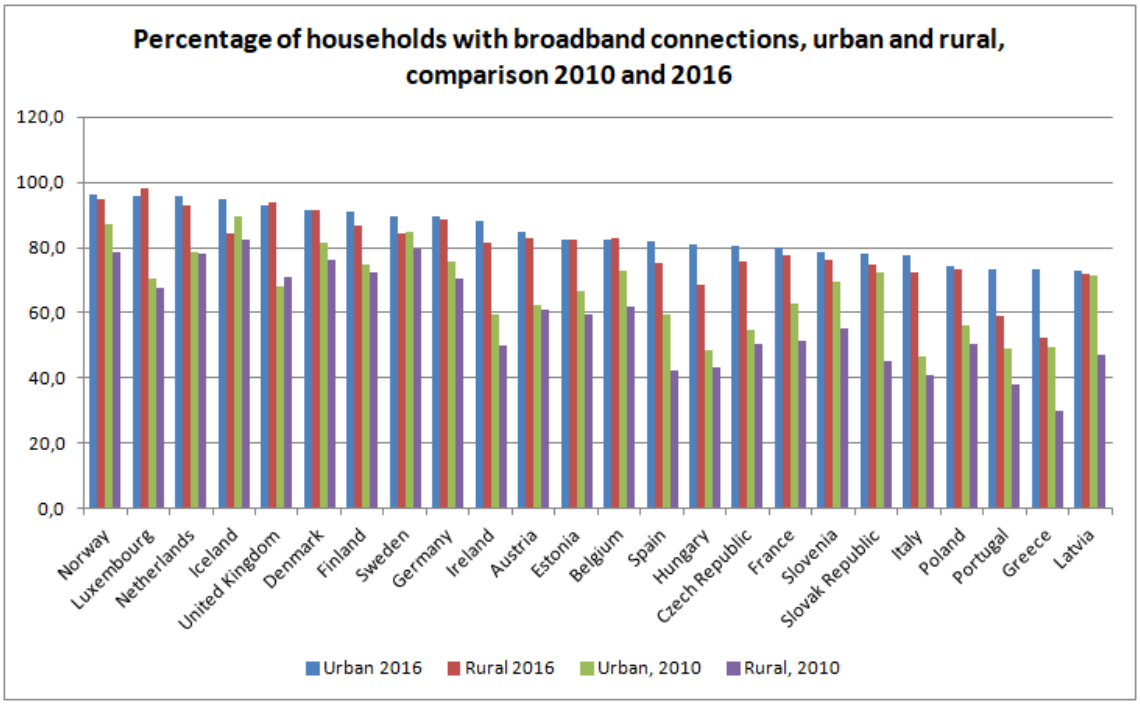
Broadband Urban and Rural divide (2010, 2016)

The percentage of households with broadband connections, urban and rural, comparatively for 2010 and 2016 (for Iceland: 2010, 2014 and for United Kingdom :2009, 2016).

From the graph, it can be seen that the advanced countries (the ones on the left of the graph, with high percentages of coverage) have smaller differences between urban and

rural. This gap is wider in 2010, but the majority of the countries have closed this gap, with exception of Hungary, Portugal and Greece, where the rural areas still in 2016 have a considerable difference between the two areas (data for the graph are presented in Table A3 of the appendix).

Graph 3. Percentage of households with broadband connection urban-rural divide 2010-2016

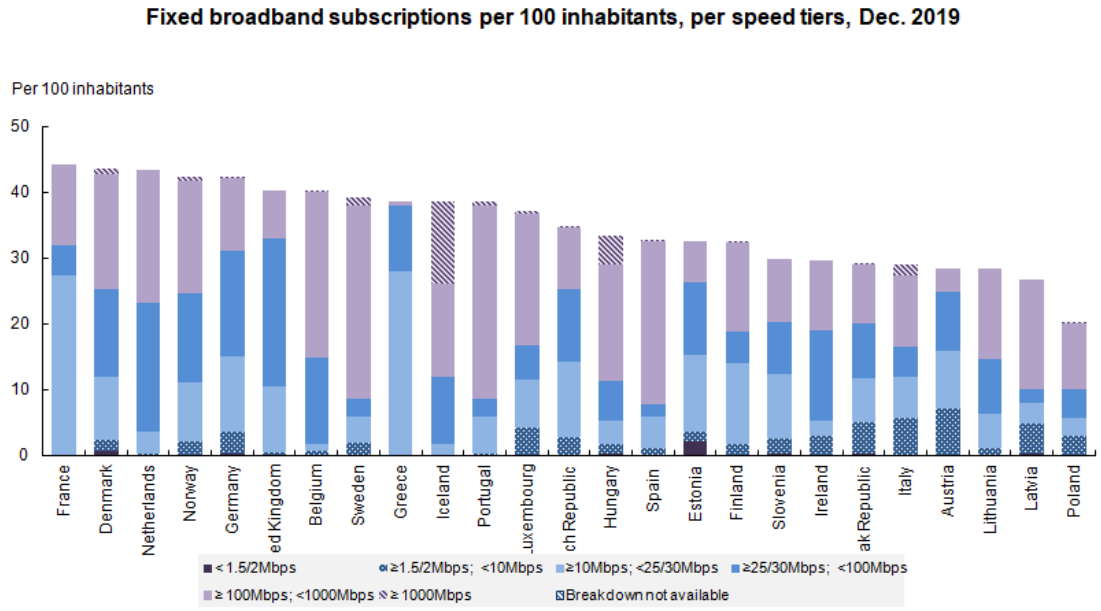


Source: OECD, ICT Access and Usage by Households and Individuals Database, http://oe.cd/hhind, 2017

Broadband Speed

Besides the overall household broadband coverage described above, the breakdown as per the connection speed tiers is given in Graph 4 (based on OECD data, listen in Table of the appendix). From the information it can be seen that Iceland has the biggest percentage of connections in high speed (> 1000 Mps) and Greece is the country with the least high speed share.

Graph 4. Fixed broadband subscriptions per 100 inhabitants, per speed tiers, (Dec. 2019)



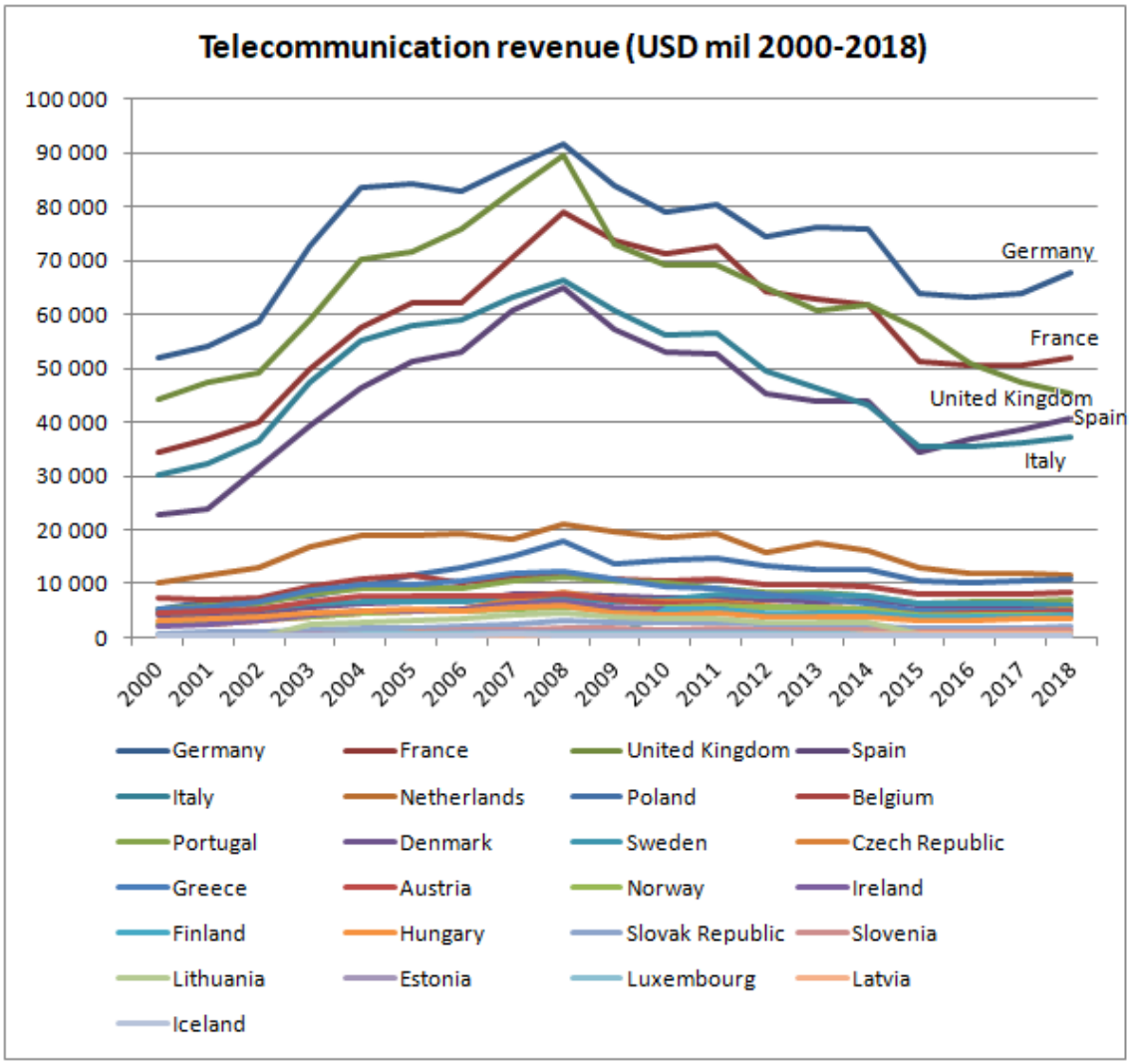
Source: OECD, https://www.oecd.org/sti/broadband/broadband-statistics/

Telecommunications revenue per country

Data from the OECD database (Table A5 in the appendix and Graph 5 below), show that the total telecommunications revenue for the five leading European Countries (Germany, France, UK, Spain and Italy) has an increasing trend from 2000 to 2008, (with a peak in 2008), and it has a declining trend after 2008, with stabilization signs after 2015 and a positive change between 2017 and 2018 (with the exemption of UK, where the decrease continued). This decreasing revenue trend brought the income of the telecom companies return to the levels of 2002-2003.

The observed revenue loss, is related to the global economic recession, when many European telecommunications operators lost more than 15% of their revenue (Fonseca et al., 2019). The smaller counties followed this pattern in a smaller scale. The biggest losses are observed in Ireland, with a revenue drop of 16,7%.between 2008 and 2018.

Graph 5. Telecommunication revenue 2000-2018

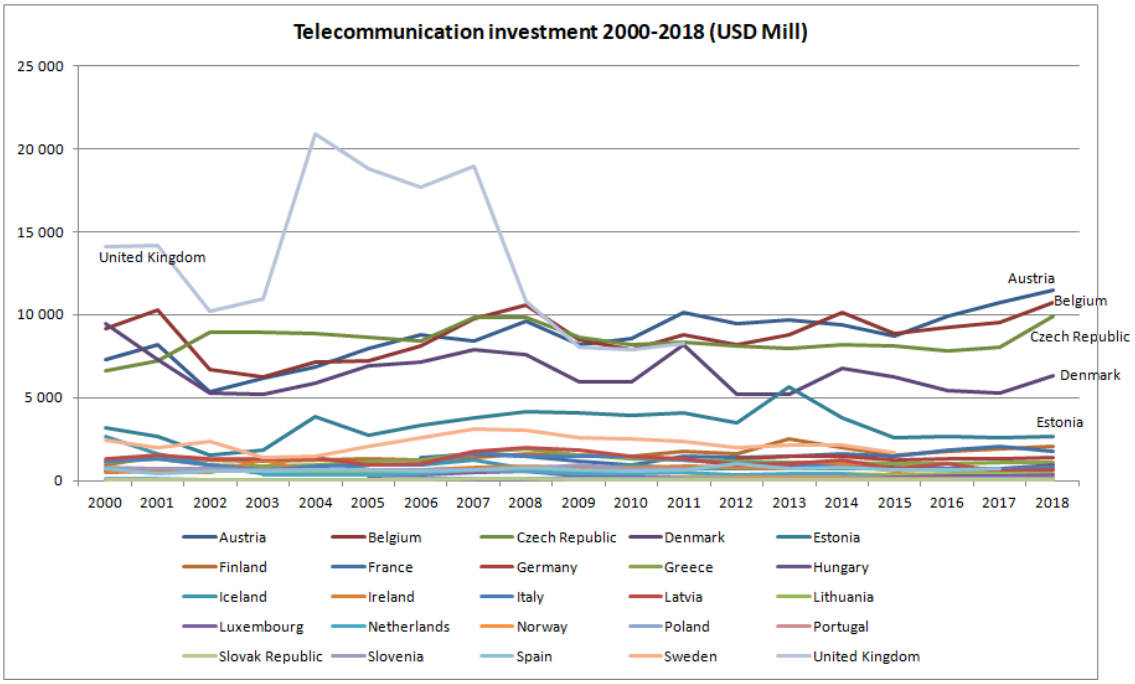


Source: OECD

Telecommunications Investments

According to the OECD database, investments in telecommunications, during the last two decades, among the European countries present a rather stable picture, with the exemption of UK, where there was a major reduction between 2007 – 2009 (also for UK, there are no available data after 2011). The leading countries are France, Germany, Italy, Spain and the Netherlands. Luxemburg, despite the low investments (due to the size of the country) is the leading country in investment growth between 2008 and 2018, with a growth of 6,7%, followed by Germany with growth of 2,56. The biggest decline in investments during this decade was by Slovak Republic (-16,13%).

Graph 6. Telecommunications Investments 2000-2018


Telecommunication investment 2000-2018 (USD Mill)
25 000
20 000
15 000
10 000
5 000
0
United Kingdom
Austria
Belgium
Czech Republic
Denmark
Estonia
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Austria
Belgium
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Latvia
Lithuania
Luxembourg
Netherlands
Norway
Poland
Portugal
Slovak Republic
Slovenia
Spain
Sweden
United Kingdom

Source: OECD

3.Methodology

In this chapter the aim is to describe the methods used to present the development of the telecommunication market in Europe. The presentation is made based on selected leading companies in the European market, which have a national and, in some cases, global presence.

3.1. Research type

The type of the present research is quantitative, based on secondary data. Quantitative research is the type of research strategy which studies the nature and the relationships among variables that have been measured by numerical means and are analyzed with the aid of statistical and graphical techniques (Saunders, Lewis, and Thornhill, 2009).

Secondary data are elements that have been collected for some purpose or research already at a prior time. Types of secondary data can be, among others, published statistics, measured by authorities, organizations or individuals and can be processed data or raw data. Processing can include selection, summarizing, ordering, grouping and other compilation. Secondary data can provide the basis for further analysis that will explore the information encapsulated in the figures and reveal new insight and knowledge for a research.

3.2. Data acquisition

The data for the analysis that follows have been obtained from Thomson Reuters database. In the previous sections, the description of the telecommunications sector in Europe has also been based on data obtained from publications of the European Commission (European Commission, 2019) and the Organization for Economic Co-operation and Development (OECD, 2019). Data obtained from Thomson Reuters database include stock prices for major European telecommunications companies on daily, monthly and yearly basis, (in the present analysis the monthly data are used) as well as net income and gross profit margin for a group of companies. The period covered refers to the years between 1998-2019. The data for the analysis are provided in the appendix of the present research (Tables A7-Net income of selected companies, A8 – gross profit margin and A9 – stock price). The two first tables are on yearly basis and the third is on a monthly basis.

The companies for which stock price data are included are:

HELLENIC TELECOM.ORG., KPN KON, PHAROL SGPS, TELECOM ITALIA, ORANGE, DEUTSCHE TELEKOM (XET), GIGASET, TELEFONICA S.A.

The companies for which income and profit data are included are:

DEUTSCHE TELEKOM AG, VODAFONE GROUP PLC ORANGE SA , TELEFONICA S.A. TELIA COMPANY AB, BT GROUP PLC ELISA CORP.

A brief description of each company follows:

DEUTSCHE TELEKOM AG

Deutsche Telekom is a telecommunication company based in Germany, with presence in more than 50 countries. It is one of the biggest integrated telecommunications firms, operating in both the fixed and the mobile market, counting 184 million mobile clients, 27,5 million fixed-network lines, and 21 million broadband lines.

VODAFONE GROUP PLC

Vodafone is a big mobile telephone operator and in some countries it is also involved in the fixed lines sector and other telecom activities. It is one of the biggest telecom companies, regarding stock value. The company started business in 1985 in the UK, and since then it has broaden the operations worldwide, having presence in Europe, America, Middle east, SouthWest East, Far East, Africa, with mobile operations in 22 countries, partner with mobile networks in additional 42, and provide fixed broadband in 17 markets. The customer base of the company counts 300+ million mobile clients, 27 million fixed broadband and 22 million TV clients.

ORANGE SA

Orange SA is a telecom company that offers telecommunications services to households, professional, and large business clients. The Company offers services and hardware (equipment sales and rentals). In the services part its portfolio includes public fixed-line

telephone, leased lines and data transmission, mobile telecommunications, cable television, Internet and wireless applications, and broadcasting services.

TELEFONICA S.A.

Telefonica S.A. is a Spanish company that offers telecommunications services mainly to countries in Europe, but also in Latin America. The services include fixed-line and mobile telephone, Internet, and data transmission services to residential and corporate customers.

