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Telecommunications operators and yield on investment

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Content

Sammanfattning

Frågan om investeringar i nätverksinfrastruktur har länge stått på den europeiska policyagendan. Sådana investeringar anses vara nödvändiga för den digitala omställningen. Konnektivitet har blivit en del av livet, både på arbetet och privat. Många menar att den digitala omställningen kommer att kräva fortsatta stora investeringar i infrastrukturen.

År 2022 publicerade flera europeiska teleoperatörer ett gemensamt uttalande med ett förslag om så kallad ”fair contribution”, vilket syftade till att skapa bättre möjligheter för fortsatta investeringar för att nå målen för den digitala decenniet 2030.[1] Teleoperatörerna föreslog att företag som genererar mycket trafik (eng. Large Traffic generators (LTGs)), vilka också skapar "*the most revenues from network services access in Europe should contribute proportionately to the costs of these service*”, dvs. ska bidra med en “fair share”, en rättvis andel av kostnaderna.[2] Europeiska kommissionen svarade på detta förslag genom att inkludera frågor om ”fair share” i sin konsultation om framtiden för sektorn för elektronisk kommunikation och dess infrastruktur, som avslutades i oktober 2023.[3]

Europeiska kommissionen berörde därefter de europeiska operatörernas finansiella prestation i en vitbok där kommissionen skrev att *“the current financial situation of the EU electronic communication sector raises concerns for its capacity to find funding for the substantial investments that are needed to catch up with the technological shift. The average revenue per user (ARPU) of electronic communications operators in the EU is relatively low compared to other economies such as the US, Japan or South Korea. This has led to declining Return on Capital Employed (ROCE)”*.[4] I vitboken framförde kommissionen också att “*the fragmentation of the EU market for electronic communications networks and services along national*

[1] Etno (2022). Joint EU and National telecom sector statement on “fair contribution”, 18 Juli, 2022. Online på News (etno.eu), retrieved 04/30/2024.

[2] Fair Share (2023) A Fair Share proposal to ensure Europe can achieve its 2030 ‘Digital Decade’ targets. Who we are | Fair Share (fairshareinitiative.eu), retrieved 04/30/2024.

[3] European Commission (2023a), Exploratory Consultation, The future of the electronic communications sector and its infrastructure, published 23 February 2023, online på The future of the electronic communications sector and its infrastructure | Shaping Europe’s digital future (europa.eu).

[4] European Commission (2024). White paper: How to master Europe’s digital infrastructure needs? Brussels 21.22004 Com (2024) 81 final, p. 10.

borders impacts the ability of operators to reach the scale needed to invest in the networks of the future [….]".[5]

I sin rapport om den inre marknadens framtid, beställd av Europeiska kommissionen och Europeiska rådet, skrev den tidigare italienske premiärministern Enrico Letta att operatörernas intäkter minskar, och att hela sektorn för elektronisk kommunikation i EU är i riskzonen om inte omedelbara åtgärder vidtas.[6] Rapporten välkomnades av branschorganisationerna GSMA och ETNO, som uppmuntrade "*member states to swift legislative action in the new institutional cycle, with top priority, as a follow-up to the White Paper [….]*".[7]

I relation till ovanstående argument från flera aktörer finns det ett antal frågor som skulle gynnas av ytterligare belysning inför policydiskussionen kring investeringar och behoven av regelöversyn för sektorn elektronisk kommunikation i EU. Några av dessa frågor behandlas i denna rapport, som är strukturerad på följande sätt:

- Utvecklingen av den svenska marknaden för elektronisk kommunikation 2008–2022 avseende intäkter, investeringar och datatrafik baserat på data insamlade av PTS. (Kapitel 2)[8]
- Investeringar, ökad dataanvändning och potentiella flaskhalsar i näten. (Kapitel 3)
- Genomgång av ett par olika metoder för att mäta avkastning. (Kapitel 4)
- Utvecklingen av avkastning på investerat kapital (ROIC) och avkastning på sysselsatt kapital (ROCE) och dess komponenter baserat på data från Bloomberg. (Kapitel 5)
- Utifrån resultaten presenteras slutsatser och potentiella konsekvenser för marknaden i relation till prisökningar och konsolideringar. Avslutningsvis beskrivs också framtida potentiell konkurrens från andra intressenter kortfattat. (Kapitel 6)

[5] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com (2024) 81 final, p. 16.

[6] Letta, E (2024). Much more than a Market. Speed, security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. April, 2024.

[7] Etno (2024) GSMA and Etno welcome Letta's report, call for Member States to support the EC White paper on digital infrastructure needs, 19 April 2024. Hämtad på News (etno.eu) 04/30/2024.

[8] PTS (2023). Data från svensk telekommarknad, Online på Svensk telekommarknad | (pts.se) and PTS (2024). Uppföljning av regeringens bredbandsstrategi 2024, (PTS-ER-2024:19), online at Uppföljning av regeringens bredbandsstrategi 2024 (pts.se).

Baserat på data från PTS genererar den svenska slutkundsmarknaden för elektroniska kommunikationstjänster intäkter på cirka 50 miljarder kronor per år, en intäktsnivå som varit stabil under de senaste 15 åren. Men intäktsmixen har förändrats då fast telefoni har minskat samtidigt som mobila tjänster och tjänster från fast bredband har vuxit i kombination med tillväxt i hur mycket data som används. Vidare kan noteras att andelen för intäkterna från elektronisk kommunikation i förhållande till BNP har minskat från 1,44 % 2008 till 0,8 % 2022. I sammanhanget är det dock viktigt att påpeka att detta inte betyder att sektorn i sig blivit mindre viktig eftersom denna bidrar till ökad produktivitet inom andra sektorer.[9] Investeringar i mobilinfrastruktur, i förhållande till försäljning såväl som i absoluta tal, har minskat i Sverige under perioden 2008–2022, därefter har de ökat.[10] Däremot ökade investeringarna i fasta bredbandsnät under 2008–2017 och minskade därefter eftersom mycket av den potentiella fiberutbyggnaden i Sverige då redan var färdig.

Övriga resultat avser börsnoterade telekomoperatörer från hela världen för perioden 2008–2022 där data hämtats från Bloomberg. Jämförelser genomförs mellan Sverige, övriga Europa, Nordamerika och resten av världen. PTS konstaterar att avkastningen på investerat kapital (ROIC) var cirka 8% till 13% under 2008, beroende på region. I slutet av perioden var ROIC cirka 5–7%. För svenska operatörer drivs minskningen främst av ett minskat rörelseresultat efter skatt (eng. förkortning NOPAT). En minskning observeras också för avkastning på sysselsatt kapital (ROCE). Slutligen, i bilagan, listar PTS 24 fusioner eller förvärv som skett under de senaste 20 åren. Anledningen till detta är att dessa har genomförts under tidigare eller nuvarande konkurrensreglering. I den nuvarande policydiskussionen argumenterar GSMA för en revidering av befintlig reglering i syfte att "*promote a more flexible competition policy*"[11], vilket enligt argumenten skulle kunna leda till fler konsolideringar inom länder samt stordriftsfördelar. Detta i sig hävdas kunna leda till mer långsiktiga investeringar.[12]

Baserat på dessa resultat gör PTS följande observationer:

1. Svenska konsumenter har fått mer värde för pengarna eftersom kostnad per dataenhet har minskat avsevärt sedan 2008.

[9] För sambandet mellan produktivitetsökning och telekommunikation, se till exempel Dholakia & Harlam (1994); Röller & Waverman (2001); Pan et al. (2022).

[10] Detta är en sannolik effekt av olika investeringscykler för olika nätverksgenerationer, det vill säga 4G och 5G.

[11] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, March 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, s. 12. retrieved 06/05/2024.

[12] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, mars 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, retrieved 06/05/2024.

2. Under de senaste åren har det inte funnits någon tydlig skillnad i ROIC eller ROCE mellan Nordamerika, Europa, Sverige och resten av världen enligt PTS analys av Bloombergs data, vilket motsäger Europeiska kommissionen argument i vitboken.[13] Detta är särskilt intressant baserat på observerade argument avseende att de europeiska marknaderna har en lägre koncentration samt lägre regulatoriska inträdesbarriärer jämfört med USA.[14]

3. Givet nedgången i ROIC och ROCE är det troligt att operatörerna kommer att försöka öka avkastningen genom att antingen minska kostnaderna, att höja priserna eller båda. Företag kan försöka uppnå detta genom konsolidering, särskilt om förvärvskontrollen skulle vara mindre strikt i framtiden. Konsolidering skulle teoretiskt sett kunna leda till lägre kostnader, t.ex. om det finns stordriftsfördelar, och skulle också kunna underlätta prisökningar om konsolideringen leder till lägre konkurrenstryck.

4. Investeringar i förhållande till försäljning (eng. Capex to sales) var högre i Nordamerika jämfört med Europa inklusive Sverige från 2008 till 2013. Därefter blev förhållandet mellan Europa och Nordamerika likartade, förutom för svenska företag som uppvisade en högre investeringsnivå i förhållande till försäljning. Analys av PTS data på nationell nivå avseende totala investeringar tyder på att ökningen av investeringarna drivs av stora investeringar i fast bredband. Se figur 5 och figur 7 där Capex to sales på den mobila sidan generellt har minskat samtidigt som motsvarande på den fasta sidan ökat fram till 2017. Det senare är också i linje med att investeringar i förhållande till försäljning totalt sett började minska i Sverige efter vid denna tid.

5. Inom ramen för den initiala *fair* share diskussionen argumenterades för högre kostnader på grund av mer datatrafik. PTS bedömer att datatillväxt i fast bredband kan hanteras genom investeringar i *core routers*, där kostnaden är låg jämfört med ny fiber. För mobilnät finns det flera sätt att hantera mer data såsom mer radiospektrum, att aktivt flytta dataanvändning från mobilnätet till WiFi eller att investera i nya basstationer för mobil kommunikation.

Vid tolkningen av resultaten är det viktigt att betona att analysen och jämförelsen av teleoperatörer använder data från Bloomberg innehållande börsnoterade företag, vilka är föremål för begränsningar som kan påverka resultaten. För det första finns det skillnader mellan länder, såsom variationer i inflationstakt, vilket kan påverka utfallet. De internationella jämförelserna baseras dock främst på kvoter som nyckeltal

[13] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com (2024) 81 final, p. 10.

[14] Germán, G & Philippon, T (2018). How EU markets became more competitive than US markets: A study of institutional drift. No. w24700. New York: National Bureau of Economic Research.

där både täljaren och nämnaren påverkas på samma sätt. För det andra har länder olika skattesystem som kan påverka. För att hantera detta jämför PTS resultat före och efter skatt. För det tredje avser vår analys hela företag snarare än specifika segment, t.ex. mobilverksamhet. Vidare kan företag ha verksamhet i olika regioner. För denna analys behöver PTS anta att det inte påverkar mellan regioner samt att verksamheten överensstämmer med regionen de är noterade på. Avslutningsvis kan det också finnas strukturella skillnader beroende på var i investeringscykelns olika regioner befinner sig.

Med hänsyn tagen till dessa begränsningar bedömer PTS ändå att slutsatser kan dras och att potentiella implikationer på tre områden för de svenska operatörerna kort kan beskrivas.

För det första kan viljan till konsolideringar potentiellt öka framöver som ett svar på sjunkande avkastning på investeringar, vilket visas i denna rapport. Det kan vara en anledning till att branschorganisationer argumenterar för en lättnad av konkurrensreglering för att främja en mer liberalt tillämpad förvärvskontroll. Detta argumenteras kunna leda till konsolideringar inom marknader samt stordriftsfördelar.[15] Dessutom hävdar Letta att europeiska företag missgynnas genom att vara mindre än sina globala konkurrenter.[16] För det andra kan potentiella prisökningar komma att realiseras som en effekt av den allmänna inflationen varit hög såväl som en effekt om ytterligare konsolideringar på marknaden äger rum. Prisökningar innebär också en potential för teleoperatörerna att öka intäkterna. Avslutningsvis kan ökad konkurrens från andra intressenter i ekosystemet för elektronisk kommunikation uppstå, vilket potentiellt kan sätta press på avkastningen för telekomoperatörer och eventuellt även priserna. Dessa effekter är ämnen som skulle behöva djupare analys i potentiella framtida studier.

Sammanfattningsvis pekar PTS resultat i riktning mot att finansiella mått, såsom ROIC och ROCE, inte skiljer sig mellan Sverige, Europa och Nordamerika under de senaste åren. Detta samtidigt som marknadskoncentrationen har argumenterats skilja sig åt mellan dessa regioner. Tidigare, och jämfört med Nordamerika, var ROCE högre i Sverige (fram till 2018) och ingen tydlig skillnad därefter. Dessutom, och noterbart, har investeringar i förhållande till intäkter varit liknande för Europa och Nordamerika under majoriteten av de senaste 10 åren, men högre för svenska operatörer. Den högre kvoten för svenska företag skulle kunna drivas av större investeringar i fast bredband eftersom en ökning kan ses för detta i PTS data på svenska investeringar.

[15] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, March 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, retrieved 06/05/2024.

[16] Letta, E (2024). Much more than a Market. Speed, security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. April, 2024, s. 8.

Summary

Investments in network infrastructure have been on the European policy agenda for some time. Such investments are seen as essential to drive the digital transformation, since connectivity has become an integral part of our professional and personal lives. However, it has been argued that the digital transformation will require large investments in infrastructure.

In 2022, several European telecom operators released a joint statement with a proposal on "fair contribution," which aims to create better conditions for continued investments to reach the Digital Decade 2030 targets.[17] The telecom operators suggest that large traffic generators (LTGs), which generate "the most revenues from network services access in Europe should contribute proportionately to the costs of these services," that is, pay their *fair share*.[18] The European Commission responded by including this issue in its exploratory consultation on the future of the electronic communications sector and its infrastructure, which concluded in October 2023.[19]

The financial performance of European operators was then addressed in a white paper (hereafter "The White Paper") where the European Commission states that "the current financial situation of the EU electronic communications sector raises concerns for its capacity to find funding for the substantial investments that are needed to catch up with the technological shift. The average revenue per user (ARPU) of electronic communications operators in the EU is relatively low compared to other economies such as the US, Japan or South Korea. This has led to declining Return on Capital Employed (ROCE)".[20] They further argue that "the fragmentation of the EU market for electronic communications networks and services along national

[17] Etno (2022). Joint EU and National Telecom Sector statement on "fair contribution," July 18, 2022. Online at News (etno.eu), retrieved 04/30/2024.

[18] Fair Share (2023). A Fair Share proposal to ensure Europe can achieve its 2030 "Digital Decade" targets. Who we are | Fair Share (fairshareinitiative.eu), retrieved 04/30/2024.

[19] European Commission (2023a). Exploratory Consultation: The future of the electronic communications sector and its infrastructure," published February 23, 2023, online at The future of the electronic communications sector and its infrastructure | Shaping Europe's digital future (europa.eu).

[20] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com 81 final, p. 10.

borders impacts the ability of operators to reach the scale needed to invest in the networks of the future…."[21]

In his report the future of the Single Market, which was commissioned by the European Commission and the European Council, former Italian prime minister Enrico Letta put forward arguments that operators have seen a persistent decline in revenues and underscores that the entire electronic communications sector in the EU is "at risk" unless immediate action is taken.[22] The report was welcomed by the GSMA and ETNO, which "encourage member states to swift legislative action in the new institutional cycle, with top priority, as a follow-up to the White Paper [….]".[23]

In this context, there are a number of questions that are worthy of further investigation when discussing investments and the need for regulatory development in the electronic communications sector in the EU. Some of these areas are addressed in this report, which is structured as follows:

- Trends in the Swedish electronic communications market from 2008-2022 in terms of revenues, investments and data traffic based on data collected by PTS (Chapter 2)[24]
- Investments, data growth and potential bottlenecks in general (Chapter 3)
- Different methods to measure return (Chapter 4)
- Changes in return on invested capital (ROIC) and return on capital employed (ROCE) and their components based on data from Bloomberg (Chapter 5)
- Based on the findings, PTS provides a short discussion regarding implications for the market, including the potential impact on prices and consolidations. Additionally, a brief description of potential competition from other stakeholders is presented. (Chapter 6)

Based on data from PTS, the Swedish retail market for electronic communication services generates revenues of around SEK 50 billion per year, a level that has been stable for the last 15 years. However, the revenue mix has fundamentally changed, as fixed telephony has declined while mobile and broadband have grown in combination with substantial growth in data volumes. Moreover, despite stable revenues, the

[21] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com 81 final, p. 16.

[22] Letta, E (2024). Much more than a Market. Speed, security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. April, 2024.

[23] Etno (2024). GSMA and Etno welcome Letta's report, call for Member States to support the EC White paper on digital infrastructure needs, 19 April 2024. Retrieved from News (etno.eu), 04/30/2024.

[24] PTS (2023). Data från svensk telekommarknad, Online at Svensk telekommarknad | (pts.se) and PTS (2024). Uppföljning av regeringens bredbandsstrategi 2024, (PTS-ER-2024:19), online at Uppföljning av regeringens bredbandsstrategi 2024 (pts.se).

share of revenues from electronic communications in relation to GDP has fallen from 1.44% in 2008 to 0.8% in 2022. However, it is important to point out that this does not mean that the sector itself is less important as it can be seen as a facilitator for productivity in other sectors.[25] Mobile investments, both in relation to sales and in absolute terms, have decreased in Sweden during between 2008-2022, after which they have increased.[26] In contrast, investments in fixed broadband networks increased between 2008-2017 and fell thereafter, as much of the fiber deployment in Sweden had been completed.

Finally, data on listed telecom carriers from all over the world for the period 2008-2022 is obtained from Bloomberg, where comparisons are performed between Sweden, the rest of Europe, North America and the rest of the world. PTS finds that return on invested capital (ROIC) was around 8% to 13% in 2008, depending on the region. By the end of the period of investigation, the ROIC reached around 5-7% within each region. In the case of Swedish operators, the decline in ROIC is mostly driven by a decrease in net operating profit after tax (NOPAT). A similar decline in return on capital employed (ROCE) can also be seen, but between different levels. Finally, in the Appendix, PTS lists 24 merger transactions that have occurred during the last 20 years. The reason for this is that these have occurred during previously adopted or current competition policy. In the present policy discussion, the mobile industry argues for the revision of merger regulation "to promote a more flexible competition policy,"[27] which could lead to in-market consolidations and economies of scale. Furthermore, it has been argued that these effects facilitate long-term investments.[28]

Based on these results, PTS makes the following observations:

1. Swedish consumers have gotten more value for their money since connectivity costs, measured as cost per data unit, have decreased substantially since 2008.
2. In recent years, there has not been a clear difference in ROIC or ROCE across North America, Europe, Sweden and the rest of the world according to PTS' analysis of data from Bloomberg. This is, in particular, interesting with respect

[25] For the relationship between productivity growth and telecommunications, see, for example, Dholakia & Harlam (1994); Röller & Waverman (2001); Pan et al. (2022).
[26] This is likely to be an effect of the investment cycles of different network generations, i.e., 4G and 5G.
[27] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, March 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, p. 12. retrieved 06/05/2024.
[28] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, March 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, retrieved 06/05/2024.

to arguments that the European markets have a lower concentration and lower regulatory barriers to entry compared to the United States.[29]

3. Given the decline in ROIC and ROCE, it is likely that companies will attempt to increase returns either by reducing costs or by increasing prices, or both. Companies may try to achieve this through consolidation, especially if merger control becomes less strict in the future. Consolidation could lead to lower costs, for example, if there are economies of scale, and could also facilitate price increases if consolidation leads to lower competitive pressure.
4. Capex to sales was higher in North America compared to Europe, including Sweden, from 2008 to 2013. Thereafter, these ratios in the two regions became similar, except for Swedish firms, which exhibited a higher capex to sales. An analysis of the national data on total investments from PTS suggests that the increase in investments is driven by large investments in fixed broadband. See Figure 5 and Figure 7, where mobile capex to sales has generally declined, and fixed capex to sales has increased until 2017. The latter is in line with capex to sales in Sweden, which started to decrease around this time.
5. Regarding investments needed due to potential bottlenecks in relation to data growth, as argued in the initial “fair share” discussion, PTS finds that data growth in fixed broadband could be handled through manageable investments in core routers in relation to the cost of new fiber. For mobile networks, there are several ways to handle data growth, such as more radio spectrum, to push wireless data from mobile networks to WiFi in order to offload mobile networks or investing in new sites.