TELIA COMPANY AB

Telia Company AB is a Swedish telecommunications with multinational presence, that operates in Denmark, Estonia, Finland, Latvia, Lithuania, Norway, Sweden and Turkey. The company was founded in 1853, and it is currently traded at Nasdaq Stockholm and Nasdaq Helsinki, with almost 472,000 shareholders. It resulted after the merger in 2002 of Swedish and Finnish telecom companies, Telia and Sonera. Before the company was privatized it was the state telecom operator. In 2018 Telia announced merger with Bonnier Broadcasting Group, which was approved by the European Commission. (Thomson, 2019).

BT GROUP PLC

BT Group PLC (British Telecom) is a telecom company offering services and solutions, for global, local, national, and international spectrum and household and business. The services include fixed, broadband, TV, and Internet connection. The operations of the company cover, beyond UK, 180 countries worldwide.

ELISA CORP

Elisa Oyj is a Finnish telecom company (the trade name in English is Elisa Corporation). The company was established in 1882, and was known previously with the names Helsingin Puhelin (until July 2000) and Elisa Communication Oyj (until 2003). The main countries of operations are Finland and Estonia, while the company also provides digital services in other markets. The subscriptions' base accounts for more than 6.2 million, including consumer, corporate and public organizations.

HELLENIC TELECOM.ORG (OTE-COSMOTE)

Hellenic Telecommunication Organization (OTE) is a telecommunications company, which has been for many years in the past the state monopoly in telecommunications. The company offers at the moment fixed lines, Internet access services, TV services, and mobile telecommunication. It is a Greek company, that has been acquired by Deutsche Telecom and has subsidiaries in Romania (Telekom Romania, and Telekom Romania Mobile).

KPN KON

Koninklijke KPN N.V. is a telecom company, founded in 1881, with headquarters in Rotterdam (the Netherlands) offering telecommunications and information technology (IT) services in the Netherlands. The areas of business of the company are household and consumer, business; wholesale market and network and IT markets. The offerings include fixed and mobile telephony, fixed and mobile broadband Internet and TV. Additional services include cloud computing, and security services for small and medium businesses, as well as IT management, cybersecurity, and information and communication technologies to large and corporate enterprises.

PHAROL SGPS

PhaRol or Portugal Telecom (PT) is a telecom company in Portugal. It is the telecom market leader in the country with regard to for fixed-line and mobile phone services. The mobile business include Telecomunicações Móveis Nacionais, or TMN, the domestic provider. In addition, PT is a partner with joint ventures in in international telecom companies, such as the Vivo (joint venture with Telefónica Móviles) and network operator Telemar Norte Leste, both in Brazil.

TELECOM ITALIA

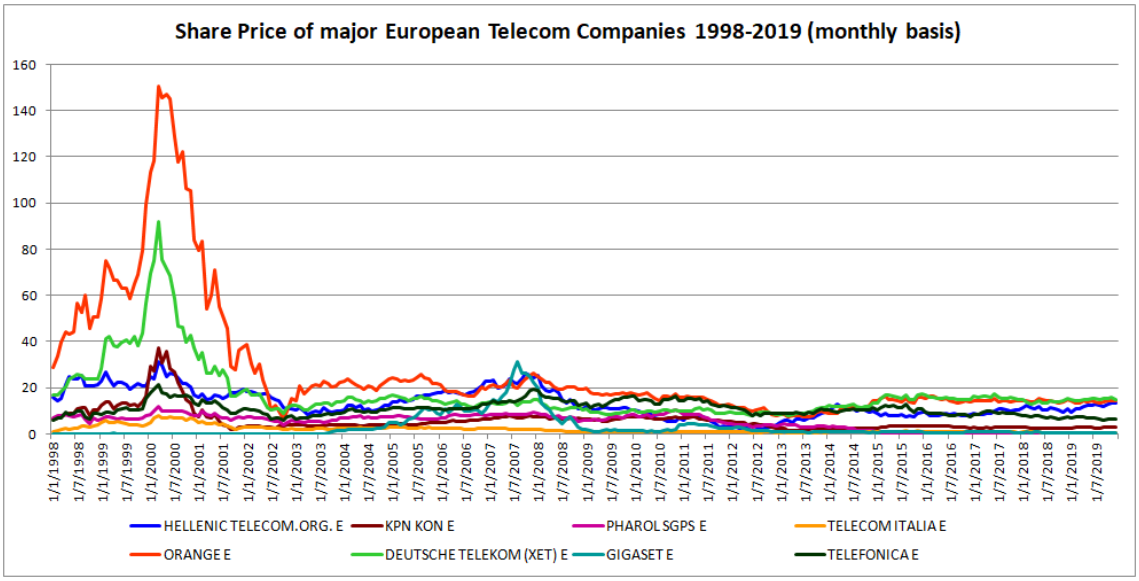
Telecom Italia S.p.A., is the leader company in telecommunication in Italy. It has subsidiaries, in collaboration with which it offers fixed line and mobile telephone and data transmission services in Italy and other countries. Among the services fixed (local and long-distance) telephone are included, as well as satellite communications, Internet

access, and teleconferencing services. The company is the biggest in the sector in Italy and it also operates in Brazil, with almost 55,000 subscribers to its mobile services.

3.3. Data presentation

The stock price data are obtained in daily, monthly and yearly basis. In the analysis of the stock price the monthly data are used. The development of the stock prices of selected European companies is depicted in the following Graph 7. The data show a peak in stock prices between mid 1999 and mid 2000, when almost all companies' had a raise in stock prices.

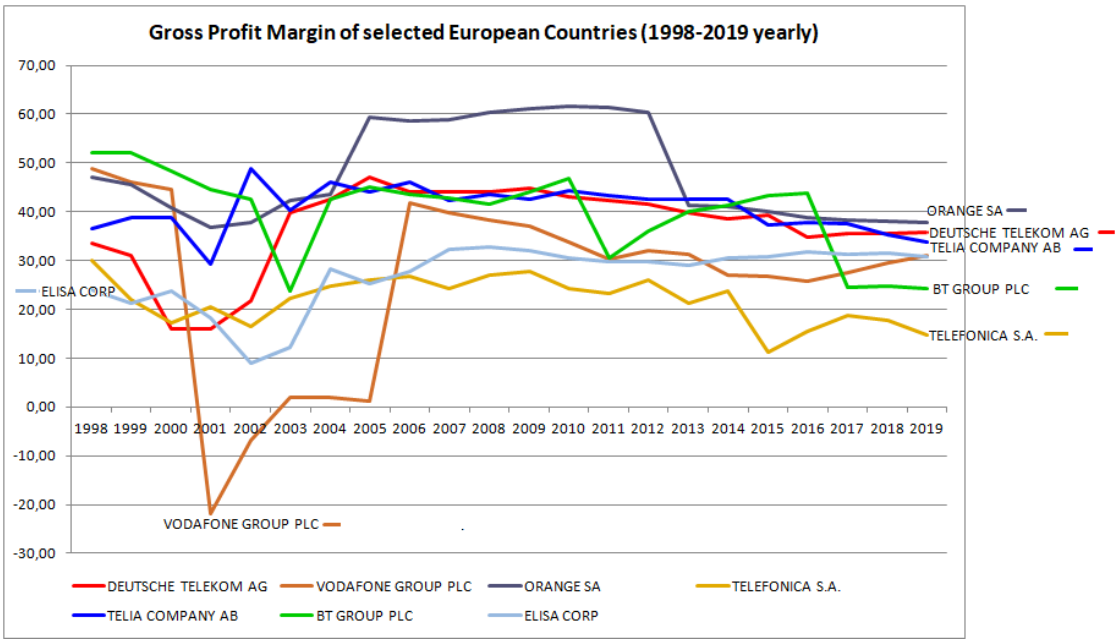
Graph 7. Share price of selected European telecom companies (1998-2019 monthly).



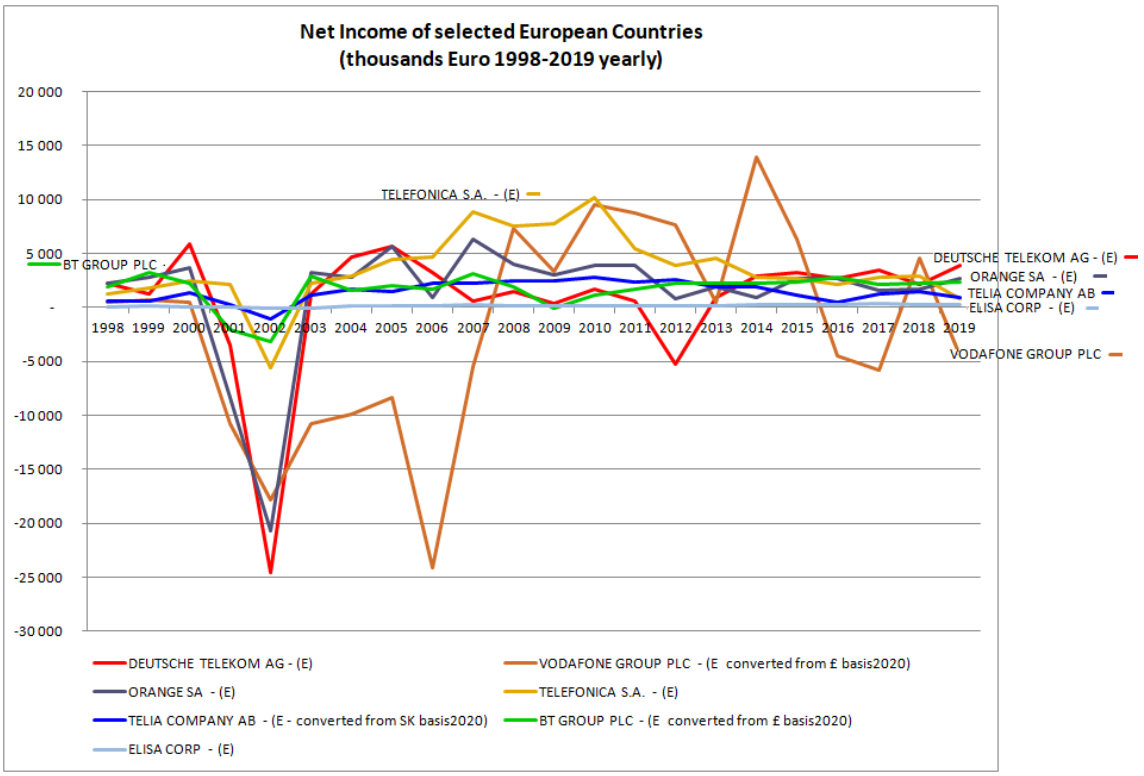
Source: Thomson Reuters and processing by the author

The visualization of the net income and gross profit margin (yearly basis) are presented in the following graphs 8 and 9.

Graph 8. Gross Profit Margin of selected European Countries (1998-2019 yearly)



Graph 9. Net Income of selected European Countries (Thousands Euros 1998-2019 yearly)



3.4. Type of statistical analysis

The statistical analysis used for the present study is an econometric type of analysis, a simple linear regression. Econometric models will be explored for the selected telecom companies described above. The independent variable in each analysis is time and the dependent variable is the measure analyzed (stock price, net income and profit margin). Regression analysis is the method to estimate a regression equation using one or more independent variables (with one independent variable is simple linear regression and with more independent variable it is called multiple linear regression) (Saunders at al., 2009).

The process of regression analysis includes the estimation of the coefficient of determination (R^2), which is a measure that examines the strength of relationship between a numerical dependent variable and one numerical independent variable (Saunders at al., 2009).

Regression analysis is used to examine the trend of a variable in longitudinal data series or, in other words to explore the trend that appears of the evolution of a variable or relative change of the variable over time. In addition, it is used to make forecasts for future values of the variable.

3.5. Purpose of the research

The aim of the analysis is to examine the trend of the performance in the telecommunication market in Europe, between the years 1998 and 2019. More specifically, the objectives of the present research analysis is to investigate the trends within the abovementioned time frame of the stock price of selected European telecom companies, with regard to their stock price, as well as their net earnings and the gross profit margin.

Additionally, the aim of the study is to make forecasts for selected telecom companies regarding their stock price and their net earnings and the gross profit margin.

4. Results

In the next paragraphs the econometric models are presented for the selected companies. First, the variable examined is the stock price, and in the sections to follow the profit margin and the net income.

4.1. Econometric models for Stock Prices

We first focus on the log-price series of the shares of the following companies: HELLENIC TELECOM.ORG, KPN KON, PHAROL SGPS, TELECOM ITALIA, ORANGE, DEUTSCHE TELEKOM, GIGASET, TELEFONICA.

Specifically, we applied the Phillips-Perron and Augmented Dickey-Fuller unit root tests and the results are depicted in the following table:

P-values of Unit Root Tests

Test	HELLENIC TEL.ORG.	KPN KON	PHAROL SGPS	**TELECOM ITALIA**	8X8 (FRA)	DEUTSCHE TELEKOM	ORANGE	GIGASET	TELEFONICA
Phillips-Perron	0.63	0.42	0.96	**0.01**	0.53	0.73	0.50	0.95	0.25
ADF	0.46	0.24	0.94	**0.03**	0.45	0.72	0.44	0.91	0.54

We observe that only for Telecom Italia the log-price series does not seem to provide evidence that supports the existence of a unit root.

Next, we estimated the following model

$\Delta\log(\text{Price}) = \alpha + u$

where Δ stands for the first differences. The results in the following table show that only in the case of Pharol SGPS a negative and statistically significant drift was estimated.

Drift (constant) Estimation ($\delta\log(\text{Price}) = \alpha + u$)

	HELLENIC TEL.ORG.	KPN KON	**PHAROL SGPS**	TELECOM ITALIA	8X8 (FRA)	DEUTSCHE TELEKOM	ORANGE	GIGASET	TELEFONICA
α	-0,00061	-0,00338	**-0,01600**	-0,00157	0,00207	-0,00054	-0,00263	0,00380	0,00053
p-value	0,931	0,648	**0,048**	0,812	0,895	0,917	0,703	0,760	0,914

4.2. Econometric models for the Net Income of selected companies

The time series for the Net Income is at a yearly basis. For the trend examination and the forecast of the Net Income figures, the relationship between the time in months and the net income figures were not significant for any of the studied companies.

Initially, the summary of the regression analyses for all the companies is presented in the following table:

Regression for net income1998-2019 (yearly)			
	a	b	F-test p-value
DEUTSCHE TELEKOM Germany	-408.620.87	203.781	0.340
VODAFONE GROUP GB - Global	-1.081.303.726	537.500	**0.091**
ORANGE SA Global	-409.748.203	204.654	0.291
TELEFONICA S.A Spain	-169.378.526	86.119	0.443
TELIA COMPANY Sweden	-81.915.479	41.517	0.192
BT GROUP GB	-138.899.134	69.989	0.188
ELISA CORP Finland	29.298.783	14.668	**0.000**

For DEUTSCHE TELEKOM AG, the econometric model resulted from the analysis was not significant (F=0,956, p=0,340), and a coefficient of determination at R^2=0,046, explaining only 4,6% of the total variance. The time coefficient is also not significant (B=203,781, t=0,978,, p=0,340). This is because there is no significant linear correlation between time and Net Income series for DEUTSCHE TELEKOM (scatter plot and trend line in graph A1 of the appendix)

Similarly, the analysis for VODAFONE GROUP PLC also showed a non significant model (R^2=0,136, F=3,151, p=0,091). The slop of the line (Graph A10 of the appendix) is positive, but it is not significant (scatter plot and trend line in graph A2 of the appendix)

The analysis for ORANGE SA showed that there is also a non significant model connecting time with net income resulting from the analysis (R2=0,056, F=1,176 p=0,291). The regression coefficient is positive, but not significant (B=204,654, t=1,085, p=0,291) (scatter plot and trend line in graph A3 of the appendix)

The analysis for TELEFONICA S.A. shows that the econometric model for the Net Income regression is not significant, meaning that there is not a significant linear relationship between time (in years) and the evolution of the Net Income of the company (R^2=0,030, F=0,611, p=0,443, B=86,119, t=0,782, p=0,443) (scatter plot and trend line in graph A4 of the appendix)

The analysis for TELIA COMPANY Net Income trend, similarly to all the above does not show significance (R^2=0,084, F=1,823, p=0,192). This is an indication that there is no significant correlations between time and net Income for TELIA (B=41,517, t-=1,350,p=0,192) (scatter plot and trend line in graph A5 of the appendix)

Examining the data for BT GROUP, similar results were found, showing that there is not a significant linear model describing the Net Income trend (and forecast). The model explains only 8,5% of the total variance (R^2=0,085, F=1,856, p=0,188), with time (years) coefficient be B=69,989, t=1,362, p=0,188 (scatter plot and trend line in graph A6 of the appendix)

In contrast with all the above companies, as far as the Net Income trend is concerned, the analysis for ELISA CORP showed a significant model with coefficient of determination R^2=0,757 (F=62,185, p=0,000) that explains 75,7% of the total variance of the Net Income time series. The trend of the Net Income is positive, with increasing income, and the Beta coefficient is significant, affecting the evolution of the Net Income (B=14,668, t=7,886, p=0,000).

The regression equation is

Y=29298,783 + 14,668 *X, (8)
Where

Y is the Net Income and X is time in years
The results show that the Net Income grows by 14,668 thousand Euros in one year. The visualization of the trend line is in graph A7 of the appendix.

4.3. Econometric models for the Gross Profit Margin of selected companies

In this section the subject is the study of the gross profit margin for the telecom companies analyzed in the previous section. Similarly to the analysis of the net income, the present analysis is also on a yearly basis and the tool used is linear regression.