When interpreting the results presented here, it is essential to emphasize that the analysis and comparison of telecom carriers uses data for listed companies from Bloomberg, which is subject to limitations that may influence the results. First, there are certain discrepancies between countries, such as variations in inflation rates, which may have an impact on the outcomes. The international comparisons are presented as ratios, where both the numerator and denominator are similarly influenced. Second, countries have different tax systems, which may affect different parts of their accounts. To handle this issue, PTS compares results before and after taxes. Third, our analysis pertains to entire companies rather than specific segments, such as mobile operations. While companies may have operations in various regions, for our analysis, we need to assume that this does not differ systematically in a way that affects the results between regions. Moreover, PTS must assume that the companies’ operational scope aligns with their listing location. Fourth, differences

[29] Germán, G & Philippon, T (2018). How EU markets became more competitive than US markets: A study of institutional drift. No. w24700. New York: National Bureau of Economic Research.

may arise from structural variations depending on the stage of the investment cycle that applies in different regions.

Acknowledging these limitations, PTS can state that we have identified potential implications for Swedish operators in different areas. First, there is a potential for increased interest in consolidation in the future in response to declining returns on investments (as shown in this report). This could be a rationale behind industry organizations' calls for a revision of merger regulation to promote a more flexible approach to mergers, as it could lead to in-market consolidations and economies of scale.[30] Moreover, Letta claims that European companies suffer from a size deficit compared to their global competitors.[31] Second, potential price increases may occur as an effect of generally high inflation in recent years, as well as an effect of further in-market consolidations. Price increases also entail a potential for telecom carriers to increase revenues. In addition to the implications presented above, increased competition from other stakeholders in the electronic communications ecosystem could put pressure on the returns for telecom carriers and potentially, prices. These effects are topics that would benefit from a more in-depth analysis in potential follow-up studies.

To sum up, our results point in the direction that financial performance measures, such as ROIC and ROCE, do not differ between Sweden, Europe and North America in recent years (i.e., markets in which the market concentration differs). Previously, ROCE was higher in Sweden (until 2018) compared to North America, with no clear difference thereafter. Moreover, and notably, the capex to sales ratio has been similar for Europe and North America for most years in the last decade, but higher for Swedish operators. The higher ratio for Swedish firms could be driven by larger capex in fixed broadband, as an increase can be seen for this in the data for Sweden from PTS.

[30] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, March, 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, retrieved 06/05/2024.

[31] Letta, E (2024). Much more than a Market. Speed, security, solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. April, 2024, p. 8.

1. Introduction and background

Investments in network infrastructure have been on the European policy agenda for some time. Such investments are seen as essential to drive the digital transformation, since connectivity has become an integral part of our professional and personal lives. However, it has been argued that the digital transformation will require large investments in infrastructure.

In 2022, several European telecom operators released a joint statement with a proposal on "fair contribution" aiming to give better opportunities for continued investments to reach the Digital Decade 2030 targets.[32] The telecom operators suggest that large traffic generators (LTGs), which generate "the most revenues from network services access in Europe should contribute proportionately to the costs of these service."[33] The European Commission responded by including this issue in its exploratory consultation on the future of the electronic communications sector and its infrastructure, which concluded in October 2023.[34]

The financial performance of European operators was then addressed in the White Paper where the European Commission states that "the current financial situation of the EU electronic communications sector raises concerns for its capacity to find funding for the substantial investments that are needed to catch up with the technological shift. The average revenue per user (ARPU) of electronic communications operators in the EU is relatively low compared to other economies such as the US, Japan or South Korea. This has led to declining Return on Capital Employed (ROCE)".[35] They further argue that "the fragmentation of the EU market for electronic communications networks and services along national borders impacts

[32] Etno (2022). Joint EU and National Telecom Sector statement on "fair contribution," July 18, 2022. Online at News (etno.eu), retrieved 04/30/2024.

[33] Fair Share (2023) A Fair Share proposal to ensure Europe can achieve its 2030 'Digital Decade' targets. Who we are | Fair Share (fairshareinitiative.eu), retrieved 04/30/2024.

[34] European Commission (2023a), Exploratory Consultation: The future of the electronic communications sector and its infrastructure, published 23 February 2023, online at The future of the electronic communications sector and its infrastructure | Shaping Europe's digital future (europa.eu).

[35] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com 81 final, p. 10.

the ability of operators to reach the scale needed to invest in the networks of the future....”[36]

In April 2024, former Italian prime minister Enrico Letta published his report on the future of the Single Market, which was commissioned by the European Commission and the European Council. Letta claims that the electronic communications sector in Europe is the sector where liberalization has had the best results. However, he argues that operators have seen a persistent decline in revenues and underscores that the entire electronic communications sector in the EU is “at risk” unless immediate action is taken.[37] The European Telecommunications Network Operators' Association (ETNO) has published a report encouraging Member States to “support for the White Paper’s call to action.”[38]

European operators have increased their debt levels during the era of low interest rates, which ended in early 2022.[39] Together with higher interest rates, the cost of capital increases from two sides, that is, the stock of debt is higher and interest rates increase when existing debts mature. European telecommunications operators are, according to Deloitte, struggling to create value for their shareholders as their return on invested capital (ROIC) is close to, or even below, their weighted average cost of capital (WACC).[40] The operators have also claimed that they do not generate sufficient profits to make necessary investments.[41] These claims are also in line with what has previously been described regarding the view of several stakeholders. However, it is worth noting that operators have released capital from their balance sheets in recent years by divesting or separating their mobile tower infrastructure and this has, to some extent, been distributed to their shareholders.[42]

Margrethe Vestager, the EU Commissioner for Competition between 2019-2024, also notes that Europe has 27 national telecoms markets with, for example, different

[36] European Commission (2024). White paper: How to master Europe’s digital infrastructure needs? Brussels 21.22004 Com 81 final, p. 16.

[37] Letta, E (2024). Much more than a Market. Speed, security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. April, 2024.

[38] Etno (2024). GSMA and Etno welcome Letta’s report, call for Member States to support the EC White paper on digital infrastructure needs, April 19, 2024. Accessed at News (etno.eu) 04/30/2024.

[39] Wood, R. Killeen, K & Dayan, J (2023). State of digital communications 2023: Research conducted for ETNO by Analysys Mason. European Telecommunications Network Operators’ Association, January 2023.

[40] Deloitte (2023). Decision time for Europe’s telcos: As overcapacity makes connectivity a commodity and customers don’t care anymore, telcos need to take action, June 2023.

[41] Bryson, Joanna J., Helena Malikova, Lisa Garbe, and David Backovsky (2023). Big Telcos Aren’t Necessarily Better: A Case Study of EU Versus US Market Concentration. SocArXiv, January 14. doi:10.31235/osf.io/m42uh

[42] WIK-Consult Report: Study on the evolution of the competition dynamics of tower and access infrastructure companies not directly providing retail services, December 7, 2023, commissioned by BEREC, BoR (23)206.

network architectures, which generates fragmentation.[43] However, she also claimed that "No evidence suggests that more concentrated national markets lead to better outcomes."[44] In line with the argument by Vestager, classic antitrust theory suggests that a more concentrated market creates weaker incentives for investments. Moreover, it has been argued that 1) more value is returned to customers in terms of infrastructure investment in the less concentrated EU market, 2) the operating profits are fairly similar between companies in Europe and North America and 3) financial data suggests that the lack of incentives, rather than lack of ability, explains why a higher share of profits is invested in the EU compared to the US.[45] However, this is not clear because both higher prices and more investments have also been observed in more concentrated markets.[46]

From a policy perspective, the White Paper provides positive potential effects of pan-European core network operators, such as "an opportunity for alignment of the operations of electronic communication and cloud services."[47] However, from an empirical point of view, attempts have previously occurred. For example, Vodafone had global ambitions but scaled down its strategy and divested its operations in a number of markets such as Spain. Telia has also sold its operations in a number of markets. Additionally, several tower transactions demonstrate that operators are prepared to abandon key assets as a way to monetize their infrastructure assets. This indicates that, at least historically, European operators have not come close to establishing pan-European operations, as several operators have downscaled.[48] However, there are also other examples where broadening has been successful, for example, the introduction of the mobile money service M-PESA by Vodafone.[49]

All in all, it is neither clear whether a more consolidated market would create better outcomes in terms of investments nor proven that different financial ratios are better in North America or Asia compared to Europe. This report addresses several key questions, which focus on various aspects and are structured as followed across different chapters:

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[43] New initiatives for digital infrastructures of tomorrow (europa.eu).

[44] Daws, Ryan (2024). EU antitrust chief warns against telecom mergers, April 18, 2024. Accessed at: EU antitrust chief warns against telecoms mergers (telecomstechnews.com) (04/30/2024).

[45] Bryson, J. J., Garbe, L., Backovsky, D., & Malikova, H. (2023). Big Telcos Aren't Necessarily Better: A Case Study of EU versus US Market Concentration.

[46] Christos Genakos, Tommaso Valletti, Frank Verboven, Evaluating market consolidation in mobile communications, *Economic Policy*, Volume 33, Issue 93, January 2018, Pages 45–100, https://doi.org/10.1093/epolic/eix020

[47] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com 81 final, p. 25.

[48] A brief overview of different transactions in Europe is provided in

Table A1 in the Appendix.

[49] Vodafone (2024). Technology and Innovation. M-PESA. Online at M-PESA (retrieved 11/06/2024).

- Trends in the Swedish electronic communications sector from 2008-2022 in terms of revenues, investments and data traffic. (Chapter 2)
- Investments, data growth and potential bottlenecks. (Chapter 3)
- Different methods to measure return. (Chapter 4)
- Changes in return on invested capital (ROIC) and return on capital employed (ROCE) and their components. (Chapter 5)
- Based on the findings, PTS provides a short discussion regarding implications for the market, including the potential impact on prices and consolidations. Additionally, a brief description of potential competition from other stakeholders is presented. (Chapter 6)

In addition to the chapters in this report, PTS lists 24 merger transactions that have been announced and completed during the last 20 years (see

Table A1 in the Appendix for the list). The list functions as a basis for a part of the discussion regarding potential policy implications in Chapter 6. Moreover, these mergers have occurred during previously adopted or current competition policy. In the present policy debate, the mobile industry argues for the revision of merger regulation to promote a more flexible approach, which could lead to in-market consolidations and economies of scale. It has also been argued that these effects will facilitate long-term investment.[50]

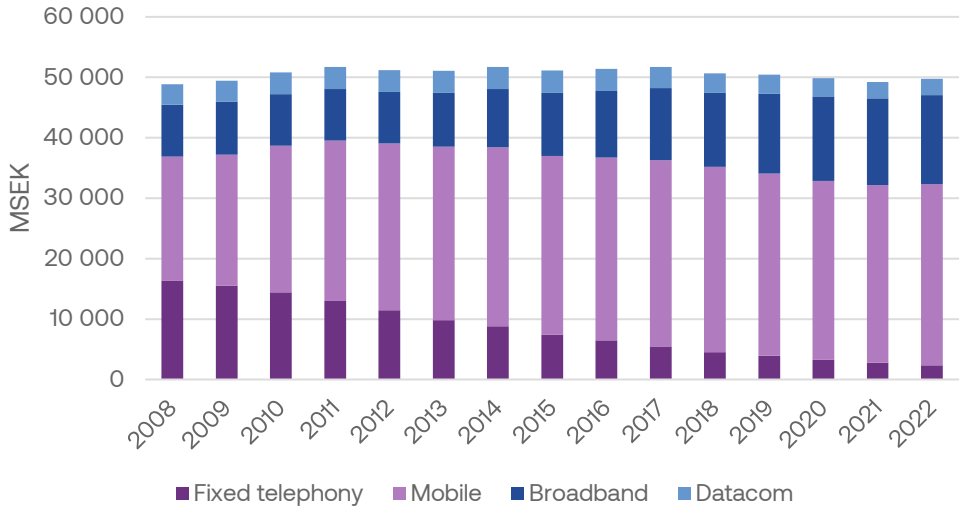
[50] GSMA (2024). New Rules for a New Era: Connecting Europe to 2030, March 2024. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe, retrieved 06/05/2024.

2. Trends in the Swedish electronic communications market

2.1 The overall market for electronic communications

Over the last 15 years, the Swedish market for electronic communications has generated around SEK 50 billion annually in retail revenues.[51] Although total revenues have been flat, the revenue mix has fundamentally changed. Fixed telephony accounted for 34% of total revenues in 2008. In 2022, this share dropped to 5%. The share of total revenues from mobile services increased from 42% in 2008 to 60% in 2022. The share of total revenues from fixed broadband increased from 18% in 2008 to 30% in 2022. The following figure illustrates how the revenue mix has changed over time.[52]

Figure 1 Total retail revenues from electronic communications in Sweden 2008-2022



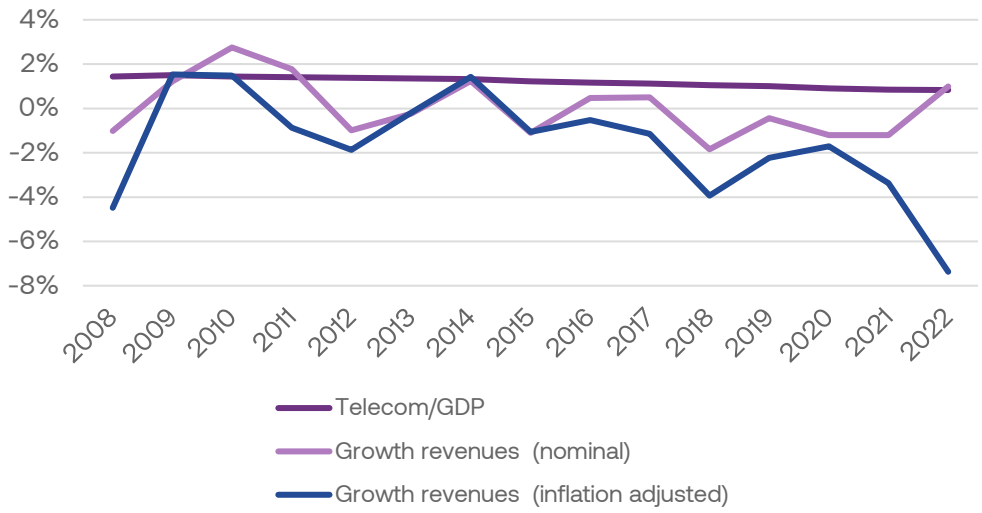
Source: PTS (2023)

[51] This includes only revenues from "traditional" electronic communication services, i.e., mobile voice and data, fixed broadband, fixed telephony and data communication services. Revenues from traditional TV, content and applications, cloud services, etc. are not included.

[52] Datacom includes, for example, services such as IP-VPN and leased lines for use by large firms and government authorities.

Altogether, SEK 14 billion in revenues that used to come from fixed telephony services now come from mobile services and broadband. The electronic communications sector as a whole can be described as mature, as the compound annual growth rate (CAGR) has been around zero. However, mobile and broadband has grown by approximately 3-4% per year. The limited growth of the sector as a whole has led to a decrease in the share of revenues from these types of electronic communication services in relation to GDP, from 1.44% in 2008 to 0.8% in 2022.[53] However, it is important to point out that this does not mean that the sector has become less important for GDP as a whole, since it can be seen as a facilitator for other sectors where connectivity is crucial.[54]

Figure 2 Revenue changes in relation to GDP



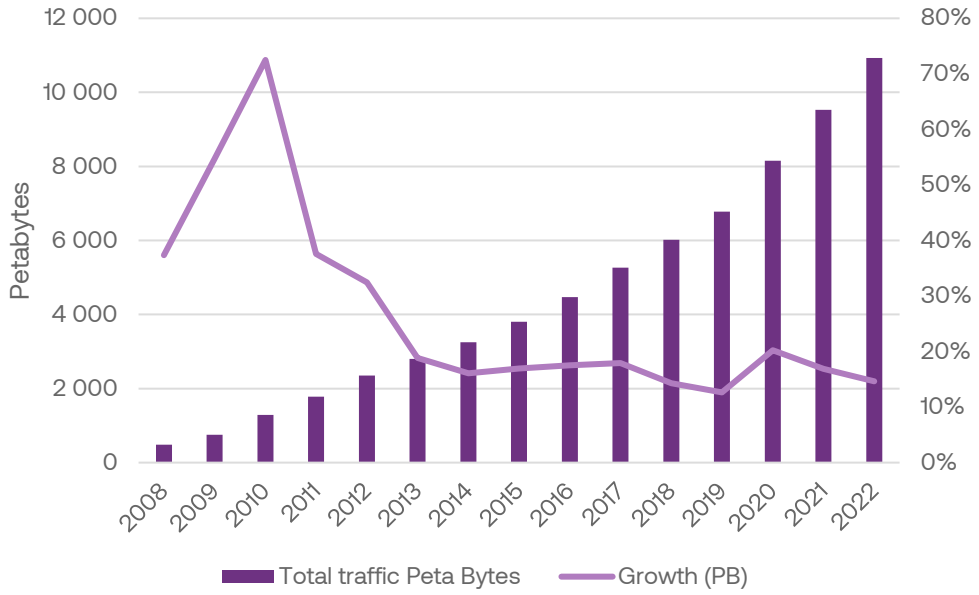
Source: PTS (2023), Statistics Sweden (National Accounts)

In contrast to the declining revenue trend, data traffic has increased significantly during the last 15 years, with a CAGR of 25%. This implies that end customers have enjoyed more connectivity for less money, as illustrated in Figure 3. However, the growth rate for data traffic has declined during the last 10 years, from over 70% to 10-20% per year. Sweden has a relatively extensive fiber infrastructure, meaning that more data traffic is likely to be transferred over fixed networks, resulting in a slower growth rate for mobile networks.

[53] This is measured in nominal terms, and the results could be affected if the general price development in the sector compared to GDP as a whole is controlled for.

[54] For the relationship between productivity growth and telecommunications, see, for example, Dholakia & Harlam, 1994; Röller & Waverman, 2001; Pan et al., 2022.