The results of the analysis are summarized in the following table

Regression for Gross profit margin 1998-2019 (yearly)			
	a	b	F-test p-value
DEUTSCHE TELEKOM Germany	-961.719	**0.497**	0.092
VODAFONE GROUP GB - Global	-937.797	0.480	0.458
ORANGE SA Global	413.813	-0.182	0.597
TELEFONICA S.A Spain	654.860	**– 0.315**	0.051
TELIA COMPANY Sweden	268.293	-0.113	0.478
BT GROUP GB	1.687.015	**– 0.820**	0.003
ELISA CORP Finland	-1.327.689	**0.674**	0.001

Initially, the gross income for DEUTSCHE TELEKOM AG is examined, for the years 1998 – 2019. The econometric model revealed from the regression analysis did not show a significant linear correlation of the profit figures based on time (F=3,139, p=0,092). The coefficient of determination is R^2=0,136,showing that 13,6% of the total gross profit is explained by the model. The regression coefficient is not significant (B=0,497,t=1,772, p=0,092),showing that time cannot predict at a significant level the gross profit, not allowing for forecasts using a linear model. The plot of the gross profit for Deutsche Telecom is presented in Graph A8 of the appendix.

Regarding VODAFONE GROUP, the results show that the resulting econometric model is also no significant (R^2=0,028,F=0,574,p=0,458). So is B coefficient (B=0,480,t=0,758, p=0,458). The time series with the trend line is presented in Graph A17 of the appendix.

Similarly, a linear econometric model did not fit significantly for the evolution of the gross profit of ORANGE SA (R^2=0,014, F=0,288, p=0,597),explaining only 1,4% of the total variance. Time coefficient is also not significant (B=-0,182, t=-0,537, p=0,597), having a negative trend (graph A10 of the appendix).

The model for TELEFONICA S.A is marginally significant (R^2=0,177, F=4,290, p=0,051), showing a positive trend of the gross profit for the company (B= -0,315, t=-2,071, p=0,051), allowing to accept the model as one that can explain the 17,7% of the total variance, with a trend that is marginally different from zero (graph A11 of the appendix).
Assuming the model marginally significant, the regression equation is as follows:

Y=654,860 – 0,315 *X, (9)
Where

Y is the Gross profit margin and X is time in years
The results show that the gross profit margin decreases by 0,318 percentile units in one year.

For TELIA COMPANY there is not a good fir of a linear model, since the regression line is not significantly different from zero and the model explains only2,5% of the total variance (R^2=0,025, F=0,523, p=0,478). The regression coefficient, is negative and has also no significance (B=-0,113, t=-0,723, p=0,478, graph A12 of the appendix)

In contrast, the model for BT Group is significant (R^2=0,367, F=11,600,p=0,003),explaining the 36,7% of the total variance. The regression line shows a trend (Graph A13 of the appendix), which is negative (B=-0820, t=-3,406,p=0,002).

The regression equation is as follows:

Y=1687,015 – 0,820*X, (10)
Where

Y is the Gross profit margin and X is time in years
The results show that the gross profit margin decreases grows by 0,820 percentile units in one year.

For the gross profit margin of ELISA CORP the analysis revealed a significant model (R2=0,447, F=16,177, p=0,001), which explains the 44,7% of the total variance of the variable (margin). The regression coefficient is significant, (B=0,674, t=4,022, p=0,001) and the regression equation is as follows:

Y=-1327,689 + 0,674 *X, (10)
Where

Y is the Gross profit margin and X is time in years
These results show a positive trend, and that the gross profit margin increases by 0,647 percentile units in one year.

5. Conclusions

In the present dissertation the aim has been to make a study of the Economic performance in European telecommunications. Initially the current telecommunications landscape per country has been described, based on information retrieved from the European Commission and 1998-2019, based on historical data for major telecom companies, and on country figures regarding the sector of telecommunications.

Market liberalization after the 90's has made the number of telecommunications operators to grow and a competition to emerge, in the place where before regulations, monopolies, usually by State companies were the rule. The situation as depicted by the European Commission, (2019) Digital Economy and Society Index (DESI), shows a trend in the market where investments are taken by private operators only partly, while a major part of the projects are financed by the governments and more by the European Union (through the European Agricultural Fund for Rural Development and the European Regional Development Fund -ERDF).

The analysis of the performance data retrieved from Thomson Reuters database lead to the main conclusion that the performance as seen by the prism of stock price of major European telecom companies has a declining trend. This conclusion is derived based on data within the time frame between 1998 and 2019. Explaining this trend, the major observation is that this is affected by the exceptionally high rise of stock prices in the years around the beginning of the new Millennium (1999-2001).

This is described in the literature as the dot-com bubble or the dot-com boom/ the tech bubble (Hunn, Eaton, 2016, Litan, 2002), referring to the in the high rise of stock prices and massive growth related to internet and telecom companies, which was followed by a drastic drop of the market. Almost all companies included in the study demonstrate this performance with a considerable increase in their stock price at the time of the dot-com boom.

However, this picture is not coupled with an economic growth in terms of revenue and profit, since the respective analysis made for the gross profit margin and the net income level do not follow the patterns of the stock price evolution and for the majority of the companies do not follow a linear route, making it not possible to estimate a standard trend for the economic results.

Specifically, the stock prices for the Greek company HELLENIC TELECOM.ORG follow a pattern, where decrease of the stock price is observed after the big boom, with losses to account for five cents per share by month. Similarly, KPN KON was found to

experience decreases of the stock price at a level of almost four cents per month, which is the case with the company PHAROL SGPS.

The major operator in Italy, TELECOM ITALIA had smaller losses of 1,6 cents per month, which was also the case for the multinational Orange. Bigger losses were observed for the European leader, Deutsche Telecom which seems to loose almost eight cents per share each month for the studied period. The Spanish Telefonica had smaller decreases at one cent per month per share, having a lower share price.

As already mentioned, this fall of the stock price did not have the same trends as the profitability, for which there are no clear trends for most of the companies. The only company within the study with significant increases in terms of net income and profit margin is ELISA CORP.

As mentioned above, the aim to examine whether there are linear trends in the patterns of the performance, has shown that there are linear relationships for part of the analyses. This can be seen as a limitation of the research, and it is proposed in a future research,in order to capture a wider set of patterns, we may use quadratic (i.e. second order polynomial) trends.

Footnotes

[1]https://www.statista.com/statistics/221335/telecoms-service-revenues-in-europe-since-2005/#statisticContainerRevenue of the telecommunications services industry in Europe from 2011 to 2019

[1]https://ec.europa.eu/digital-single-market/en/news/2019-desi-report-electronic-communications-markets-overview-member-state-telecom-chapters

[1]https://ec.europa.eu/digital-single-market/en/news/2019-desi-report-electronic-communications-markets-overview-member-state-telecom-chapters

[1] United Kingdom is included in the study, as it has been member of the EU for most of the period under analysis and it has been included in the Digital Economy and Society Index (DESI) issued by the European Commission issued in 2019

https://ec.europa.eu/eurostat/371

Appendix 1- Data tables

Table A1. OECD Key ICT Indicators - Total communication access paths

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	5 755	7 755	9 491	9 848	10 375	10 857	11 927	12 556	13 515	14 196	15 055	15 890	16 958	17 843	18 414	18 140	17 845	18 432	19 291	19 897	21 462
Belgium	6 490	7 796	10 104	12 005	13 276	14 045	14 899	15 615	16 248	17 442	18 582	18 497	19 388	19 828	19 843	19 982	20 584	20 718	20 577	19 970	19 779
Czech Rep	4 700	5 751	8 244	10 616	12 016	13 036	14 096	15 306	16 091	17 223	17 955	18 414	18 282	18 566	18 114	18 099	17 758	17 805	17 005	17 167	17 397
Denmark	5 134	5 803	6 572	7 132	7 996	8 472	9 105	9 597	10 171	10 608	10 604	10 534	10 423	10 536	10 523	10 207	10 251	10 094	9 943	10 075	10 115
Estonia	745	898	1 088	1 229	1 333	1 503	1 703	1 881	2 254	2 533	2 562	2 277	2 584	2 601	2 748	2 718	2 719	2 558	2 497	2 498	2 507
Finland	5 801	6 280	6 785	7 258	7 743	7 977	8 339	8 835	9 125	9 420	9 967	10 694	11 201	11 655	11 768	11 674	11 679	11 602	11 509	11 478	11 440
France	45 067	54 507	63 695	71 081	74 407	79 267	84 684	90 660	95 978	99 625	102 065	105 295	107 913	110 819	114 475	117 331	119 961	122 220	123 865	128 612	132 037
Germany	54 350	63 556	87 868	95 822	102 032	108 791	120 302	128 902	138 883	153 549	164 007	165 498	165 411	169 642	167 368	167 289	162 052	160 722	174 747	177 305	175 690
Greece	7 595	9 534	11 693	13 776	15 085	15 996	16 723	18 124	19 779	22 612	25 637	27 374	22 118	21 851	22 386	23 046	22 992	23 067	23 317	23 204	22 237
Hungary	4 530	5 240	6 668	8 422	10 253	11 401	12 285	12 960	14 350	15 724	17 084	16 741	16 395	16 020	15 820	15 778	15 754	15 540	15 124	15 154	15 181
Iceland	265	333	376	394	443	473	494	533	558	572	594	594	593	592	599	598	611	626	636	641	637
Ireland	2 531	3 261	3 657	4 430	4 834	5 158	5 598	6 214	6 890	7 480	7 630	7 713	7 809	7 994	7 928	8 156	8 388	8 310	8 455	8 577	8 818
Italy	45 434	55 064	66 784	75 849	78 875	85 113	92 655	102 743	111 475	123 118	124 181	126 206	130 655	134 266	135 347	135 017	133 381	133 000	134 650	137 927	141 480
Latvia	..	..	..	..	10	20	49	61	110	339	412	437	435	455	3 494	3 382	3 290	3 495	3 508	3 638	3 591
Lithuania	1 351	1 482	1 697	2 146	2 601	2 993	4 000	5 344	5 809	6 156	6 324	6 266	6 217	6 275	6 331	5 766	5 528	5 440	4 844	4 843	4 828
Luxembourg	358	426	551	683	731	801	935	1 031	1 059	1 068	1 111	1 130	1 151	1 203	1 168	1 184	1 341	1 383	1 374	1 422	1 450
Netherlands	11 114	15 001	19 174	19 485	20 788	22 690	26 433	26 346	27 900	30 237	31 904	31 616	31 036	31 902	30 821	30 335	31 094	31 949	34 348	33 743	35 192
Norway	4 547	5 109	5 633	5 910	6 276	6 636	7 329	7 732	7 928	8 102	8 146	8 272	8 227	8 359	8 378	8 384	8 384	8 335	8 322	8 293	8 256
Poland	10 413	13 437	16 362	20 407	23 822	27 677	33 949	41 828	50 876	54 986	57 376	58 862	60 823	63 613	67 472	69 744	68 651	66 027	63 985	60 975	58 911
Portugal	6 969	8 564	10 431	11 756	13 189	14 163	15 047	16 107	17 096	18 222	19 617	20 771	21 269	21 567	21 568	21 448	21 648	21 840	22 153	22 501	22 558
Slovak R	2 005	2 319	2 992	3 704	4 327	4 992	5 577	5 871	6 304	7 591	7 491	7 286	7 692	7 757	7 869	8 022	8 186	8 472	8 753	8 894	9 074
Slovenia	..	..	..	..	2 466	2 573	2 709	2 698	2 817	2 924	3 119	3 100	3 082	3 087	3 113	3 111	3 127	3 128	3 147	3 184	3 196
Spain	23 519	32 018	41 687	47 083	52 382	57 186	59 999	67 149	72 219	76 513	79 356	81 143	82 356	83 865	81 700	81 722	83 019	84 210	85 316	86 568	88 602
Sweden	10 198	11 219	12 425	13 128	14 523	15 539	15 724	16 356	17 064	17 668	18 267	18 731	19 263	19 579	19 750	19 926	19 816	20 024	19 786	19 396	19 179
UK	44 443	55 589	71 836	76 838	82 131	88 159	97 517	106 666	113 796	120 499	125 108	128 951	131 382	133 137	135 295	136 077	138 289	141 161	140 747	141 324	142 504

Source: OECD https://www.oecd.org/sti/broadband/oecdkeyictindicators.htm

Table A2. OECD Key ICT Indicators - Total communication access paths per 100 inhabitants

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	72,2	97,0	118,5	122,5	128,4	133,7	146,0	152,7	163,5	171,1	180,9	190,5	202,8	212,7	218,5	214,0	208,9	213,6	220,7	226,2	242,9
Belgium	63,6	76,2	98,6	116,7	128,5	135,4	143,0	149,0	154,0	164,2	173,5	171,3	178,0	180,4	179,3	179,6	184,1	184,4	182,2	176,0	173,5
Czech Republic	45,7	55,9	80,3	103,8	117,8	127,8	138,1	149,6	156,7	166,9	172,2	175,5	173,8	176,9	172,4	172,2	168,7	168,9	161,0	162,1	163,7
Denmark	96,9	109,1	123,1	133,2	148,8	157,3	168,6	177,2	187,2	194,4	193,2	190,9	188,0	189,3	188,4	182,0	181,8	177,8	173,7	174,9	174,7
Estonia	53,7	65,3	77,9	88,6	96,6	109,7	125,0	138,9	167,3	189,0	191,6	170,6	194,1	195,9	207,7	206,2	206,8	194,6	189,8	189,6	189,6
Finland	112,6	121,6	131,1	139,9	148,9	153,0	159,5	168,4	173,3	178,1	187,6	200,3	208,8	216,3	217,4	214,6	213,8	211,7	209,4	208,4	207,4
France	75,1	90,4	104,9	116,2	120,8	127,8	135,5	144,0	151,4	156,2	159,1	163,4	166,6	170,3	175,0	178,5	181,0	183,8	185,7	192,5	197,2
Germany	66,2	77,4	106,9	116,4	123,7	131,8	145,8	156,3	168,6	186,7	199,7	202,1	202,3	211,3	208,1	207,4	200,1	196,8	212,2	214,5	211,9
Greece	70,9	88,6	108,2	126,8	138,4	146,4	152,7	165,0	179,5	204,7	231,4	246,5	198,9	196,8	202,7	210,2	211,1	213,2	216,4	215,8	207,3
Hungary	44,1	51,2	65,3	82,7	100,9	112,6	121,6	128,5	142,5	156,4	170,2	167,0	164,0	160,9	159,5	159,5	159,7	157,9	154,1	154,8	155,4
Iceland	96,7	120,2	133,7	138,1	154,2	163,5	169,0	179,5	183,5	183,5	187,1	186,4	186,4	185,7	186,7	184,8	186,7	189,3	189,7	186,6	180,6
Ireland	68,3	87,2	96,5	115,2	123,4	129,6	138,4	150,3	162,8	170,9	170,1	170,1	171,4	174,7	172,6	176,8	180,6	177,3	178,4	179,0	181,6
Italy	79,8	96,8	117,3	133,1	138,2	148,5	160,6	177,2	191,7	210,7	211,1	213,6	220,4	226,1	227,3	224,2	219,4	219,0	222,1	227,8	234,2
Latvia	..	..	..	..	0,4	0,9	2,2	2,7	4,9	15,4	18,9	20,4	20,7	22,1	171,7	168,0	165,0	176,7	179,0	187,3	186,4
Lithuania	38,1	42,0	48,5	61,8	75,6	87,6	118,5	160,8	177,7	190,5	197,7	198,1	200,7	207,2	211,9	195,0	188,5	187,3	168,9	171,3	172,3
Luxembourg	84,2	98,9	126,4	154,7	163,7	177,3	204,1	221,7	224,0	222,4	227,4	227,0	227,0	232,0	220,0	218,0	241,1	242,8	235,5	238,4	238,4
Netherlands	70,8	94,9	120,4	121,4	128,7	139,8	162,3	161,4	170,7	184,6	194,0	191,3	186,8	191,1	184,0	180,5	184,4	188,6	201,7	197,0	204,2
Norway	102,6	114,5	125,4	130,9	138,3	145,4	159,6	167,2	170,1	172,0	170,8	171,3	168,3	168,8	166,9	165,0	163,2	160,6	158,9	157,2	155,4
Poland	27,2	35,1	42,8	53,4	62,3	72,5	88,9	109,6	133,4	144,3	150,5	154,3	157,9	165,1	175,1	181,1	178,4	171,7	166,5	158,7	153,4
Portugal	68,6	83,8	101,4	113,5	126,6	135,4	143,5	153,4	162,5	172,8	185,8	196,5	201,2	204,3	205,1	205,1	208,1	210,9	214,6	218,5	219,4
Slovak Republic	37,2	43,0	55,4	68,8	80,4	92,8	103,6	109,0	116,9	140,6	138,5	134,5	141,6	143,7	145,5	148,2	151,1	156,2	161,2	163,5	166,6
Slovenia	..	..	..	..	123,6	128,9	135,7	134,8	140,2	144,8	154,2	151,8	150,4	150,4	151,4	151,1	151,7	151,6	152,4	154,1	154,4
Spain	58,5	79,3	102,8	115,5	126,5	135,5	140,0	153,8	162,8	169,1	172,6	175,0	176,9	179,4	174,7	175,4	178,7	181,5	183,7	186,0	189,6
Sweden	115,2	126,7	140,1	147,6	162,7	173,5	174,8	181,1	187,9	193,1	198,1	201,4	205,4	207,2	207,5	207,6	204,4	204,4	199,4	192,8	188,5
United Kingdom	76,0	94,7	122,0	130,0	138,4	147,8	162,7	176,6	187,1	196,5	202,4	207,1	209,3	210,4	212,4	212,3	214,1	216,8	214,4	214,0	214,5
OECD	**62,1**	**76,2**	**88,9**	**96,8**	**106,3**	**114,3**	**124,7**	**134,9**	**144,6**	**153,3**	**158,3**	**159,8**	**161,9**	**165,0**	**166,5**	**166,5**	**169,7**	**171,3**	**174,3**	**175,5**	**178,5**

Source: OECD https://www.oecd.org/sti/broadband/oecdkeyictindicators.htm

Table A3. Households with broadband connections, urban and rural, 2010 and 2016 (coverage percentages)

Country	Urban 2016	Rural 2016	Urban, 2010	Rural, 2010
Norway	96,3	94,7	87,3	78,6
Luxembourg	96,0	98,3	70,3	67,6
Netherlands	95,9	93,1	78,6	78,1
Iceland	95,0	84,1	89,8	82,4
United Kingdom	93,0	93,7	68,0	71,1
Denmark	91,5	91,3	81,4	76,2
Finland	91,2	86,7	75,0	72,5
Sweden	89,6	84,4	84,7	79,3
Germany	89,5	88,4	75,8	70,4
Ireland	88,1	81,4	59,4	50,0
Austria	84,9	82,7	62,5	60,8
Estonia	82,5	82,3	66,8	59,4
Belgium	82,5	82,9	72,9	61,8
Spain	81,9	75,0	59,2	42,4
Hungary	80,8	68,4	48,6	43,0
Czech Republic	80,6	75,8	54,7	50,5
France	80,0	77,8	63,0	51,3
Slovenia	78,4	76,3	69,3	55,4
Slovak Republic	78,3	74,6	72,5	45,2
Italy	77,5	72,3	46,6	41,0
Poland	74,3	73,3	55,9	50,3
Portugal	73,5	58,8	48,8	38,0
Greece	73,4	52,4	49,3	30,0
Latvia	72,7	71,7	71,4	47,1

Table A4. Fixed broadband subscriptions per 100 inhabitants, per speed tiers, (Dec. 2019)

	< 1.5/2Mbps	≥1.5/2Mbps; <10Mbps	≥10Mbps; <25/30Mbps	≥25/30Mbps; <100Mbps	≥ 100Mbps; <1000Mbps	≥ 1000Mbps
France			27,3	4,6	12,2	
Denmark	0,7	1,6	9,6	13,2	17,5	0,9
Netherlands	0,0	0,2	3,4	19,5	20,2	
Norway		2,1	8,9	13,7	17,0	0,6
Germany	0,2	3,4	11,4	16,0	11,0	0,2
United Kingdom		0,4	10,0	22,5	7,2	
Belgium	0,1	0,6	1,0	13,1	25,2	0,0
Sweden	0,1	1,8	4,1	2,7	29,3	1,4
Greece	0,0	0,1	27,7	10,1	0,7	
Iceland	0,0	0,1	1,6	10,3	14,0	12,6
Portugal	0,1	0,2	5,7	2,7	29,3	0,6
Luxembourg		4,3	7,1	5,3	20,0	0,3
Czech Republic	0,0	2,7	11,5	11,0	9,4	0,1
Hungary	0,3	1,3	3,7	6,0	17,6	4,3
Spain	0,1	1,1	4,7	1,7	24,9	0,0
Estonia	2,1	1,6	11,6	11,0	6,2	
Finland		1,6	12,4	4,9	13,3	0,3
Slovenia	0,2	2,3	9,9	8,0	9,5	
Ireland	0,1	2,7	2,5	13,6	10,8	
Slovak Republic	0,3	4,8	6,6	8,4	8,9	0,3
Italy	0,0	5,6	6,4	4,4	11,0	1,6
Austria	0,0	7,2	8,7	8,9	3,6	
Lithuania	0,1	1,0	5,2	8,3	13,8	
Latvia	0,3	4,5	3,2	2,1	16,5	
Poland	0,1	2,8	2,8	4,3	10,0	0,3

Source: OECD, Broadband Portal, www.oecd.org/sti/broadband/oecdbroadbandportal.htm

Table A5. Telecommunication revenue 2000-2018 (USD Mill)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany	52 037	54 018	58 491	72 614	83 500	84 125	82 875	87 534	91 618	83 889	78 933	80 278	74 359	76 000	75 733	63 778	63 222	63 708	67 765
France	34 331	36 734	40 123	49 830	57 440	62 156	62 275	70 570	78 985	73 613	71 377	72 633	64 294	62 929	61 737	51 086	50 500	50 611	52 024
United Kingdom	44 227	47 478	49 101	58 836	70 130	71 472	75 772	82 921	89 394	72 834	68 978	69 111	64 758	60 851	61 784	57 164	50 723	47 304	45 120
Spain	22 947	23 992	31 462	39 253	46 307	51 090	52 850	60 567	64 938	57 261	53 068	52 710	45 218	43 716	43 716	34 245	36 687	38 502	40 608
Italy	30 043	32 346	36 424	47 282	55 210	58 064	58 829	63 208	66 479	60 833	56 208	56 372	49 508	46 259	43 205	35 348	35 464	36 204	37 148
Netherlands	10 244	11 607	12 988	16 793	18 888	18 993	19 202	18 410	21 012	19 636	18 679	19 286	15 643	17 538	16 136	12 990	12 024	11 880	11 594
Poland	5 427	6 583	6 905	7 650	9 589	11 443	12 915	15 153	17 884	13 849	14 308	14 598	13 292	12 741	12 596	10 518	10 071	10 442	10 850
Belgium	7 335	7 088	7 516	9 636	10 990	11 413	10 249	11 057	11 637	10 903	10 541	10 754	9 685	9 730	9 385	7 979	8 050	8 115	8 548
Portugal	5 096	5 995	6 452	7 933	9 143	9 218	9 223	10 633	11 333	10 497	10 133	9 065	8 483	8 362	7 695	6 365	6 501	6 632	6 916
Denmark	4 173	4 240	4 384	5 522	6 356	6 677	6 811	8 146	8 124	7 575	7 224	7 349	6 885	6 642	7 140	5 841	5 699	5 742	6 066
Sweden	4 634	4 812	5 171	6 255	6 815	6 667	6 608	7 337	7 521	6 560	7 166	8 026	7 632	7 922	7 585	6 176	6 234	6 301	5 838
Czech Republic	2 316	2 558	3 270	4 000	4 439	4 882	5 396	6 849	8 430	7 008	6 665	6 723	5 943	5 420	5 011	4 638	4 686	5 011	5 386
Greece	5 089	5 603	6 658	8 650	9 980	9 799	10 624	11 797	12 276	11 003	9 460	9 196	7 901	7 277	6 478	4 877	4 894	4 961	5 009
Austria	4 464	5 043	5 307	6 738	7 603	7 731	7 557	7 830	7 890	7 058	6 336	6 286	5 708	5 547	5 248	4 374	4 566	4 676	4 778
Norway	2 620	2 814	3 360	3 991	4 475	4 754	4 851	5 336	5 641	5 324	5 579	5 884	5 690	5 715	5 356	4 198	4 075	4 170	4 173
Ireland	2 270	2 478	3 197	4 067	4 925	4 898	5 357	6 214	6 641	5 612	5 156	5 311	4 151	4 206	4 031	3 381	3 416	3 552	4 152
Finland	..	..	..	..	..	..	..	..	..	..	5 160	5 257	4 679	4 660	4 587	3 767	3 867	3 909	4 092
Hungary	3 210	3 440	3 869	4 686	4 810	5 099	5 009	5 779	5 820	4 537	4 276	4 422	3 957	3 708	3 785	3 244	3 290	3 425	3 602
Slovak Republic	803	939	1 027	1 346	1 624	1 857	1 949	2 532	3 151	2 949	2 642	2 707	2 398	2 362	2 252	1 844	1 872	1 870	2 006
Slovenia	..	..	..	..	..	1 190	1 311	1 513	1 821	1 770	1 492	1 692	1 554	1 432	1 424	1 205	1 197	1 270	1 275
Lithuania	..	..	..	2 279	2 632	3 144	3 370	4 075	4 595	4 004	3 431	3 326	2 913	2 860	2 793	629	658	689	738
Estonia	..	339	419	555	663	761	883	1 014	1 063	994	929	1 028	937	863	800	684	651	673	732
Luxembourg	343	372	394	478	534	567	612	676	744	702	662	710	719	760	713	598	610	632	677
Latvia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	706	598	590	611	626
Iceland	253	216	228	319	382	464	471	579	276	187	205	225	213	227	248	224	235	256	244

Source: OECD, “Telecommunications database”

Table A6. Telecommunication investments 2000-2018 (USD Mill)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	2 643	1 620	905	416	441	949	937	1 203	749	701	929	711	714	685	735	735	667	712	796
Belgium	961	1 427	1 203	1 195	1 253	1 328	1 266	1 360	1 584	1 503	1 495	1 761	1 608	2 495	1 967	1 553	1 752	1 885	2 041
Czech Republic	471	599	455	1 267	512	576	627	783	877	763	793	826	760	723	1 042	590	686	649	736
Denmark	1 116	1 324	970	851	955	1 146	1 236	1 681	1 888	1 555	1 312	1 243	1 131	1 094	1 115	997	983	1 104	1 112
Estonia	100	86	61	66	63	76	99	130	148	91	91	120	152	121	118	101	104	90	95
Finland	..	..	..	..	..	..	..	..	..	..	..	833	731	753	800	756	656	683	953
France	7 260	8 198	5 376	6 178	6 866	7 927	8 769	8 411	9 601	8 194	8 551	10 131	9 480	9 668	9 389	8 701	9 881	10 737	11 510
Germany	9 167	10 268	6 698	6 250	7 125	7 250	8 125	9 726	10 588	8 472	7 867	8 750	8 205	8 800	10 133	8 889	9 222	9 551	10 706
Greece	1 346	1 534	1 291	1 277	1 360	901	1 006	1 774	2 016	1 871	1 427	1 308	935	1 044	1 229	742	992	575	604
Hungary	820	750	713	625	653	638	635	669	711	951	676	699	..	..	..	..	..	..	..
Iceland	69	37	24	37	54	76	48	116	79	28	35	34	39	45	41	38	57	69	70
Ireland	710	442	575	582	674	674	590	627	759	614	591	620	1 031	733	755	619	628	740	..
Italy	6 586	7 208	8 936	8 963	8 855	8 609	8 444	9 812	9 837	8 642	8 200	8 346	8 098	7 929	8 183	8 099	7 827	8 071	9 893
Latvia	..	..	..	..	..	..	..	..	..	..	..	..	103	87	151	109	98	75	91
Lithuania	..	..	..	348	337	346	438	643	552	416	428	500	341	399	379	88	109	86	95
Luxembourg	15	30	49	44	73	56	88	109	129	136	122	159	171	202	208	146	125	117	95
Netherlands	3 204	2 671	1 564	1 842	3 821	2 702	3 306	3 754	4 171	4 073	3 910	4 073	3 474	5 636	3 749	2 587	2 633	2 548	2 643
Norway	578	597	707	524	550	576	640	683	709	..	..	..	1 339	1 438	1 428	1 244	1 343	1 320	1 356
Poland	2 434	1 965	2 326	1 363	1 492	2 086	2 598	3 113	3 058	2 560	2 472	2 341	1 995	2 151	2 137	1 715	..	..	..
Portugal	1 190	1 274	967	653	848	916	969	1 670	1 468	1 465	1 436	1 250	992	989	821	697	677	727	712
Slovak Republic	..	..	..	476	565	538	547	595	592	543	479	520	263	299	421	349	392	426	419
Slovenia	..	..	..	..	..	237	311	497	590	258	214	179	227	206	241	211	233	278	303
Spain	9 432	7 313	5 242	5 162	5 894	6 894	7 107	7 884	7 605	5 940	5 965	8 221	5 199	5 200	6 758	6 231	5 419	5 258	6 283
Sweden	..	..	..	..	..	..	1 382	1 583	1 470	1 190	974	1 463	1 419	1 496	1 585	1 481	1 835	2 047	1 782
United Kingdom	14 122	14 159	10 185	10 933	20 869	18 779	17 696	18 934	10 776	8 020	7 897	8 279	..	..	..	..	..	..	..

Source: OECD, “Telecommunications database”, OECD Telecommunications and Internet Statistics (database), http://dx.doi.org/10.1787/data-00170-en

Table A7. Net income of selected companies (Thousands Euro 1998-2019)

Net Income (000 E)	DEUTSCHE TELEKOM AG - (E)	VODAFONE GROUP PLC - (E converted from £ basis2020)	ORANGE SA - (E)	TELEFONICA S.A. - (E)	TELIA COMPANY AB - (E - converted from SK basis2020)	BT GROUP PLC - (E converted from £ basis2020)	ELISA CORP - (E)
1998	2 244	461	2 300	1 308	651	1 877	51
1999	1 253	700	2 768	1 805	549	3 281	121
2000	5 926	536	3 660	2 505	1 336	2 261	22
2001	- 3 454	- 10 739	- 8 280	2 107	243	- 1 991	1
2002	- 24 587	- 17 771	- 20 736	- 5 577	- 1 049	- 3 177	-71
2003	1 253	- 10 801	3 206	2 204	1 180	2 955	-17
2004	4 634	- 9 917	2 784	2 877	1 685	1 559	107
2005	5 682	- 8 294	5 709	4 446	1 521	2 003	176
2006	3 203	- 24 108	928	4 637	2 208	1 702	160
2007	569	- 5 425	6 300	8 906	2 298	3 135	220
2008	1 483	7 326	4 069	7 592	2 471	1 911	176
2009	353	3 386	2 997	7 776	2 451	-91	176
2010	1 695	9 510	3 920	10 167	2 763	1 131	150
2011	557	8 765	3 895	5 403	2 384	1 652	202
2012	- 5 255	7 653	820	3 928	2 585	2 202	209
2013	930	472	1 873	4 593	1 946	2 300	197
2014	2 924	13 921	925	2 814	1 885	2 220	225
2015	3 254	6 337	2 652	2 745	1 112	2 349	243
2016	2 675	- 4 426	2 752	2 113	485	2 847	257
2017	3 461	- 5 822	1 639	2 856	1 249	2 099	337
2018	2 166	4 540	1 661	2 929	1 443	2 235	316
2019	3 867	- 4 461	2 738	860	960	2 375	303

Source: Thomson Reuters

Table A8. Gross Profit Margin of selected companies (1998-2019)

Gross Profit Margin	DEUTSCHE TELEKOM AG	VODAFONE GROUP PLC	ORANGE SA	TELEFONICA S.A.	TELIA COMPANY AB	BT GROUP PLC	ELISA CORP
1998	33,56	48,81	47,09	30,01	36,44	52,12	24,14
1999	31,12	46,14	45,50	22,12	38,90	52,12	21,14
2000	15,95	44,63	40,85	17,34	38,91	48,46	23,83
2001	16,10	-21,88	36,80	20,53	29,30	44,64	18,19
2002	21,87	-6,84	37,88	16,59	48,90	42,58	8,95
2003	39,78	1,99	42,40	22,16	40,28	23,68	12,34
2004	42,51	1,94	43,52	24,75	46,14	42,62	28,34
2005	47,02	1,32	59,31	26,06	44,16	44,96	25,28
2006	43,96	41,84	58,51	26,80	46,07	43,66	27,80
2007	43,96	39,80	58,99	24,30	42,40	42,70	32,27
2008	43,98	38,30	60,29	27,15	43,67	41,63	32,83
2009	44,93	37,00	61,15	27,81	42,53	43,95	32,12
2010	42,97	33,80	61,60	24,24	44,30	46,88	30,60
2011	42,42	30,30	61,47	23,31	43,42	30,65	29,88
2012	41,50	32,04	60,27	26,10	42,56	36,04	29,68
2013	39,71	31,36	41,39	21,38	42,62	40,14	29,07
2014	38,49	27,13	40,96	23,71	42,45	41,29	30,65
2015	39,37	26,87	39,95	11,25	37,27	43,38	30,67
2016	34,78	25,72	38,88	15,47	37,91	43,78	31,87
2017	35,58	27,41	38,39	18,70	37,46	24,62	31,32
2018	35,43	29,63	38,11	17,71	35,28	24,79	31,58
2019	35,70	30,93	37,86	14,67	33,70	24,31	30,70

Source: Thomson Reuters

Table A9. Stock prices (Euro) of selected European telecom companies 1998-2019 (monthly basis).