Figure 3 Estimated data traffic in PB and growth of data in Sweden[55]



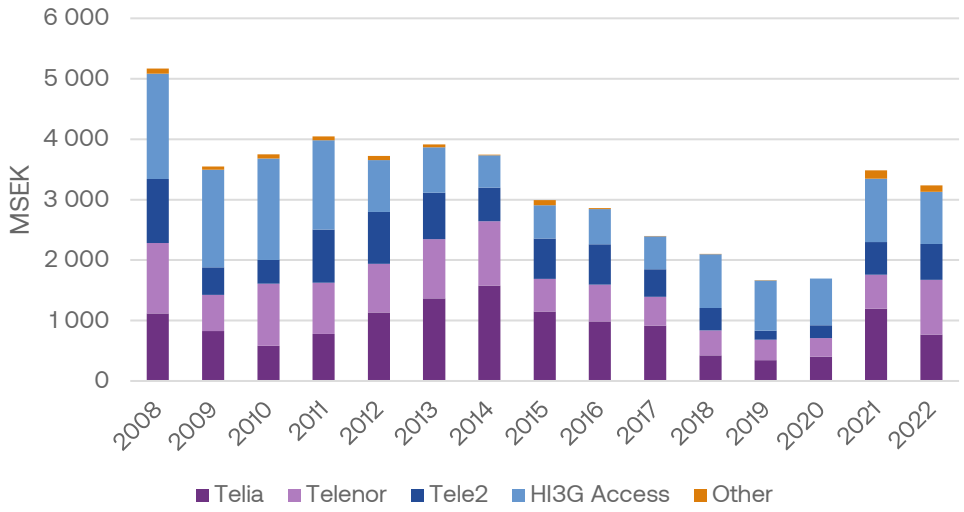
Source: PTS (2023)

2.2 Investments in mobile networks

Despite modest revenue growth, operators have invested a total of SEK 48 billion in mobile networks from 2008 to 2022, amounting to an annual average of SEK 3.2 billion. The extensive deployment of 3G networks took place during 2001-2007, and the total investments in mobile networks made during these seven years amounted to SEK 35.7 billion. The following figure shows how mobile investments have changed from 2008 to 2022, showing that there have been variations over time.

[55] The traffic estimate includes all traffic in electronic communications, voice calculated as data, data traffic in fixed broadband, mobile data and mobile voice.

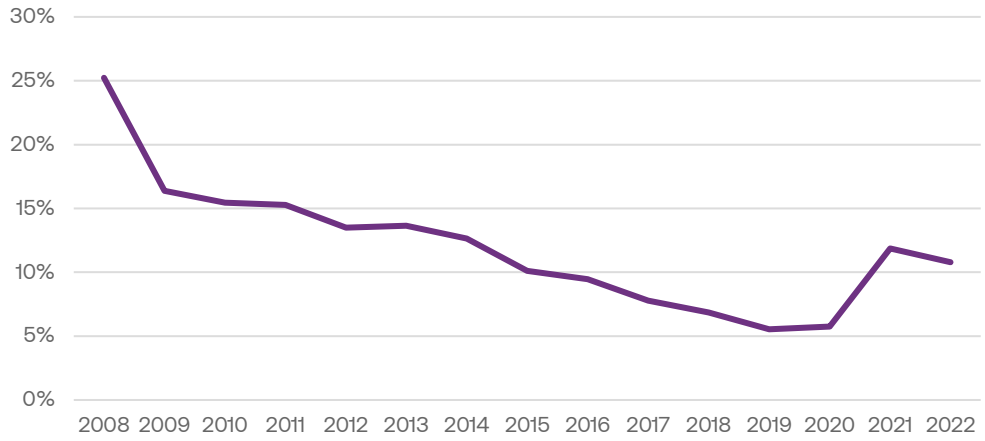
Figure 4 Mobile capex in Sweden



Source: PTS (2024)

In order to measure the relative level of investments, the ratio of capital expenditures in relation to sales, i.e., capex to sales, is commonly used, as shown in Figure 5.

Figure 5 Mobile capex to sales



Source: PTS (2023) and PTS (2024)

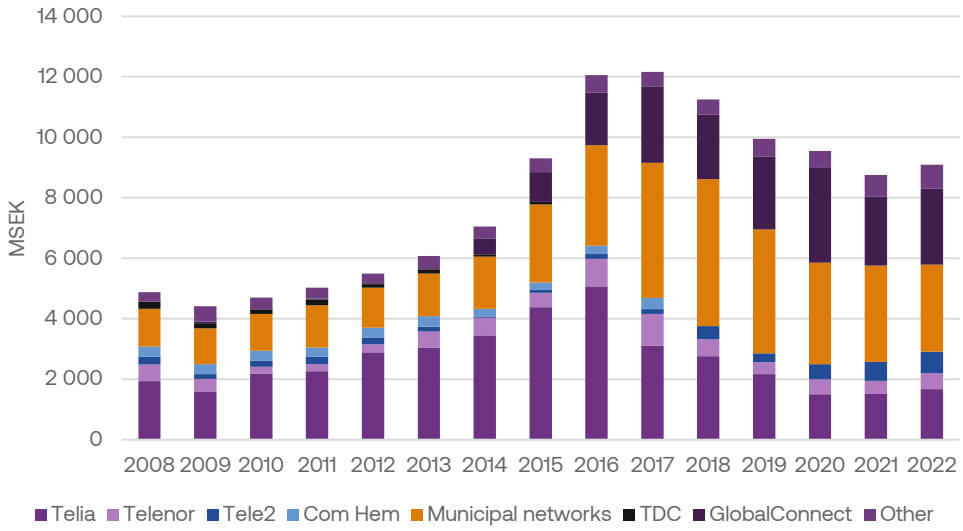
From Figure 5, PTS can observe a decline for almost every year. Investments in mobile networks have been driven by the launch of the different mobile generations.

This is illustrated, for example, by the increase in 2021-2022, which was driven by 5G deployment.[56]

2.3 Investments in fixed broadband networks

The deployment of Swedish fiber networks has been ongoing for the last 15 years. Investments peaked in 2016-2017, with annual fixed broadband investments of SEK 12 billion. In total, SEK 119 billion has been invested in fixed broadband from 2008-2022, of which Telia contributed SEK 39.5 billion, municipal networks SEK 38.3 billion and GlobalConnect SEK 18.4 billion. Figure 6 shows how investments in fixed broadband have changed from 2008 to 2022.

Figure 6 Fixed broadband capex

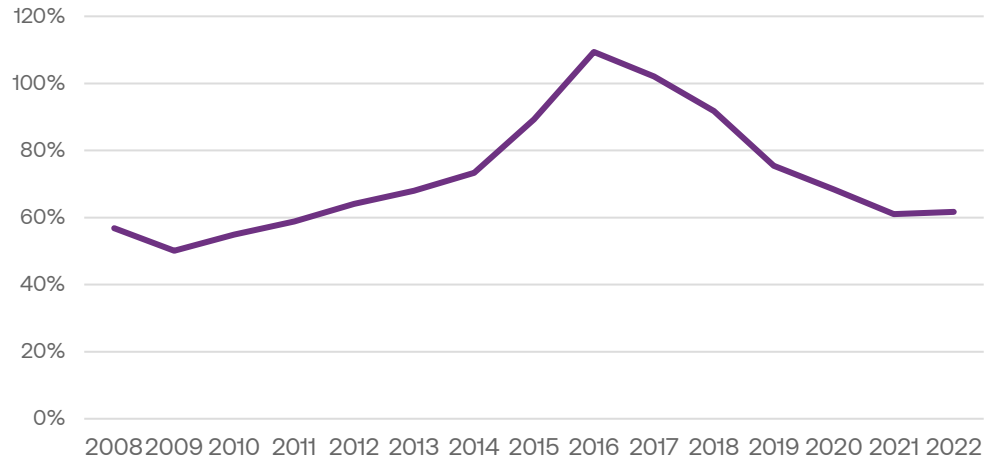


Source: PTS (2024)

Revenues generated from fixed broadband are about half of revenues generated from mobile, and the share of capex to sales is significantly higher in fixed broadband compared to mobile. The average ratio during 2008-2022 is 72%, and it was above 100% during the peak years, as illustrated in Figure 7.

[56] Investments in 4G were mostly related to changes in equipment on existing sites. Moreover, the capex to mobile sales started from a higher level, where investments in 3G had already been made, meaning that clear increases cannot be observed. However, there was also increased price pressure during the period as more operators were competing on the Swedish market. This also works the other way around; i.e., capex to sales would increase as sales decline when prices are pressured (all else being equal). Finally, when 5G investments started in 2020, we see an increase from a low level of capex to sales.

Figure 7 Fixed broadband capex to sales



Source: PTS (2023) and PTS (2024)

The fixed broadband capex to sales ratio has consistently been very high during the last 15 years, with a peak in 2016. The decline after 2016 is largely due to the high fiber coverage achieved through earlier investments. About 84% of Swedish households had fiber access in 2023.[57] These numbers are based on PTS data and represent revenues generated from fixed internet access. The operators could also generate additional revenues from their fixed infrastructure, for example, subscription-based media content.

Given the substantial investments in fiber networks, it is relevant to examine the profit margins that the operators generate. However, since Telia, Tele2 and Telenor only report profit margins for their business in Sweden as a whole, it is not possible to assess the financial outcome of broadband investments specifically for these companies. However, GlobalConnect reports key figures for the operation in Sweden and Finland, which generated an EBITDA margin of 57% during 2022.[58]

[57] PTS mobiltäcknings- och bredbandskartläggning 2022, 2023-03-27, PTS-ER-2023:13., online at PTS mobiltäcknings- och bredbandskartläggning 2023, retrieved 04/30/2024.
[58] GlobalConnect, Annual report 2022, Års och hållbarhetsrapport - GlobalConnect.

3. Investments, data growth and potential bottlenecks

An investment creates value for a company when the present value of its cash flow is greater than the cost of the investment. Additionally, the opportunity cost, which is the value that the company would receive from an alternative investment, has to be taken into consideration, as well as the comparison of the risk and potential return for the different investments and how likely it is that they will reach the expected levels. This means that investors evaluate the prospective returns of, for example, investments in fiber infrastructure in Sweden compared with potential investments in other regions or other sectors.[59]

From a firm's perspective, the main driver of investments is whether there is a business case for a particular investment, which is further described in Chapter 4. Whether there is a business case depends on several factors. Examples of investments are the deployment of new networks, maintenance measures and upgrades to existing networks. Table 1 presents potential investments for fixed broadband and mobile networks.

Table 1 Potential investments

Potential investments	Fixed broadband	Mobile networks	Comment
Deployment of new networks	Deployment of access and core networks	Deployment of mobile sites, new radio access network, core network	Deployment of both active and passive equipment, new infrastructure
Maintenance of existing networks	Replacement of active equipment, repair of infrastructure, passive and active equipment	Replacement of active equipment, repair of passive infrastructure	Replacement of equipment, software updates
Capacity upgrades of existing networks	Adding new gateways, software updates	Densification of mobile sites, adding new active equipment, activation of additional spectrum	Considerably more costly to establish new mobile sites than upgrade fixed broadband networks

[59] Williamson, B & Howard, S (2022). Thinking beyond WACC – the investment hurdle rate and the seesaw effect," Communication Chambers, January 2022. Report commissioned by ETNO.

Potential investments	Fixed broadband	Mobile networks	Comment
Coverage extension of existing networks	Extend access networks, add last mile, convert homes passed into homes connected	Deploy new mobile sites	Driven by customer demand

In order for an investment to take place, it would, in principal, be necessary for the factors set out above to generate sufficient willingness to pay among customers in order to yield a positive present value.

The amount of data exchanged is larger than ever, has grown with 34.4 % CAGR since 2015 and will increase, according to data provided by the GSMA, referred to by BEREC in their survey response to the European Commission. Moreover, "…there also seems to be a paradox between increasing volumes of data on the infrastructures and alleged decreasing returns and appetite to invest in network infrastructure. Some electronic communications operators, notably the incumbents, call for the need to establish rules to oblige content and application providers (CAPs) or digital players in general who generate[s] enormous volumes of traffic to contribute to the electronic communications network deployment costs. In their view, such contribution would be 'fair' as those CAPs and digital players take advantage of the high-quality networks but would not bear the cost of their roll-out."[60]

The fair share discussion has focused on traffic volumes. However, peak traffic is the dimensioning factor for networks. Busy Hour (BH), the one-hour time period during a day when the highest volume of traffic is generated, is used to plan, design and dimension network resources such as circuits, links, switches and routers.[61] Hence, the main focus should be on peak traffic during the busy hour and peak capacity rather than total data traffic. Given that the major bottlenecks in fiber networks are attributable to gateways and switches, limited investments are needed to upgrade capacity in existing fiber networks.

An indication of the total data traffic during busy hour is that the maximum traffic in 2023 in Sweden, according to data from Netnod's internet exchange points, was 2.35 Tbps. This represents a capacity of 0.3 Mbps per internet user in Sweden.

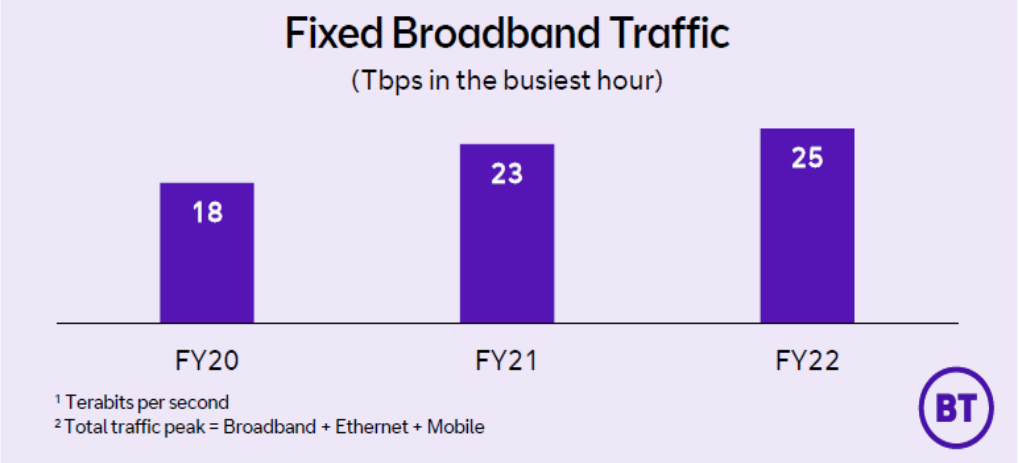
In order to capture the magnitude of traffic in broadband networks, PTS has examined data from three operators and one NRA. These numbers should be

[60] European Commission (2023b). BEREC EU Survey response – EC Explanatory Consultation, The future of the electronic communications sector and its infrastructure, published February 23, 2023, p. 40-41, online at The future of the electronic communications sector and its infrastructure | Shaping Europe's digital future (europa.eu).

[61] Telecom trainer (2023), BH (Busy Hour) (telecomtrainer.com).

relevant for the Swedish market after adjustments. Based on this data, PTS draws the conclusion that the cost to upgrade gateways in fiber networks should be manageable.

Figure 8 Traffic during busy hour for BT



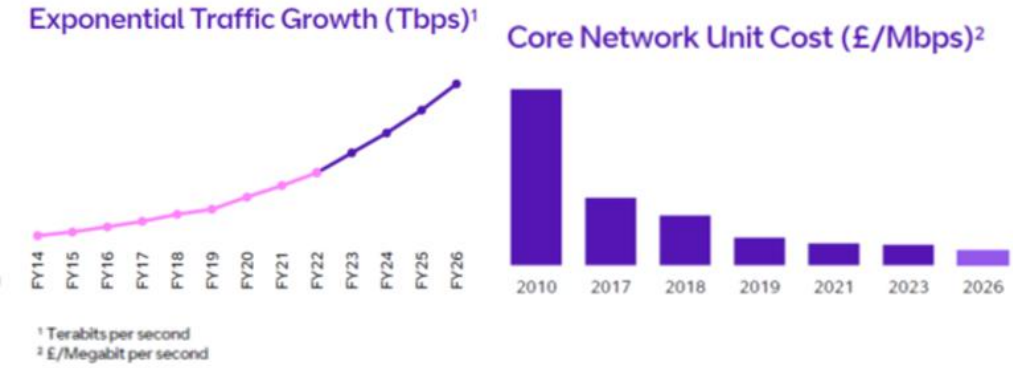
Source: British Telecom (2022)

British Telecom (BT) has presented values for the magnitude of fixed broadband traffic, which was 25 Tbps during busy hour in 2022, marking an increase from 18 Tbps in 2020 and 23 Tbps in 2021. Moreover, the total peak traffic, that is, the peak during a shorter period of time, was 28 Tbps.[62]

BT (including Open Reach) has 21.2 million broadband lines, which implies that the average capacity usage per active line is 1.18 Mbps. Based on the total peak traffic, this equates to 1.32 Mbps per line. Although BT does not reveal the details for unit costs, the trend of falling cost per Mbps is clear, as the following figure illustrates. However, it is not clear whether the falling costs appear because the marginal costs are falling or because the fixed costs are distributed over more data.

[62] British Telecom (2022). Networks at BT - Investor business briefing presentation slides, retrieved 04/30/2024.

Figure 9 Trends for traffic and unit costs BT



Source: British Telecom (2022)

KPN has reported network load on their network platforms, which was 13.5 Tbps in 2023. Based on KPN's 5.2 million fixed subscribers, this amounts to an average capacity per subscriber of 2.6 Mbps, and the network platforms are capable of handling traffic growth.[63]

These numbers are in line with what the Spanish regulator CNMC (National Markets and Competition Commission) has reported. CNMC has announced that the peak data use of FTTH (Fiber-to-the-Home) is much lower than earlier estimates. Estimates of traffic growth on telecommunications networks were reduced to 9.17% from previous estimates of 25% year-over-year growth. An average use of 2.7 Mbps during busy hour was recorded in 2022, which is expected to rise to 3.2 Mbps in 2024.[64]

The global operator Cogent carries approximately 25% of all internet traffic. The company has also seen price deflation in combination with gradually increased capacity, averaging over 90 Tbps peak traffic.[65]

In order to use these capacity estimates to determine what kind of equipment is required to handle peak traffic, PTS has examined the performance of core routers, which are designed to operate in the Internet backbone, or core. For example, TDC NET has deployed Nokia's 7750 SR-s routers, which scale system capacity up to 216

[63] KPN (2023). Capital Markets Day, November 7, 2023. Online at KPN - News & Events - Capital Markets Day, retrieved 04/30/2024.
[64] CPI (2023). Competition policy international, July 24, 2023. Online at Spain's Watchdog CNMC Reports Lower Traffic Growth on Telecommunication Networks (pymnts.com), retrieved 04/30/2024.
[65] Cogent (2023). Investor presentation, Q3 2023. Online at PowerPoint Presentation (cogentco.com), retrieved 04/30/2024.

Tbps (full duplex) with the flexibility to optimize any network location.[66] There are certainly a large number of other suppliers of switches and routers for the IP Core. For example, the Cisco 8800 series provides equipment that can handle bandwidth up to 518 Tbps.[67]

Altogether, this implies that potential bottlenecks in fiber networks could be handled by high capacity routers, which means that future investments to handle more traffic are likely to be manageable in relation to investments in new areas with fiber.

[66] Nokia (2024). 7750 service router: Leads the industry in IP edge and core. Online at 7750 Service Router | Nokia, retrieved 04/30/2024.

[67] Cisco (2024). Cisco 8000 Series Routers Data Sheet, Online at Cisco 8000 Series Routers Data Sheet - Cisco (updated February 6, 2024), retrieved 04/30/2024.