Stock Price (Euro)	HELLENIC TELECOM.ORG.	KPN KON	PHAROL SGPS	TELECOM ITALIA	ORANGE	DEUTSCHE TELEKOM (XET)	GIGASET	TELEFONICA
1/1/1998	15,93	6,6373	6,8642	0,8346	28,7148	17,016	0,129	5,6783
1/2/1998	14,4	6,9825	7,8368	1,3753	33,8842	16,694	0,129	6,6835
1/3/1998	15,6	8,1123	8,037	1,7447	39,6587	18,519	0,129	7,1534
1/4/1998	21,51	8,5203	8,3593	2,3234	44,0916	20,38	0,129	9,2028
1/5/1998	24,63	8,7399	7,9453	2,0429	43,0524	24,031	0,116	8,5304
1/6/1998	23,67	8,8184	7,6118	2,2477	44,0784	24,593	0,116	9,0803
1/7/1998	24,02	10,6485	8,0217	2,4257	56,5614	25,631	0,116	9,7912
1/8/1998	25,54	11,1416	8,1905	3,2758	52,6152	25,513	0,095	9,8851
1/9/1998	20,83	11,5947	6,5106	3,2447	60,1129	24,031	0,095	7,6318
1/10/1998	20,62	7,9963	4,6016	2,9242	45,5122	23,647	0,095	6,5454
1/11/1998	20,6	10,222	6,6995	3,6453	50,7737	23,673	0,064	8,745
1/12/1998	21,29	10,2753	6,0717	3,7877	50,6422	23,877	0,099	8,8657
1/1/1999	22,66	12,5276	6,292	5,1185	58,4029	28,06	0,11	8,6326
1/2/1999	26,78	14,0973	7,2127	5,8258	74,8939	40,99	0,11	9,3898
1/3/1999	23,66	13,6568	7,3143	4,9123	71,7877	42	0,114	9,433
1/4/1999	20,68	10,6905	6,9275	4,8089	66,697	38,05	0,225	8,9436
1/5/1999	22,42	12,1589	6,5086	5,6535	66,4382	37,61	0,15	10,4063
1/6/1999	22,07	13,3924	6,9243	4,8951	63,0731	39,49	0,15	10,7384
1/7/1999	21,08	13,554	6,2988	4,373	63,1163	40,49	0,104	11,1424
1/8/1999	19,33	12,2911	6,6167	3,9944	58,5864	39,03	0,092	10,3185
1/9/1999	20,82	12,9225	6,2615	4,1742	65,1439	42,11	0,071	10,6322
1/10/1999	21,74	11,8564	6,3248	4,0227	69,0698	38,24	0,064	10,4021
1/11/1999	20,59	14,0679	6,8762	3,5022	79,2513	43,6	0,067	10,9041
1/12/1999	20,98	16,2413	7,7438	4,1458	99,3121	56,65	0,06	15,1828
1/1/2000	24,81	29,4575	8,6439	5,1113	113,0312	69,5	0,054	17,7784
1/2/2000	23,69	27,1373	10,0872	6,9665	118,0356	75	0,049	19,1083
1/3/2000	31,38	37,446	12,082	7,8183	150,5645	91,99	0,045	21,263
1/4/2000	29,72	30,9113	10,1359	6,6825	145,6463	75,45	0,034	18,0273
1/5/2000	24,7	35,6838	9,9494	6,8907	146,8543	71,39	0,041	17,4086
1/6/2000	26,24	28,4296	9,8521	7,364	144,956	68,5	0,048	15,7873
1/7/2000	25,68	26,6968	9,6494	7,099	128,4759	58,5	0,052	16,7117
1/8/2000	24,13	22,4969	9,8521	6,8339	117,5179	46,74	0,055	16,2353
1/9/2000	21,65	18,4428	9,8521	6,8907	122,1772	46,2	0,062	16,5055
1/10/2000	21,73	14,7223	9,5196	5,9821	106,1285	39,6	0,067	16,6122
1/11/2000	20,31	13,5097	8,5141	6,7393	105,2657	42,49	0,067	15,9793
1/12/2000	16,69	8,902	7,7009	6,4175	83,6949	37,34	0,06	13,2129
1/1/2001	15,95	7,2517	7,9795	4,8178	79,3375	32,1	0,06	12,516
1/2/2001	17,3	10,292	9,8146	5,4236	83,4791	35,17	0,059	14,8373
1/3/2001	14,94	7,6599	8,6267	4,3009	53,8839	26,15	0,049	13,6038
1/4/2001	15,24	6,678	7,8648	4,234	59,8375	26,35	0,038	13,4789
1/5/2001	16,8	8,3815	8,9626	4,8265	70,7523	29,2	0,032	14,1229
1/6/2001	16,14	5,4505	7,5781	4,0811	54,8762	25,15	0,022	12,6499
1/7/2001	15,36	4,0621	7,0611	4,1957	50,9072	27,56	0,018	11,2213
1/8/2001	16,46	3,28	6,8188	3,6701	45,8164	24,36	0,021	10,4663
1/9/2001	17,94	1,7885	5,7408	2,9628	29,1206	16,4	0,024	9,0674
1/10/2001	17,72	1,8188	6,6684	1,9899	27,6969	16,5	0,029	8,8453
1/11/2001	18,24	2,7586	7,3536	2,5232	36,2735	17,26	0,029	9,6965
1/12/2001	19,1	3,0011	6,9358	2,736	37,7921	18,85	0,045	10,8809
1/1/2002	18,3	3,4619	7,3118	3,052	38,7412	19,3	0,047	11,1251
1/2/2002	18,48	3,3467	7,27	2,8844	30,1646	16,65	0,047	10,4169
1/3/2002	17,68	3,4861	6,8857	2,9269	26,4027	16,61	0,047	10,2886
1/4/2002	16,64	3,5589	7,128	3,0181	30,3027	17,27	0,049	9,8948
1/5/2002	17,16	3,0496	6,7687	2,7042	23,262	14,74	0,049	9,1479
1/6/2002	17,32	2,7889	6,5347	2,6066	17,8693	11,5	0,066	8,5626
1/7/2002	15,78	2,8192	5,7993	2,316	10,1987	10,16	0,097	6,576
1/8/2002	14,68	2,6919	5,1977	2,28	12,3126	11,05	0,101	6,8147
1/9/2002	14,16	3,2739	5,2729	2,3245	9,8622	10,9	0,1	7,0303
1/10/2002	11,54	3,2194	3,8523	1,8028	6,6007	8,96	0,101	5,7367
1/11/2002	11,08	3,9105	5,0974	2,1739	9,681	11,44	0,105	7,3768

1/12/2002	10,86	4,0863	5,8244	2,5812	15,3498	12,55	0,105	7,9389
1/1/2003	10,5	3,759	5,4734	2,0615	14,3921	12,25	0,123	6,5683
1/2/2003	11,4	3,8681	5,5486	2,034	20,9927	11,71	0,21	7,1374
1/3/2003	9,94	3,862	4,9386	1,877	17,2567	10,2	0,168	6,9725
1/4/2003	8,56	3,5346	5,3481	2,0318	18,6211	10,33	0,155	6,9678
1/5/2003	9,6	3,6134	5,3564	2,157	20,6237	11,98	0,168	7,9369
1/6/2003	9,7	3,5892	5,4233	2,2588	21,3709	12,93	0,185	7,8808
1/7/2003	9,54	3,6013	5,2227	2,3012	20,7731	13,07	0,193	7,9529
1/8/2003	11,14	3,6801	4,972	2,2779	22,965	13,38	0,202	8,2252
1/9/2003	10,1	3,9226	5,557	2,19	21,6399	13,15	0,336	8,6577
1/10/2003	9,42	4,0015	5,8327	2,145	20,5041	12,59	0,714	8,2012
1/11/2003	9,82	4,0318	6,05	2,325	20,9226	13,71	1,5	8,7197
1/12/2003	10,1	3,9651	6,6851	2,44	22,2078	14,01	1,428	8,8489
1/1/2004	10,48	3,7104	6,6684	2,35	22,5765	14,51	1,386	9,3979
1/2/2004	12,44	4,056	7,0444	2,475	23,8318	16,09	1,722	10,2215
1/3/2004	12,2	3,9287	7,6043	2,57	22,4768	16,03	1,848	10,7059
1/4/2004	11,14	3,7953	7,504	2,575	21,2215	14,64	2,025	10,0438
1/5/2004	12,22	3,6619	7,6795	2,705	20,1056	14,36	1,974	10,0681
1/6/2004	10,6	3,5164	6,9358	2,5	19,1192	13,48	2,008	9,4544
1/7/2004	10,7	3,7953	7,3118	2,545	20,9226	14,43	2,058	9,8904
1/8/2004	10,02	3,7044	7,0194	2,475	20,2052	13,72	2,033	9,6401
1/9/2004	10,54	3,8135	6,9692	2,48	19,0096	14,15	2,478	9,4706
1/10/2004	11	3,7286	7,5625	2,575	20,8329	15,55	2,688	10,1649
1/11/2004	12,26	3,7286	7,5124	2,65	22,4669	15,15	3,176	10,4475
1/12/2004	12,5	4,0863	7,3369	2,975	24,0112	16,29	4,873	10,8916
1/1/2005	13,64	4,2743	7,5625	3,06	24,4595	16,71	4,89	11,3114
1/2/2005	13,64	4,4926	8,0305	3,07	24,0211	16,54	5,125	11,3034
1/3/2005	14,62	4,25	7,7547	2,94	22,9451	15,89	4,033	11,3276
1/4/2005	13,98	4,2319	7,5291	2,9175	23,0945	15,44	4,747	10,7866
1/5/2005	14,5	3,9287	7,2283	2,6325	22,7956	14,56	6,595	10,7301
1/6/2005	14,74	4,0015	7,0611	2,645	23,4134	15,18	6,763	11,1015
1/7/2005	16,36	4,1227	6,6684	2,6025	24,1805	15,42	8,04	11,395
1/8/2005	16,54	4,3531	6,543	2,7075	25,5554	16,36	9,821	11,6049
1/9/2005	16,96	4,5956	6,4344	2,56	24,22	15,3	11,417	11,3278
1/10/2005	16,8	4,8381	6,1837	2,705	23,79	15,19	10,544	11,4369
1/11/2005	17,2	4,8139	6,3007	2,3725	21,99	14,5	11,09	10,9835
1/12/2005	17,9	5,1413	6,518	2,4175	21,6	14,14	9,015	10,6728
1/1/2006	17,92	5,1413	7,1363	2,4725	21,21	14,09	8,347	10,6812
1/2/2006	18,76	4,7472	6,9943	2,3025	18,64	13,01	10,754	10,5469
1/3/2006	17,88	5,2868	8,1057	2,3275	18,2	13,44	9,473	11,1011
1/4/2006	18,36	5,7657	8,4817	2,415	18,58	13,95	10,691	10,8995
1/5/2006	17,74	5,6445	8,4316	2,22	18,51	14,32	13,106	10,6644
1/6/2006	17,24	5,4384	7,7631	2,215	17,58	12,93	11,514	10,7316
1/7/2006	17,1	5,402	7,9135	2,1875	16,93	12,63	9,662	10,9919
1/8/2006	17,82	5,693	8,1475	2,07	16,29	12,01	9,788	11,0507
1/9/2006	18,2	5,8142	8,231	2,17	16,57	11,37	10,208	11,2858
1/10/2006	19,56	6,1113	8,1809	2,2	18,06	12,44	10,493	11,4034
1/11/2006	20,64	6,3357	8,1725	2,3775	20,4	13,53	8,821	12,7637
1/12/2006	22,72	6,2811	8,0639	2,24	19,36	13,15	10,25	12,6377
1/1/2007	22,76	6,5297	8,2227	2,29	20,95	13,84	13,4	13,5362
1/2/2007	23,26	6,7661	8,5653	2,2675	21,26	13,44	14,786	14,124
1/3/2007	19,92	6,6873	8,4065	2,2275	20,16	13,04	13,829	13,5194
1/4/2007	20,46	7,2815	8,4316	2,34	20,14	12,67	16,005	13,9645
1/5/2007	21,2	7,5785	8,7491	2,215	21,59	13,38	17,87	13,8637
1/6/2007	23,9	7,7483	8,6405	2,1675	23,42	14,35	21,222	14,334
1/7/2007	22,5	7,4997	8,4734	2,0275	20,2	13,66	27,893	13,8553
1/8/2007	22	6,7419	8,5151	1,919	19,66	12,52	31,253	14,5019
1/9/2007	23,84	7,1178	8,4316	2,095	22,23	13,66	26,49	15,3752
1/10/2007	26,34	7,3966	8,2227	2,16	23,56	13,84	26,464	16,3493
1/11/2007	25,38	7,6816	9,11	2,1475	25,18	13,99	24,591	19,0868
1/12/2007	24,52	7,5967	9,28	2,1675	26,22	15,09	22,364	19,1959
1/1/2008	25,2	7,5422	8,93	2,125	24,62	15,02	19,659	18,6585
1/2/2008	20,94	7,53	8,6	2,0225	23,67	13,56	13,199	16,6096
1/3/2008	18,64	7,6028	8,34	1,627	22,22	12,46	11,182	15,8035
1/4/2008	18,48	6,5539	7,445	1,404	22,07	10,9	10,376	15,8874
1/5/2008	19,12	7,145	7,625	1,352	20,16	11,54	7,318	15,5935

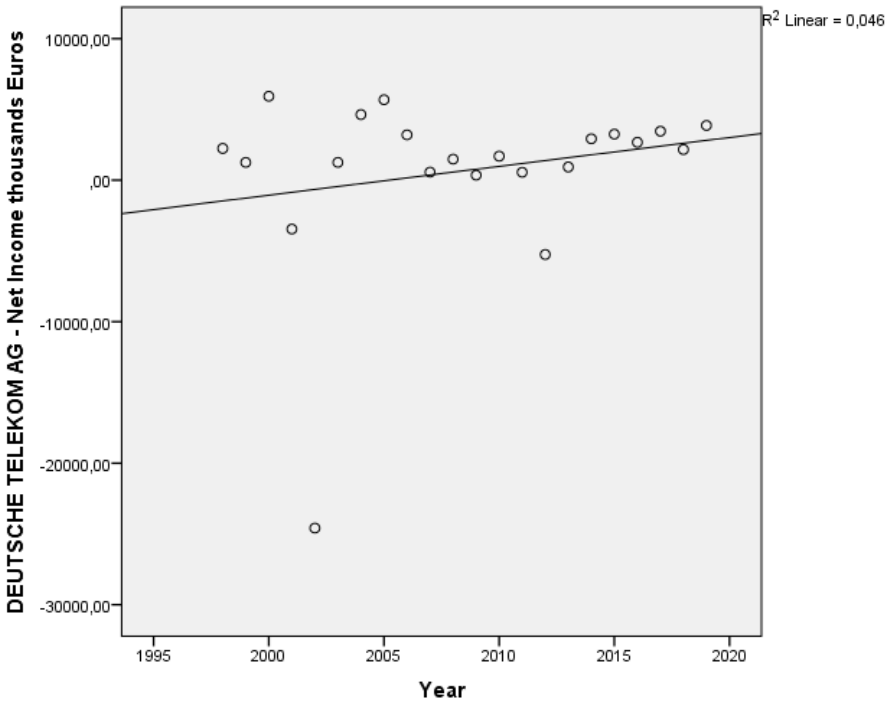
1/6/2008	18,06	7,0298	7,915	1,385	19,245	10,68	6,066	15,1233
1/7/2008	15	6,6539	6,955	1,286	19,16	10,59	4,47	14,1408
1/8/2008	13,5	6,6327	6,975	1,131	20,195	10,99	6,234	13,8889
1/9/2008	14,68	7,0353	7,295	1,106	20,17	11,38	7,553	14,2332
1/10/2008	12,18	6,269	7,061	1,052	20,325	11,24	4,99	14,3928
1/11/2008	11,06	6,7206	5,507	0,887	19,55	11,725	2,823	12,2599
1/12/2008	11	6,3932	5,75	1,008	19,5	10,345	1,831	13,024
1/1/2009	11,9	6,2932	6,07	1,15	19,96	10,75	2,193	13,3095
1/2/2009	11,54	6,2871	6,128	0,955	17,795	9,515	1,428	11,6049
1/3/2009	10,3	6,1295	6,226	0,9	17,355	9,375	0,836	12,2179
1/4/2009	11,07	6,2659	5,985	1,022	17,41	9,555	1,033	12,6797
1/5/2009	11,6	5,5226	5,81	0,963	16,87	9,14	1,563	12,1003
1/6/2009	11,58	5,6687	6,41	1,021	17,545	8,25	1,815	12,8477
1/7/2009	11,07	6,0446	7,21	1,02	16,675	8,58	1,411	13,7042
1/8/2009	11	6,2811	7,19	1,096	17,525	9,01	1,874	14,6951
1/9/2009	10,82	6,4266	7,27	1,116	17,49	9,125	1,512	14,6195
1/10/2009	11,5	6,9692	7,13	1,148	17,86	9,165	1,563	15,6355
1/11/2009	11,3	7,4603	7,77	1,116	17,145	9,325	1,327	16,0722
1/12/2009	10,55	7,2875	8,27	1,093	17,675	10,2	1,395	16,3913
1/1/2010	10,29	7,1784	8,52	1,088	17,43	10,29	1,21	16,3913
1/2/2010	9,98	7,3148	7,462	1,081	16,795	9,41	1,262	14,5481
1/3/2010	8,86	7,1723	7,826	1,07	17,36	9,573	1,262	14,6699
1/4/2010	9,19	7,1056	8,278	1,08	17,815	10,02	1,201	14,8546
1/5/2010	8,39	6,7995	7,65	1,055	16,39	9,878	1,26	14,3172
1/6/2010	6,67	6,3902	8,465	0,95	15,39	9,187	1,151	13,108
1/7/2010	6,28	6,3296	8,338	0,8995	14,145	9,72	0,983	12,6713
1/8/2010	6,3	6,6327	8,549	1,016	16,43	10,45	1,554	15,0225
1/9/2010	5,52	6,9146	9,176	1,099	16,19	10,46	1,718	15,0519
1/10/2010	5,2	6,9541	9,764	1,022	15,885	10,05	1,534	15,2703
1/11/2010	5,67	7,2815	10,36	1,092	17,225	10,45	2,093	16,2191
1/12/2010	6,91	6,7025	9,762	0,9815	15,77	10,05	4,134	14,2332
1/1/2011	6,15	6,7055	8,351	0,981	15,9	9,713	3,907	14,2752
1/2/2011	7,37	7,0329	8,5	1,066	16,16	9,855	4,345	15,56
1/3/2011	7,3	7,1663	8,556	1,116	15,885	9,7	4,384	15,4508
1/4/2011	7,71	7,2815	8,278	1,088	15,885	11,095	4,265	15,0729
1/5/2011	8,02	6,5266	8,4	1,019	15,86	11,27	4,035	15,2912
1/6/2011	7,18	6,175	7,58	0,983	15,66	10,215	3,987	14,0233
1/7/2011	6,4	6,0992	6,854	0,957	14,66	10,69	3,777	14,2626
1/8/2011	5,45	5,9895	5,929	0,8405	14,13	10,43	3,214	12,8267
1/9/2011	4,48	6,0483	6,01	0,8595	13,49	8,999	3,108	12,2515
1/10/2011	3,18	5,9113	5,293	0,821	12,14	8,706	2,452	11,8736
1/11/2011	3,61	5,6069	4,889	0,8545	12,43	8,887	2,442	12,474
1/12/2011	3,1	5,4729	4,619	0,84	12,685	9,55	2,624	11,6553
1/1/2012	2,8	5,6524	4,491	0,849	12,355	9,17	2,477	11,4705
1/2/2012	2,9	5,0806	3,76	0,792	11,555	8,681	3,139	11,332
1/3/2012	2,34	4,9109	3,878	0,868	11,485	8,72	3,056	10,8282
1/4/2012	3,05	5,0158	3,997	0,8985	11,185	9,108	2,591	10,3663
1/5/2012	2,47	4,1112	4,066	0,8585	10,335	8,517	2,186	9,2453
1/6/2012	1,19	4,6381	3,128	0,6845	10,075	7,808	1,643	7,7598
1/7/2012	2	4,5126	3,554	0,7745	10,435	8,713	1,604	8,9672
1/8/2012	1,94	3,9893	3,369	0,68	10,96	9,207	1,372	8,0235
1/9/2012	2,66	4,1397	3,91	0,752	11,145	9,533	1,341	8,756
1/10/2012	2,95	3,6468	3,798	0,79	9,301	9,613	1,289	8,9801
1/11/2012	3,16	2,9374	3,866	0,7115	8,621	8,89	1,038	8,8465
1/12/2012	3,98	2,6676	3,466	0,6995	8,12	8,521	0,941	8,6612
1/1/2013	5,1	2,2529	3,749	0,683	8,339	8,595	0,963	8,7819
1/2/2013	6	2,5015	4,288	0,73	8,37	9,023	1,156	9,0275
1/3/2013	5,92	1,5521	3,84	0,5455	7,307	8,12	1,052	8,7
1/4/2013	4,72	1,5909	3,864	0,551	7,89	8,246	0,967	9,0404
1/5/2013	6,6	1,583	3,961	0,6425	8,124	8,982	0,947	9,6006
1/6/2013	6,65	1,411	3,146	0,58	7,723	8,75	0,727	9,0361
1/7/2013	6,08	1,602	2,95	0,54	7,25	8,932	0,724	8,6173
1/8/2013	6,93	2,083	2,92	0,5125	7,422	9,253	0,658	9,3507
1/9/2013	6,87	2,212	2,903	0,55	7,751	9,816	0,773	8,993
1/10/2013	7,85	2,364	3,4	0,6415	9,407	10,82	1,03	10,0875
1/11/2013	8,9	2,375	3,352	0,7135	10,145	11,625	1,015	11,0743