4. How can return be measured?

4.1 About investments and returns

The focus of this chapter is an examination of Return on Invested Capital (ROIC) and Return on Capital Employed (ROCE) as a measure of comparison. As explained in Chapter 3, simply generating a positive return would be too modest of a goal, since the investment in a particular company needs to be compared to the profit that could be obtained elsewhere. For this purpose, WACC is the threshold of return a company must meet.[68]

ROIC and ROCE each consist of several components. Thus, it is also relevant to study the components of each factor. For example, a decline in ROIC may originate from higher investments or from lower returns.[69]

4.2 Measuring company return

ROIC shows how investments are connected to free cash flow, economic profit and growth, which makes it a measure of value creation.

$$1)\ ROIC = \frac{NOPAT}{Invested\ capital}$$

The numerator, net operating profit after taxes (NOPAT), is the cash earnings of a business excluding any financing costs. NOPAT is thus the same no matter how the company chooses to finance itself. The denominator, invested capital, is the net assets the company has. ROIC is important from an investor perspective as it gives an indication of the level of dividends to shareholders. ROCE is similar, but the definition is slightly different.

$$2)\ ROCE = \frac{EBIT}{Capital\ Employed}$$

The numerator, Earnings Before Interest and Taxes (EBIT), is the most common measure of operating profit. It excludes the costs of interest and taxes, which

[68] Mauboussin J.M & Callahan, D (2023). ROIC and the Investment Process: ROICs, How They Change, and Shareholder Returns. CONSILIENT OBSERVER, Morgan Stanley, Investment Management (June 6, 2023).
[69] Mauboussin, J.M & Callahan, D. (2022). Return on invested capital: How to calculate ROIC and Handle common issues. Morgan Stanley (October 6, 2022).

facilitates international comparisons as, for example, NOPAT may be affected by tax differences between countries.

4.3 What do companies strive for?

The Swedish companies that PTS analyses, i.e. Telia, Tele2 and Telenor, do not provide much information about ROIC or ROCE in their financial reports or outlook. Instead, the focus is on revenue growth, EBITDA, capex and free cash flow. That said, it does not mean that ROIC and ROCE are not important.

KPN highlights its return on capital and claims to be an industry-leading company. The company states that it has improved ROCE by 360 basis points compared to 2020 and has an ambition to achieve a ROCE of around 15% between 2024-2027, which is 7-8 percentage points higher than their cost of capital.[70] KPN defines ROCE as net operating profit less adjustments for taxes (NOPLAT) divided by capital employed, on a four-quarter rolling basis.[71] Net operating profit is the adjusted EBITA (excluding incidentals and amortization of other Intangibles, and including restructuring costs). Capital employed is the carrying amount of operating assets and liabilities, which excludes goodwill and other intangibles.[72]

Ofcom examines the ROCE of mobile operators in the United Kingdom, with a special focus on spectrum holdings, and states that average return for the included operators (on an economic basis) has been above the cost of capital during the period 2019-2021.[73] However, Ofcom underscores that the financial returns vary across operators, and Three and Vodafone earned returns below the cost of capital.

Ofcom uses a pre-tax nominal WACC of 7.8%, which was Ofcom's most up-to-date cost of capital in March 2021. This implies that it does not take the higher interest rates into consideration and that future returns may need to be assessed against a different cost of capital.[74] Ofcom also calculates accounting ROCE adjusted for

[70] KPN (2023). Capital Markets Day, November 7, 2023. Online at KPN - News & Events - Capital Markets Day, retrieved 04/30/2024.
[71] This definition differs from the definition that is used in this report as it includes taxes. Here, PTS uses NOPAT but also EBIT when calculating ROCE, meaning that a measure without taxes is also included.
[72] KPN (2023). Annual report 2022. Online at KPN Integrated Annual Report 2022, retrieved 04/30/2024.
[73] Ofcom (2022). Ofcom's future approach to mobile markets and spectrum, Conclusions paper, December 6, 2022. Online at Conclusions paper: Ofcom's future approach to mobile markets and spectrum.
[74] Ofcom (2018). Mobile Call Termination Market Review 2018-2021, final statement, Annex 10 Cost of capital, March 28, 2018. Online at Final statement: Mobile Call Termination Market Review 2018-2021 (ofcom.org.uk).

exceptional items, which shows lower returns for the operators, with three operators below the cost of capital.[75]

It has been argued that the focus for VHCN investment should be on the "hurdle rate" rather than the WACC, as the hurdle rate for new investment includes a premium over the cost of capital. This should reflect the asymmetry of returns due to the risk of regulation that caps the upside, but leaves the downside.[76] Thus, the expectation (average) becomes lower.

All in all, there are different ways to calculate return on investment. In the next chapter, PTS chooses a few different measures to make comparisons and adjust for abnormal occurrences.

4.4 Potential problems and solutions of measuring returns

In this study, the main focus is on comparing the listed operators in Sweden with operators in other countries. However, this is subject to limitations, as outlined in Table 2.

Table 2 Limitations and approaches used to handle these limitations in the analysis

Limitations	Solutions
Countries have different currencies. For example, if profits are measured in the domestic currency and are converted to USD, profits would appear to decline if the USD strengthens. Moreover, the inflation rate can also affect profit.	The primary results consist of ratios where both the numerator and denominator are similarly affected by the currency. Additionally, sensitivity analyses were conducted using ratios in USD, yielding consistent outcomes.
Countries have different tax systems, meaning that it may be more or less relevant for firms to maximize different variables depending on the country.	PTS employs various metrics, as detailed in Section 4.2. ROIC, which is commonly used to assess a company's capital efficiency in generating post-tax profits, is contrasted with ROCE, offering a pre-tax measure that facilitates cross-country comparisons.
Data on the company level does not consider that many firms have operations in different countries.	When separating regions, PTS assumes that companies operate in the country where they are listed. While this is a simplification, PTS believes that the results are still valid for regional comparisons.

[75] Ofcom (2022). Ofcom's future approach to mobile markets and spectrum, Conclusions paper, December 6, 2022. See footnote 91 with link to an Excel file that shows Ofcom's calculations. Link to the Excel file: mobile-spectrum-roce-analysis.xlsm (live.com).

[76] Brian Williamson and Stephen Howard, Thinking beyond WACC – the investment hurdle rate and the seesaw effect, Communication Chambers, January 2022. Report commissioned by ETNO.

Limitations	Solutions
Companies can be at different stages in their investment cycles and/or have different product mixes.	PTS conducts comparisons spanning 15 years to account for variations in investment cycles. Additionally, our focus on regional comparisons acknowledges potential differences in product mix at the company level. While variations may exist, the likelihood of systematic differences diminishes when increasing the number of companies within the group of telecommunication carriers.

Source: PTS based on an assessment of limitations from our analyses.

5. Financial performance: Swedish operators in an international context

5.1 The yield on investments is declining

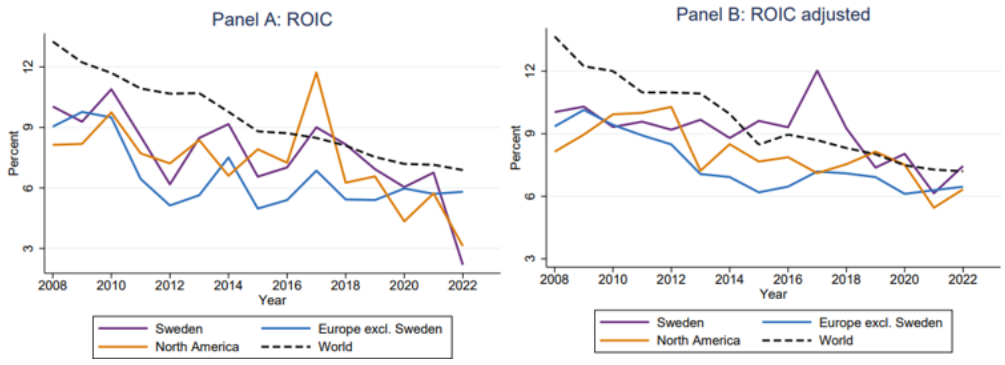
In terms of performance metrics, PTS evaluates Return on Invested Capital (ROIC) and Return on Capital Employed (ROCE). ROIC can be measured in slightly different ways. Here, PTS relies on the method and values provided by Bloomberg, which are based on Net Operating Profit After Tax (NOPAT) divided by Average Invested Capital.[77] PTS also provides an alternative version of both metrics, adjusted for extraordinary items and/or abnormal losses. These measures are also sourced from Bloomberg, where they are calculated in the terminal using the domestic currencies and result in a percentage.[78]

In total, the data covers 139 listed telecommunications operators from around the world. PTS divides the operators into four region groups: Sweden, Europe (excluding Sweden), North America and the rest of the world. Sweden is represented by the operators Telia, Tele2 and Telenor. The results for ROIC and ROIC adjusted are shown in Figure 10.

[77] The profit is calculated as monthly averages, and the invested capital is an average between the present and previous year.

[78] Extreme observations are present in the data. Thus, PTS winsorizes the top and bottom 1% of the observations for each measure of interest.

Figure 10 Revenue weighted average ROIC and adjusted ROIC for Telia, Tele2 and Telenor compared to other telecommunication carriers.



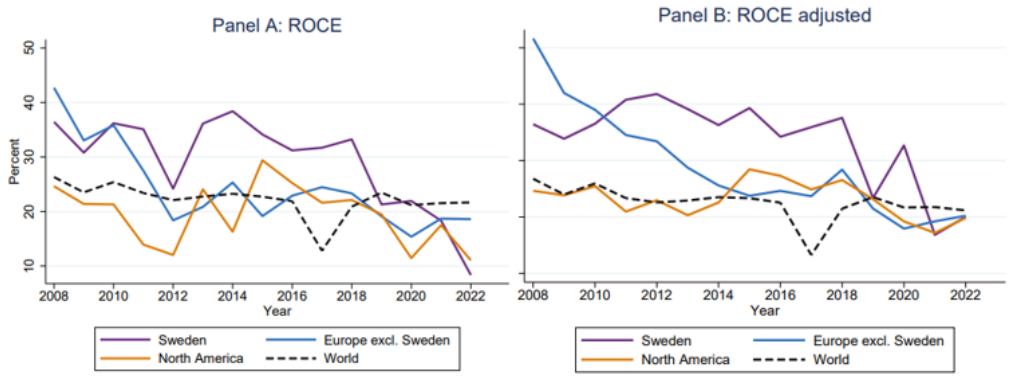
Source: PTS based on data from Bloomberg

In Figure 10, PTS finds that there is a decline in ROIC for all regions, regardless of whether PTS adjusts the measure of earnings. Europe has historically been on a lower level than Sweden and North America in the non-adjusted version. For many years, this is also the case in the adjusted version, but the differences are smaller. In general, ROIC has declined from approximately 9% to less than 6% from 2008 to 2022.