1/12/2013	9,47	2,389	3,263	0,7	9,527	11,62	0,979	10,2815
1/1/2014	9,67	2,343	3,16	0,721	9	12,43	0,985	10,1996
1/2/2014	11,2	2,693	3,2	0,8	8,94	11,68	0,981	9,6739
1/3/2014	12,7	2,527	3,167	0,7945	8,853	11,95	0,945	9,3636
1/4/2014	11,99	2,59	3,08	0,8575	10,75	11,65	0,971	9,9238
1/5/2014	11,49	2,562	3	0,9235	11,675	12,085	0,976	10,4021
1/6/2014	10,93	2,666	2,693	0,926	12,03	12,435	0,98	10,6046
1/7/2014	10,8	2,638	2,55	0,9165	11,795	12,895	0,981	10,9192
1/8/2014	10,14	2,35	1,544	0,853	11,45	12,09	0,859	10,4064
1/9/2014	10,92	2,545	1,581	0,8655	11,215	11,47	0,778	10,3935
1/10/2014	10,56	2,49	1,64	0,891	11,415	11,86	0,768	10,5141
1/11/2014	9,46	2,603	1,361	0,898	12,46	11,895	0,68	10,3073
1/12/2014	9,9	2,641	1,4	0,887	14,17	13,58	0,721	11,3287
1/1/2015	9,1	2,628	0,864	0,882	14,15	13,25	0,658	10,5663
1/2/2015	7,73	2,756	0,655	1,009	15,6	15,555	0,905	11,4794
1/3/2015	9,15	3,073	0,694	1,08	16,26	16,665	0,885	12,3437
1/4/2015	8	3,241	0,581	1,087	14,965	17,045	0,9	11,9157
1/5/2015	8,1	3,309	0,573	1,059	14,74	16,475	0,84	12,2295
1/6/2015	8,08	3,268	0,509	1,129	14,55	15,645	0,891	11,5212
1/7/2015	8,2	3,4	0,394	1,167	14,08	15,605	0,788	11,6019
1/8/2015	7,25	3,63	0,342	1,235	15,215	16,95	0,825	12,6375
1/9/2015	8	3,382	0,248	1,063	13,66	14,83	0,799	10,9653
1/10/2015	7,5	3,2	0,265	1,054	13,195	15,055	0,831	9,5532
1/11/2015	8,82	3,346	0,4	1,27	15,905	17	0,82	10,8622
1/12/2015	9,16	3,582	0,327	1,2	16,07	17,305	0,81	10,6925
1/1/2016	9,24	3,492	0,271	1,175	15,485	16,69	0,568	9,4465
1/2/2016	8,08	3,513	0,238	0,9935	16,345	16,015	0,515	8,8318
1/3/2016	7,77	3,528	0,165	0,929	16,16	15,85	0,48	8,7728
1/4/2016	7,73	3,638	0,136	0,915	15,395	15,445	0,509	8,7414
1/5/2016	8,47	3,414	0,143	0,8465	14,795	15,41	0,549	8,7755
1/6/2016	9,15	3,569	0,143	0,855	15,5	15,78	0,501	8,4802
1/7/2016	8,25	3,211	0,109	0,74	14,585	15,245	0,486	7,9975
1/8/2016	8,77	2,989	0,176	0,764	13,755	15,28	0,37	8,1092
1/9/2016	8,53	2,88	0,19	0,8165	13,415	14,875	0,61	8,3408
1/10/2016	7,84	2,936	0,246	0,732	13,8	14,92	0,579	8,3897
1/11/2016	8,1	2,915	0,249	0,7895	14,15	14,65	0,94	8,471
1/12/2016	8,6	2,633	0,167	0,71	13,63	14,645	0,736	7,4765
1/1/2017	9	2,874	0,212	0,858	14,57	16,425	0,835	8,496
1/2/2017	8,6	2,556	0,279	0,7925	14,265	16,025	0,82	8,5373
1/3/2017	8,56	2,668	0,349	0,776	14,4	16,47	0,8	9,5165
1/4/2017	8,86	2,827	0,374	0,83	14,55	16,4	0,753	9,9744
1/5/2017	8,93	2,655	0,236	0,815	14,2	16,1	0,75	9,7488
1/6/2017	10,05	3,053	0,269	0,834	15,53	17,28	0,769	9,5443
1/7/2017	10,77	2,829	0,309	0,823	14,08	15,825	0,799	8,8598
1/8/2017	10,94	3,082	0,334	0,8695	14,26	15,595	0,745	9,2736
1/9/2017	10,55	2,955	0,318	0,795	14,255	15,115	0,749	8,6938
1/10/2017	10,06	2,904	0,396	0,778	13,775	15,735	0,727	8,689
1/11/2017	10,44	2,983	0,45	0,7515	14,185	15,35	0,68	8,6794
1/12/2017	10,35	3,053	0,318	0,698	14,45	14,975	0,645	8,2195
1/1/2018	11,5	2,908	0,25	0,7205	14,475	14,795	0,572	7,8
1/2/2018	12,5	2,817	0,2145	0,7176	14,455	13,955	0,776	7,8691
1/3/2018	11,56	2,556	0,226	0,7398	13,935	13,075	0,696	7,6291
1/4/2018	10,98	2,437	0,228	0,771	13,785	13,25	0,71	7,7069
1/5/2018	12,05	2,577	0,2725	0,8182	15,115	14,495	0,718	8,0957
1/6/2018	10,6	2,346	0,268	0,7002	14,79	13,23	0,636	7,32
1/7/2018	10,36	2,304	0,2375	0,6282	14,245	13,285	0,582	6,9571
1/8/2018	11,14	2,456	0,2285	0,6504	14,585	14,17	0,642	7,3546
1/9/2018	10,96	2,198	0,193	0,555	13,95	13,975	0,6	6,7248
1/10/2018	10,55	2,287	0,1742	0,4953	13,62	13,89	0,58	6,5549
1/11/2018	9,61	2,364	0,1528	0,534	14,045	14,45	0,506	7,0531
1/12/2018	10,91	2,621	0,186	0,5746	14,975	15,445	0,382	7,6406
1/1/2019	9,52	2,56	0,1632	0,4833	14,155	14,82	0,277	7,0454
1/2/2019	10,99	2,749	0,1816	0,4839	13,595	14,21	0,35	7,225
1/3/2019	10,95	2,708	0,191	0,5322	13,33	14,525	0,41	7,1798
1/4/2019	12	2,785	0,1896	0,545	14,585	14,834	0,431	7,2106
1/5/2019	12,38	2,736	0,1566	0,4986	13,965	14,914	0,49	7,1347

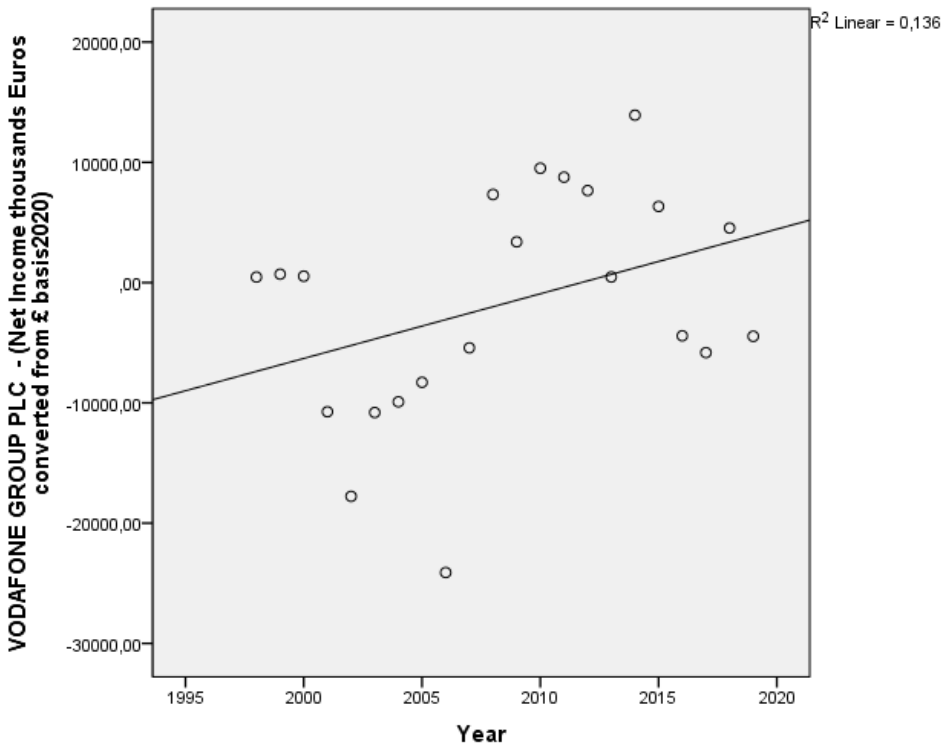
1/6/2019	12,46	2,753	0,143	0,4383	14,15	15,224	0,35	6,9072
1/7/2019	12,89	2,694	0,1524	0,4828	13,855	15,238	0,409	6,9821
1/8/2019	12,31	2,62	0,1498	0,5125	13,52	15,052	0,381	6,601
1/9/2019	12,04	2,886	0,116	0,486	13,83	15,25	0,331	6,1018
1/10/2019	12,75	2,804	0,1094	0,5223	14,36	15,338	0,361	6,6682
1/11/2019	13,58	2,752	0,0949	0,5253	14,395	15,616	0,359	6,6374
1/12/2019	13,56	2,73	0,1022	0,5529	14,38	14,906	0,35	6,5242

Appendix 2- Regression graphs

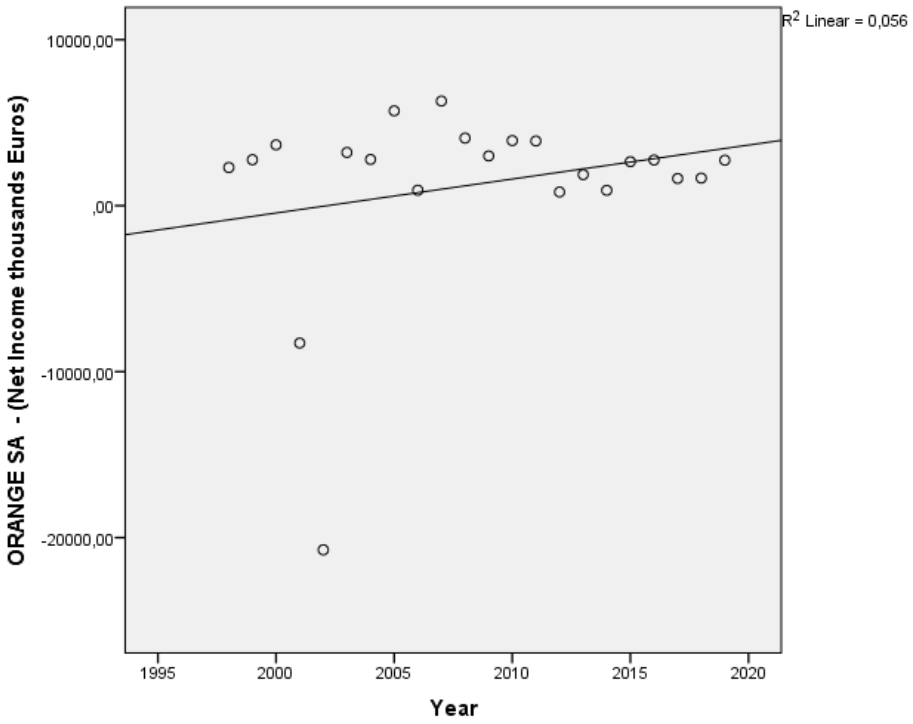
Graph A1.Deutsche telecom Net Income scatter dot plot and trend line



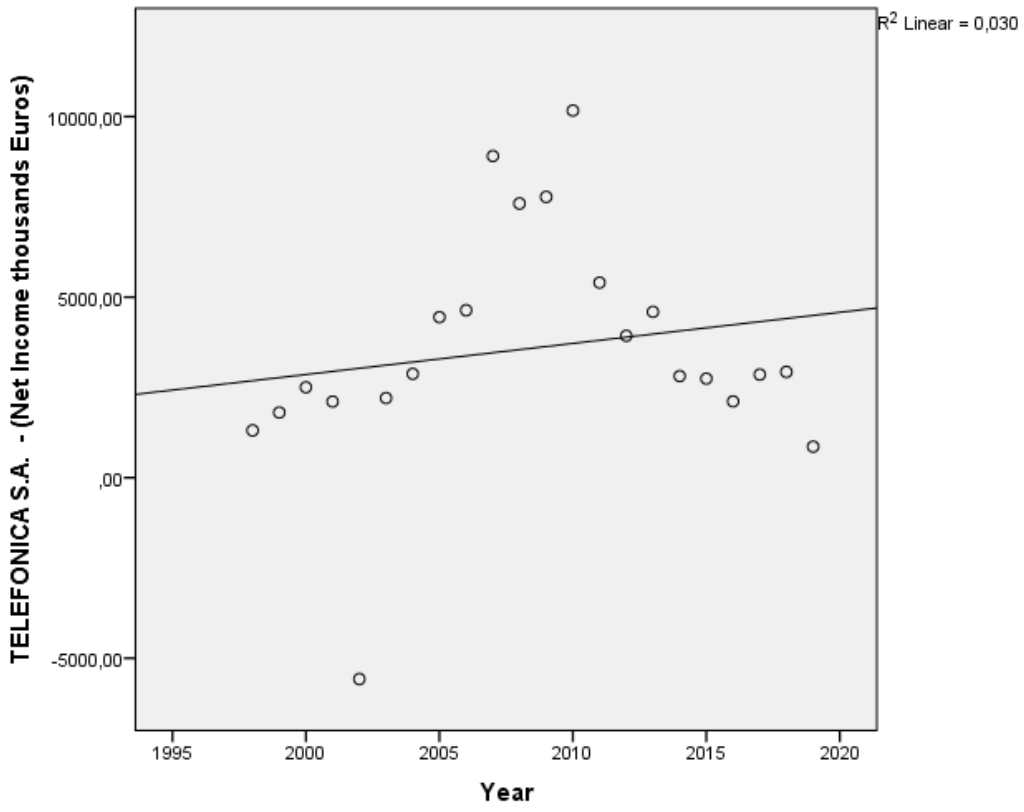
Graph A2.Vodaphone Net Income scatter dot plot and trend line



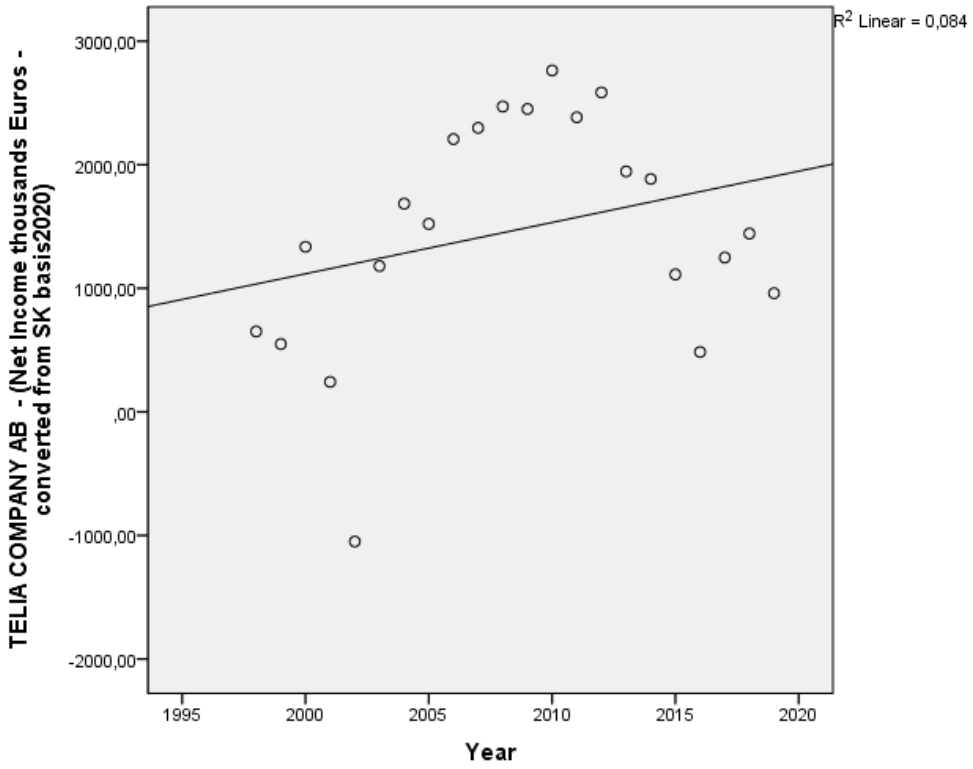
Graph A3.Orange Net Income scatter dot plot and trend line



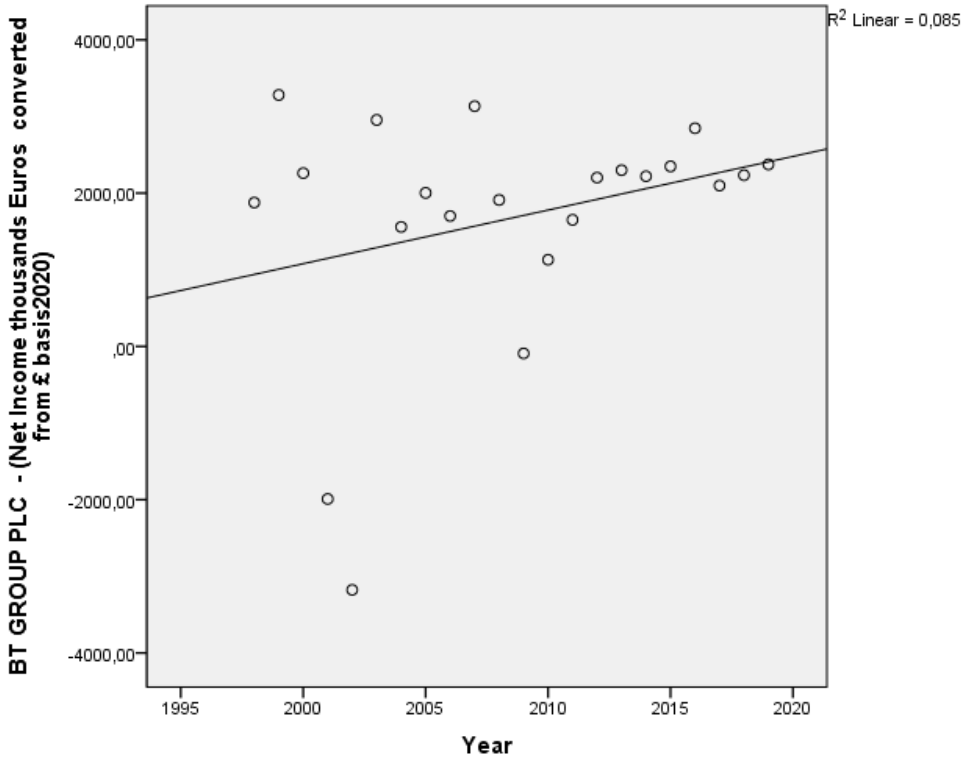
Graph A4.Telephonica Net Income scatter dot plot and trend line



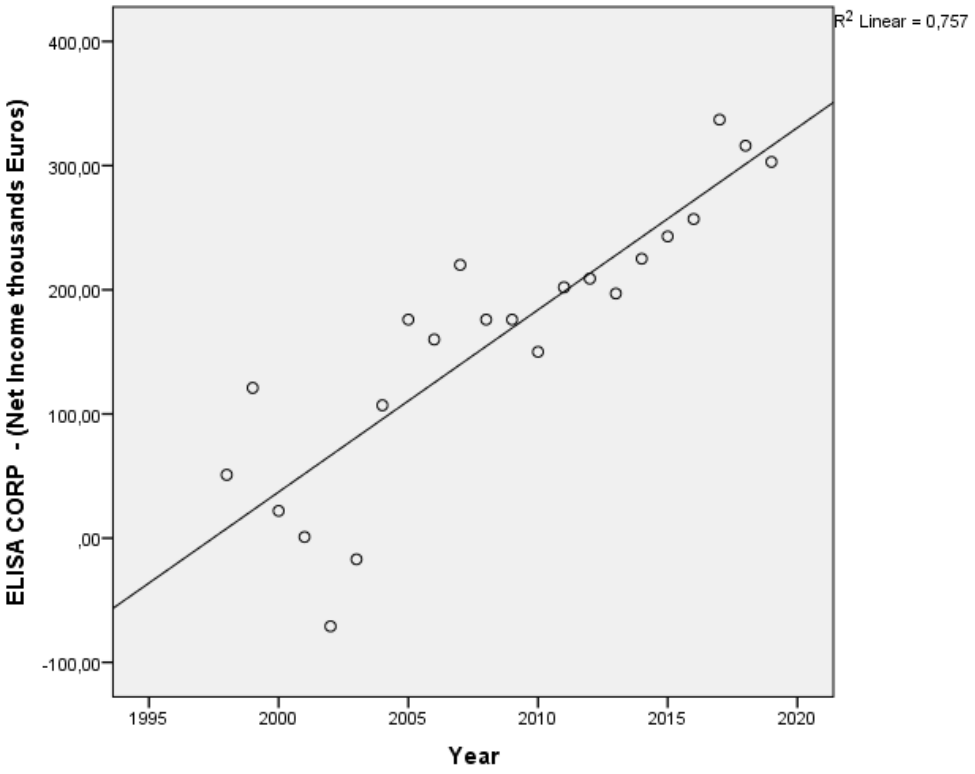
Graph A5.Telia Net Income scatter dot plot and trend line



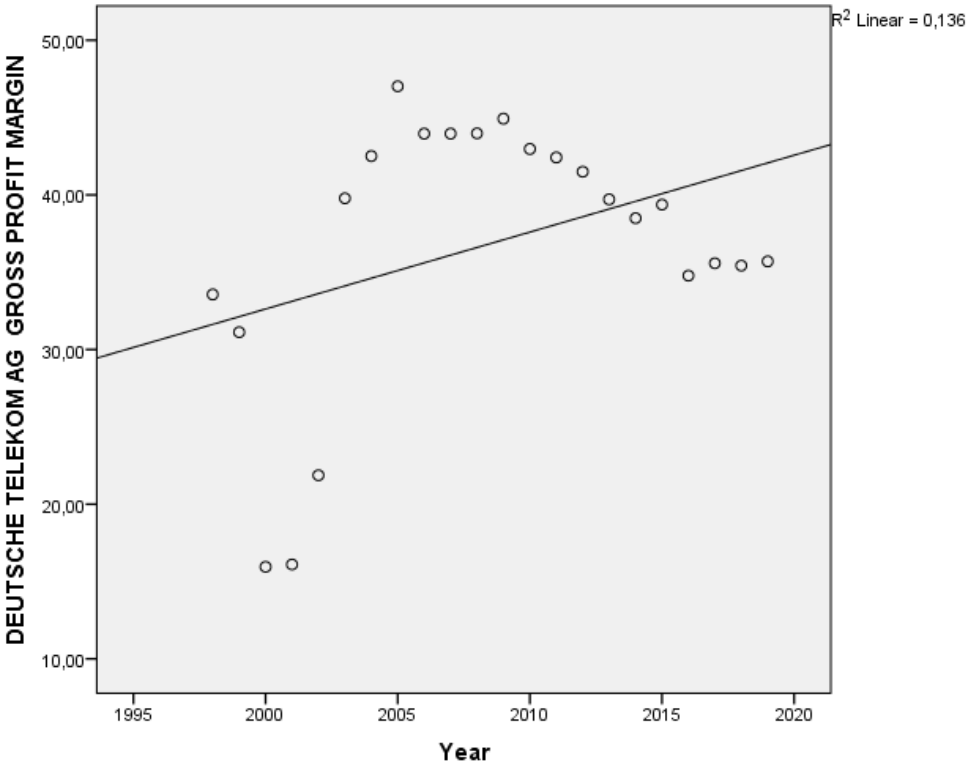
Graph A6.BT Net Income scatter dot plot and trend line



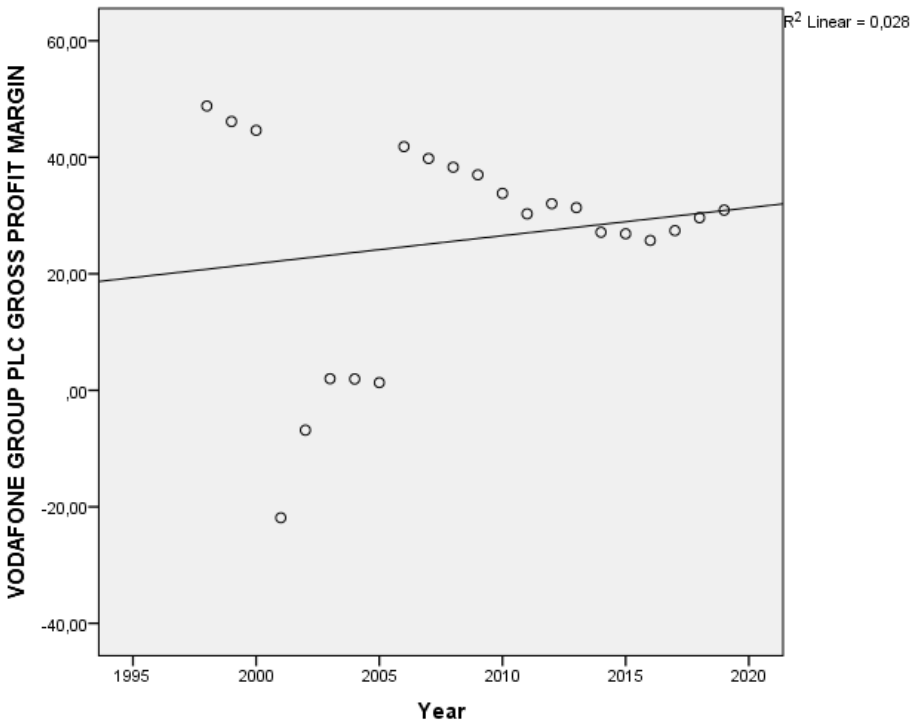
Graph A7. ELIA Net Income scatter dot plot and trend line



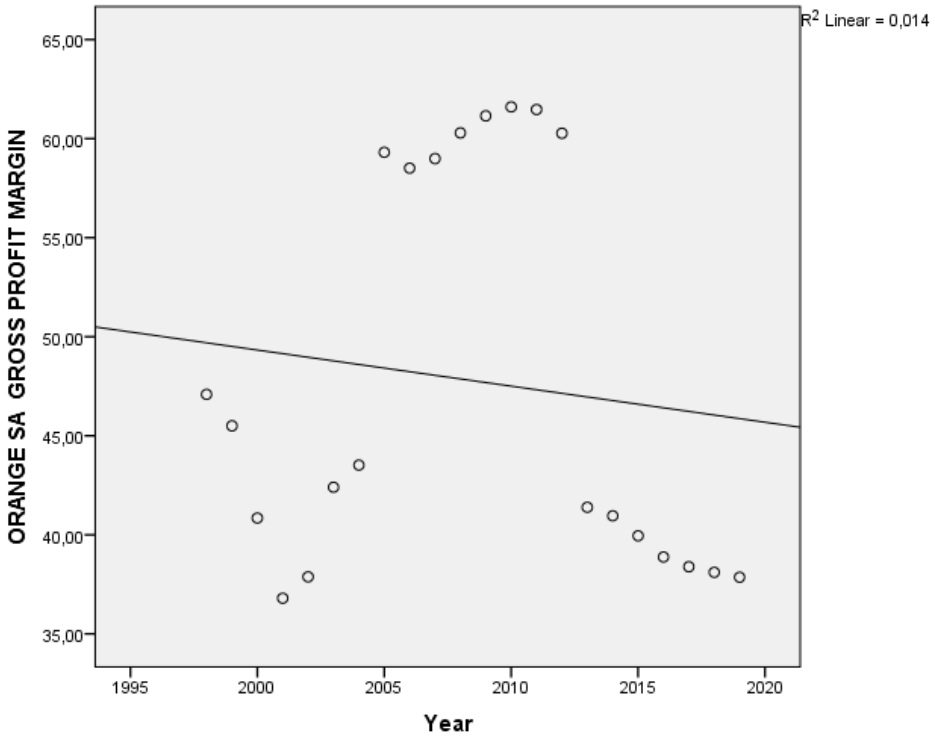
Graph A8. Deutsche Telecom Gross Profit Margin scatter dot plot and trend line



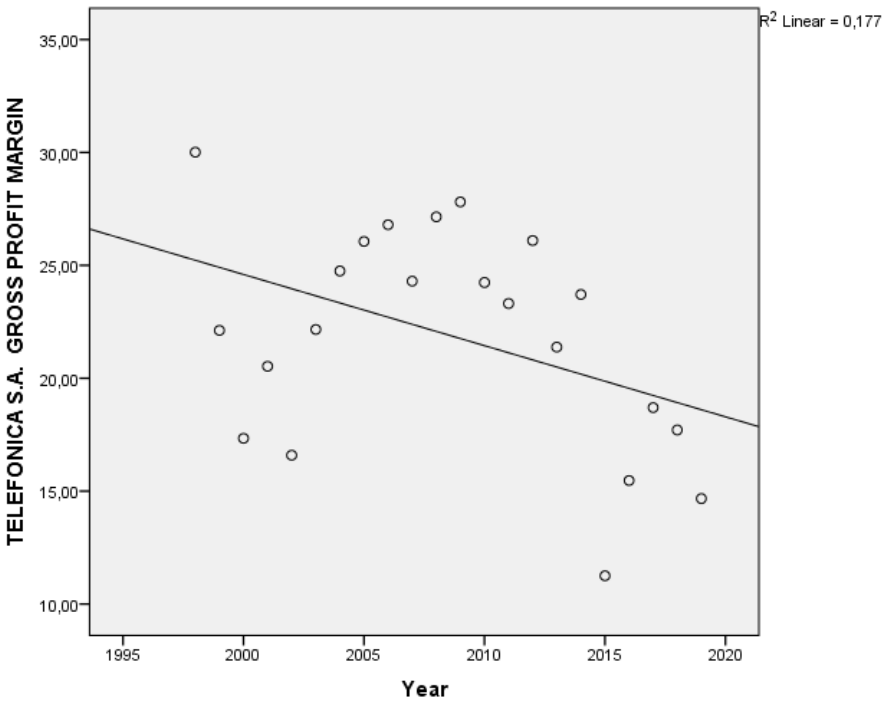
Graph A9. Vodafone Gross Profit Margin scatter dot plot and trend line



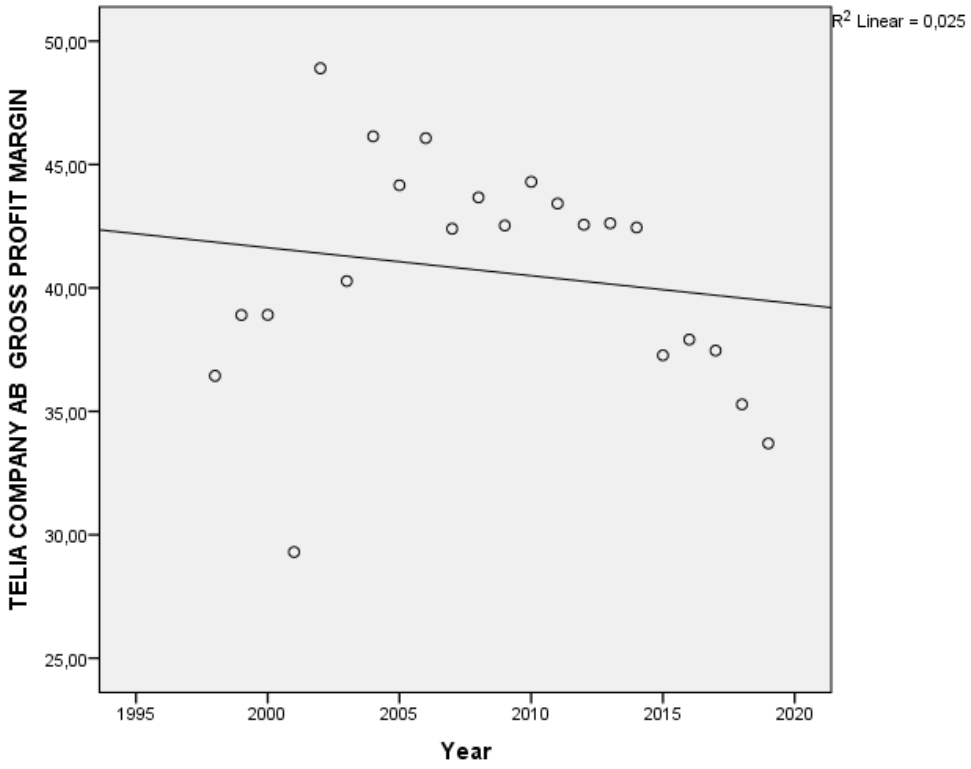
Graph A10. Orange Gross Profit Margin scatter dot plot and trend line



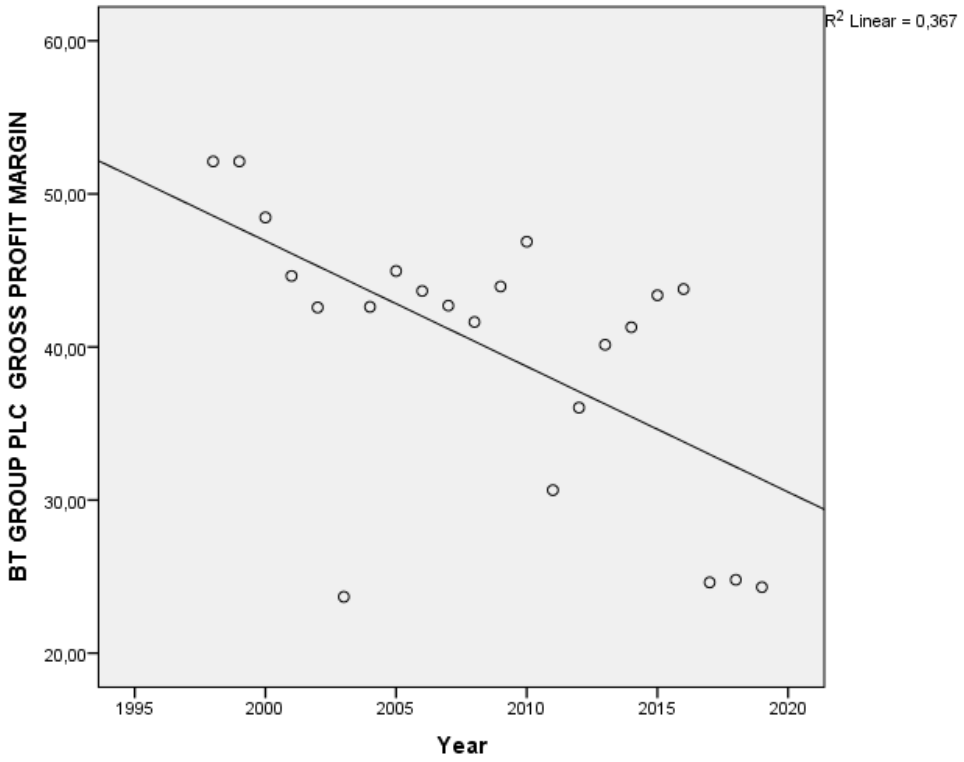
Graph A11. Telefonica Gross Profit Margin scatter dot plot and trend line



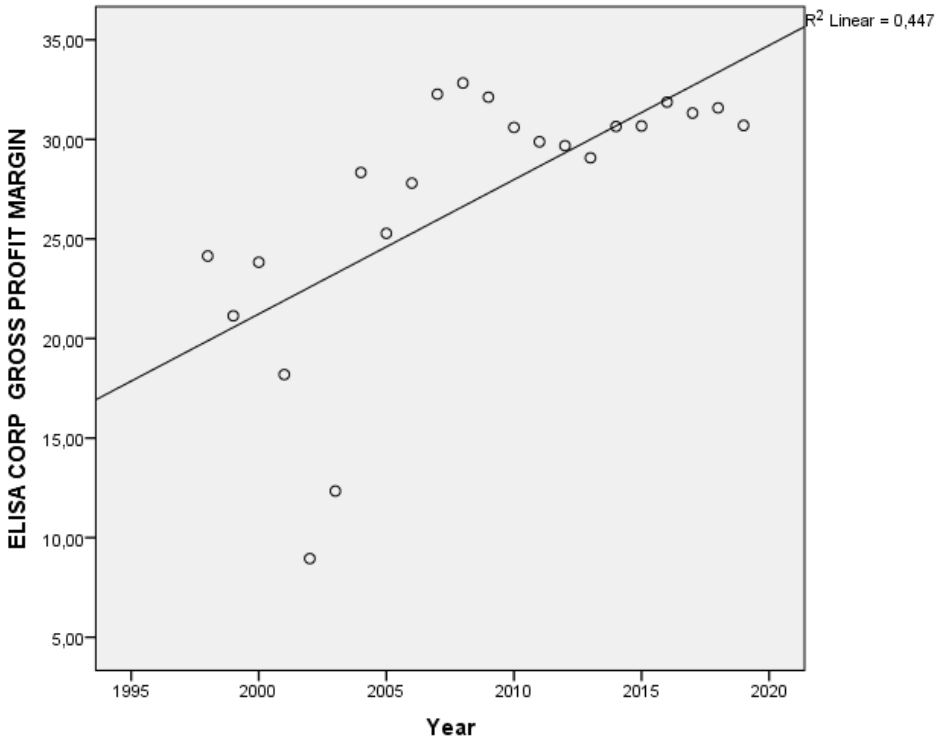
Graph A12. Telia Gross Profit Margin scatter dot plot and trend line



Graph A13. BT Gross Profit Margin scatter dot plot and trend line



Graph A14. BT ELISA Profit Margin scatter dot plot and trend line



References

Bender, R. and Raice S. (2015). European Telecom Companies Race to Merge in the Wall Street Journal.

Dassler, T. Parker, D. &Saal, D. (2002). Economic Performance in European Telecommunications, 1978-98: A comparative study. European Business Review. 14. 194-209. 10.1108/09555340210427085.

European Commission, (2009). Telecommunication: Comprehensive sectoral analysis of emerging competences and economic activities in the European Union. European Commision, DG Employment, Social Affairs and Equal Opportunities.

European Commission, (2019). Digital Economy and Society Index (DESI). https://ec.europa.eu/digital-single-market/en/news/2019-desi-report-electronic-communications-markets-overview-member-state-telecom-chapters

Fonseca, M., Gorter, O., Kutcher, E., Nattermann, P., Vanderspar, B. (2019). Telecom operators: Surviving and thriving through the next downturn. McKinsey & Company, retrieved from https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/telecom-operators-surviving-and-thriving-through-the-next-downturn#

Gropelli, A. (2019). Delivering Consumer Value in Digital Times Evolving Landscapes in European Telecommunications Services. European Telecommunication Network Operators' Association.

http://link.springer.com/article/10.1007%2Fs10368-009-0125-4 on 22/8/2020.

https://ec.europa.eu/eurostat/371

Hunn, D., Eaton, C., (2016). "Oil bust on par with telecom crash of dot-com era". *Houston Chronicle*.

ITU/ICT Indicators Database (2015). *The key 2005-2015 ICT data for the world, by geographic regions and by level of development.* Retrieved on September 20th from https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

Jungmittag, A. and Welfens, P. (2009). Liberalization of EU Telecommunications and Trade: Theory, Gravity Equation Analysis and Policy Implications in International Economics and Economic Policy, 6:1 (23-39). Retrieved from

Litan, R.E. (2002). "The Telecommunications Crash: What To Do Now?". *Brookings Institution.*

Mayer-Schönberger, V. and Strasser, M. (1999). A Closer Look at Telecom Deregulation: The European Advantage in Harvard Journal of Law & Technology, 12:3.

Newman, Y., &Rierson, M., (2004). Illiquidity Spillovers: Theory and Evidence from European Telecom Bond Issuance. Doi: 10.2139/ssrn.497603

OECD, (2019), Key ICT Indicators, https://www.oecd.org/sti/broadband/oecdkeyictindicators.htm

Saunders, M., P. Lewis, and A. Thornhill, (2009), *Research Methods for Business Students*, Fifth Edition. Harlow: FT Prentice Hall.

Stiglitz, J. (1999). Knowledge as a Global Public Good [chapter] in Global Public Goods: International Cooperation in the 21st Century. DOI:10.1093/0195130529.003.0015

Thomas, R. (2013). *EU Regulators Adopt Measures to Reform Telecoms Market* in the Financial Times.

Thomson, S., (2 December 2019). "Telia completes Bonnier Broadcasting acquisition". Digital TV Europe. Informa.

Tirole, J. and Laffont, J. (2000). *Competition in Telecommunications.* The MIT Press

JEFFREY, W. ([χ.χ.]). Εισαγωγή στην Οικονομετρία Μια Σύγχρονη Προσέγγιση. [χ.τ.]: ΠΑΠΑΖΗΣΗ ΕΚΔΟΣΕΙΣ ΑΕΒΕ.

https://www.ibm.com/analytics/spss-statistics-software (Ανακτήθηκε 12 Αυγούστου, 2020).

https://ec.europa.eu/competition/publications/reports/kd0417233enn.pdf (Ανακτήθηκε 5 Ιουνίου, 2020).

https://etno.eu/datas/ETNO%20Documents/Facts%20%20Figures_final.pdf (Ανακτήθηκε 9 Ιουλίου, 2020).

https://www.u-picardie.fr/eastwest/fichiers/art78.pdf (Ανακτήθηκε 5 Σεπτεμβρίου, 2020).

https://www.investopedia.com/terms/e/econometrician.asp (Ανακτήθηκε 12 Ιουλίου, 2020).

https://www.soumu.go.jp/iicp/chousakenkyu/seika/pdf/DP2009-02.pdf (Ανακτήθηκε 12 Ιουλίου, 2020).

https://www.cosmote.gr/cs/otegroup/en/ote_ae.html (Ανακτήθηκε 12 Ιουλίου, 2020).

https://www.kpn.com/ (Ανακτήθηκε 12 Ιουλίου, 2020).

http://pharol.pt/pt-pt (Ανακτήθηκε 12 Ιουλίου, 2020).

http://www.tisparkle.com/?gclid=CjwKCAjw2dD7BRASEiwAWCtCb95VCJszM4Fodxk4ZU8xvqzzCIJ64sUqM9pneBdF5nJbV_179nZYvxoCG-oQAvD_BwE (Ανακτήθηκε 12 Ιουλίου, 2020).

https://orange.jobs/site/en-home/ (Ανακτήθηκε 12 Ιουλίου, 2020).

https://www.telekom.com/en (Ανακτήθηκε 4 Αυγούστου, 2020).

https://www.gigaset.com/hq_en/ (Ανακτήθηκε 4 Αυγούστου, 2020).

https://www.telefonica.com/es/home (Ανακτήθηκε 4 Αυγούστου, 2020).

https://ec.europa.eu/digital-single-market/en/country-information-austria (Ανακτήθηκε 18 Αυγούστου, 2020).

https://ec.europa.eu/digital-single-market/en/country-information-belgium (Ανακτήθηκε 18 Αυγούστου, 2020).

https://www.budde.com.au/Research/Bulgaria-Telecoms-Infrastructure-Operators-Regulations-Statistics-and-Analyses (Ανακτήθηκε 18 Αυγούστου, 2020).

https://www.flandersinvestmentandtrade.com/export/sites/trade/files/market_studies/249140520154614/249140520154614_1.pdf (Ανακτήθηκε 18 Αυγούστου, 2020).

https://www.semanticscholar.org/paper/Recent-trends-in-the-Cypriot-electronic-sector-Clerides-Karagiannakis/59312e7610ff24f114dbfa5422560acf49e6e36a?p2df (Ανακτήθηκε 18 Αυγούστου, 2020).

https://www.budde.com.au/Research/Czech-Republic-Telecom-Market-Statistics-Infrastructure-Operators-Regulations-and-Analyses (Ανακτήθηκε 18 Αυγούστου, 2020).

https://www.eiu.com/industry/telecommunications/europe/denmark (Ανακτήθηκε 18 Αυγούστου, 2020).

https://www.oecd.org/finland/41076976.pdf (Ανακτήθηκε 25 Αυγούστου, 2020).

https://www.budde.com.au/Research/Estonia-Telecoms-Mobile-and-Broadband-Statistics-and-Analyses (Ανακτήθηκε 25 Αυγούστου, 2020).

https://www.oecd.org/ (Ανακτήθηκε 31 Αυγούστου, 2020).

https://www.oecd.org/france/32482712.pdf (Ανακτήθηκε 25 Αυγούστου, 2020).

https://pdf.sciencedirectassets.com/282136/1-s2.0-S2212567113X00024/1-s2.0-S2212567113000452/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEDsaCXVzLWVhc3QtMSJIMEYCIQDzts8%2BM8jj0EWnhBYwTncq4iJZ4RLWsAjw551J1v8%2BcAIhAJ5a7Jandqv25IjBHc4Zo9qivEcXaJPgkfSiXLDzgbbdKrQDCGMQAxoMMDU5MDAzNTQ2ODY1IgxXH1p9qpcTgoyRLS8qkQNlqaT8LtHFaQa%2BKl1KoZODTvGEzEr3IwXYULN7YWI4WnepPyRZIOQYaQlIuYZ0X4OhduTueNGn3GR1WLJNUAalvcLgkCwavRvwqofoIxyXhVJZebywtGkfCo6NgiFO7Vdlim5zQvpb7FYEAn28p7nlONqGvK%2FuGqlorG%2BjpgwVYOXh6V4lpFcEMHOWU3%2FGaB7VQZIpOeolb%2Fspb8UpQF0rn%2FJ1Bt9dmER2rR0dDKBFQSoDsVtoMV3HO16Reo042THcKWg636t%2BJNWFr0S5Z7wrBSTqNO9tOvAeOFDNi0bzcRY%2Bqy%2FYrbXGT8ONhNSPcn6slqhYEMcnSqFm8u3%2FOB9cQ3iq7EY2HYfE1WRhSnvGdmHHaKqw%2BTkRLOohi3jTaxtmWILKO83nMeV2SJsiX0dWpM1oNcrYdLX7Cue5WZUBfnZYRgQpkNYikwihxGW7mgEU1RubKzzRECMXFYUyJYKE3BJ0hOaVt%2FnQujVeDtVW1SQxMMJc%2Boo%2FCITiRdBbNRueFSW%2B4G9F7IoUviW6Qviv7TDKktP7BTrqAXUkRZVxss%2BP5XbsLhGIMvu4YMJXpFGJXv2dV9YaeHNvrQ0pWm%2Ft6K5MUKTeucu5yrjAF8AdemRuZQeC5FnL7In8Qls%2F95hQIUhKnukLHAjNnEslk01r88zvukubDio0CNn07MOM7ZMXiRh0tDC3GgRK

9Ndm3nvy6Ar2WJJC4mpHag3Kg%2B6F0fry8Z9LYQphN8hAEiPFhovK8
8BgSjIhH9
oV1rOLNUEiMxDkIVJFUCE8BgrYehvkAVlNsMV8yXr09ihsuo8tD2nwE
ZLmn58%2
F9%2BfeDAxJYwu%2BRac%2BFX7o%2FMerERhALh0qJkhXFw%3D%3
D&X- Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-
Date=20200930T195345Z&X-
Amz-SignedHeaders=host&X-Amz-Expires=300&X-
Amz-
Credential=ASIAQ3PHCVTYTWJHLZH5%2F20200930
%2Fus-east-
1%2Fs3%2Faws4_request&X-Amz-
Signature=5732e9c2e8814fc997a000442dd7760e363c1ba6c319870db8c4a1
e2966abc8
2&hash=d935f07dae8ad8b5df4d19a20f19093b83b81ad3baa85e38956acc52
b95d82ce&
host=68042c943591013ac2b2430a89b270f6af2c76d8dfd086a07176afe7c76
c2c61&pii= S2212567113000452&tid=spdf-8207d70b-4d79-4ba3-a617-
49e7fd11d211&sid=884b4cf29453a948177b4701517e90590f33gxrqb&
type=client (Ανακτήθηκε 25 Αυγούστου, 2020).

https://www.budde.com.au/Research/Hungary-Telecoms-Mobile-and-
Broadband- Statistics-and-Analyses (Ανακτήθηκε 25 Αυγούστου,
2020).

https://www.businesswire.com/news/home/20181004005385/en/Ireland
-Telecoms- Mobile-and-Broadband-Statistics-and-Analyses-2018---
ResearchAndMarkets.com (Ανακτήθηκε 31 Αυγούστου, 2020).

https://www.budde.com.au/Research/Italy-Telecoms-
Infrastructure-Operators- Regulations-Statistics-and-Analyses
(Ανακτήθηκε 31 Αυγούστου, 2020).

https://infobase.thomsonreuters.com/infobase/login/?next=/infobase/
(Ανακτήθηκε 16 Σεπτεμβρίου, 2020).