For comparison, PTS presents ROCE in Figure 11. As mentioned in Section 4.3, this measure is before taxes, meaning that it is arguably a better measure for international comparisons. ROCE is measured in domestic currency using the ratio of EBIT and capital employed.[79]

[79] The results are similar if EBIT and capital employed are measured in USD.

Figure 11 Revenue weighted average ROCE and adjusted ROCE for Telia, Tele2 and Telenor compared to other telecommunication carriers.



Source: PTS based on data from Bloomberg

Figure 11 shows a negative trend. The decline is the largest in Europe and Sweden. However, both regions were on a higher level in the beginning of the period, and PTS notes that each region has a similar ROCE level by the end of the period. Overall, telecom carriers in Sweden and the averages of all other listed telecom operators have experienced a decline in both ROIC and ROCE. However, there is no distinct difference observed between, for instance, Europe and North America. While the ROCE has shown a greater decline in Europe, albeit from a higher initial level, the decrease in ROIC has been comparable in both regions. In order to address the caveats described in 4.4, PTS uses different measures of yield on investment (before and after tax), both non-adjusted and adjusted, and obtains results in USD and domestic currency. The results paint a similar picture for all measures; that is, the trend is negative and no clear difference in yield on investments is observed between Europe and North America.[80] It is interesting to note that there is no difference in these variables, especially when considered together with the size arguments presented by Letta, the White Paper and the mobile industry is, in particular, interesting as the market in the United States is argued to be characterized by strong concentration and significant barriers to entry.[81]

ROIC and ROCE are important variables of interest for capital intensive firms. The results could thus be seen as an indication of a weaker competitive advantage for

[80] However, the fact that companies have operations in different countries is a problem that cannot be specifically addressed. Thus, PTS needs to assume that a company belongs to the country where it is listed and that any errors due to this assumption are minor. The exception is that PTS includes Telenor in the graph for Sweden.

[81] Germán, G & Philippon, T (2018). How EU markets became more competitive than US markets: A study of institutional drift. No. w24700. New York: National Bureau of Economic Research.

the sector and could, potentially, be interpreted as a lower ability to capitalize on their business models.

ROIC and ROCE have declined for the sector as a whole. There are examples of operators that have attempted to broaden their business model and failed, for example, when Orange and Deutsche Telecom developed their own vocal assistant, which was launched in 2019.[82] Shortly after, the commercialization phase was halted and in September 2022, Orange integrated Alexa by Amazon in its set-top box.[83] This is likely to be a costly decision. However, there are also other examples where broadening has been successful, for example, the introduction of the mobile money service M-PESA by Vodafone.[84]

To put the decline in return of capital in context, PTS examines whether the current level of return is high or low compared to other sectors that compete for investors' capital. PTS compares the level with similar measures for all companies in STOXX Europe 600 Index for utilities during the period 2008-2022. PTS finds that this sector also experienced a decline, however, the decline is smaller and started from a lower level. ROIC in the utility sector was approximately 7%-8% at the beginning of the period and 6%-7% at the end of the period. In the utilities sector, ROCE has been on a lower level during the whole period, and a decline can also be observed there. Moreover, both trends contain volatility. ROIC and ROCE for the utilities sector are reported in Figure A1 in the Appendix.

In order to further investigate the reasons behind the decline for telecommunication carriers, PTS studies the components for ROIC in the next section.

5.2 Components of the performance measures

In order to assess the factors behind the decline, PTS analyses how the components of the ROIC change over time for the listed telecom operators in Sweden compared to the rest of the world. Here, PTS only studies Sweden versus the rest of the world in order to make the comparison more manageable. Moreover, all variables are in USD (for ROIC and ROCE, PTS calculated the ratios using domestic currency).[85]

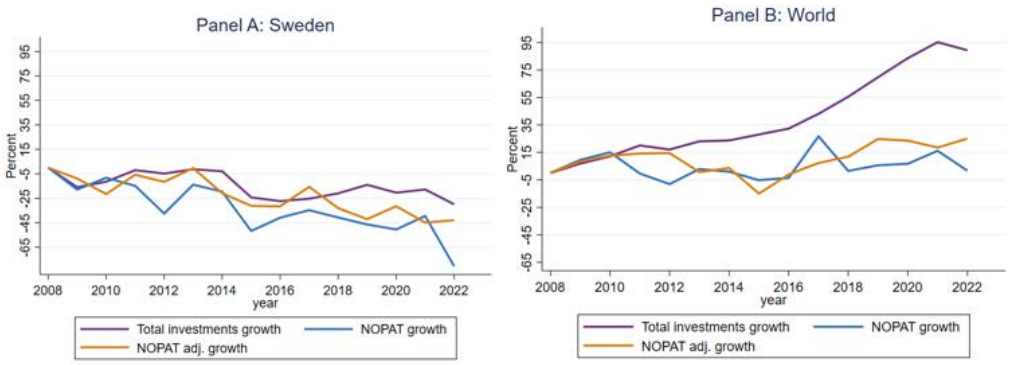
[82] Schwartz (2020). Orange Will Wind Down Djingo Smart Speaker in Favor of Smart Home and TV Services. Online at: https://voicebot.ai/2020/10/07/orange-will-wind-down-djingo-smart-speaker-in-favor-of-smart-home-and-tv-services/ (updated October 7, 2020). (retrieved 04/30/2024).

[83] Clover (2022). Alexa voice assistant will be integrated into Organge UHD set-top. Online at: Alexa voice assistant to be integrated into Orange UHD set-top (retrieved 04/30/24).

[84] Vodafone (2024). Technology and Innovation. M-PESA. Online at M-PESA (retrieved 11/06/2024).

[85] The reason is that the groups representing the rest of the world consist of companies that use many different currencies, and these cannot be aggregated due to the use of different currencies.

Figure 12 Changes in total investments and NOPAT



Source: PTS based on data from Bloomberg

The trend in Sweden has been quite different from the rest of the world, as Figure 12 shows. The decline observed in Figure 10 is driven by a large decrease in NOPAT for Sweden, while the decline in nominal investments is smaller.

From a policy perspective, a sufficient amount of investment is important. The measure of changes presented above does not tell the whole story, and the level is not relevant as the size of the regions differ. One way of handling this is to compare capex to sales. In doing so, PTS observes that according to from Bloomberg

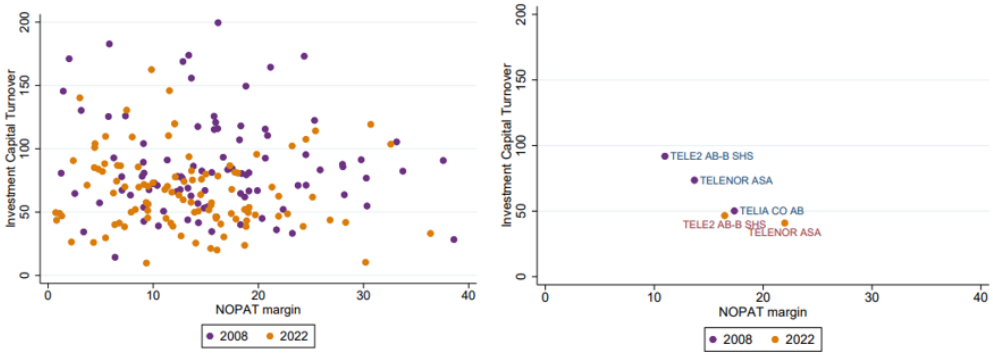
Figure A2 in the Appendix, Sweden is above the rest of Europe and North America for most years.[86] For Telia, the capex to sales ratio is expected to be on a similar level for 2024 as 2023,[87] Telenor expects a high level (i.e. 17%)[88] and Tele2 expects a level of 14% in 2025 and then a return to historical levels of around 10%-12%.[89]

The international peer group shows an increase in total investment, but the NOPAT has not shown a similar increase. In the case of Sweden, PTS observes a decline in both variables. As there is a negative trend in the adjusted version of return, PTS concludes that it relates to continuing operations. This is further investigated in Figure 13 below, where Investment Capital Turnover is on the y-axis and NOPAT margin is on the x-axis. These ratios constitute ROIC as: $ROIC = \frac{Revenues}{Total\ Investments} * \frac{NOPAT}{Revenues}$. In the figure on the left, PTS sees a tendency where the yellow dots in 2022 are closer to the origin, that is, where lower ROIC is driven by both ratios. Comparing simple

[86] Here, PTS compares capex to sales between regions for the listed companies. Previously in this report, it was separated by mobile and fixed broadband. However, that comparison cannot include the international view.
[87] Telia Co AB (2024). Bloomberg transcript, Earnings call Q4 2023, 01/26/2024.
[88] Telenor ASA (2024). Bloomberg transcript, Earnings call Q1 2024, 04/30/2024.
[89] Tele2 AB (2024). Bloomberg transcript, Earnings call Q1 2024, 04/18/2024.

averages over time, PTS observes that the Investment Capital Turnover is 86% and 66% for 2008 and 2022, respectively. Likewise, the NOPAT margin declined from 16% to 13% during the same period. Thus, the former ratio decreased more, meaning that it is a larger driver of the decline.

Figure 13 Comparison of Investment Capital Turnover and NOPAT margin over time



Source: PTS based on data from Bloomberg

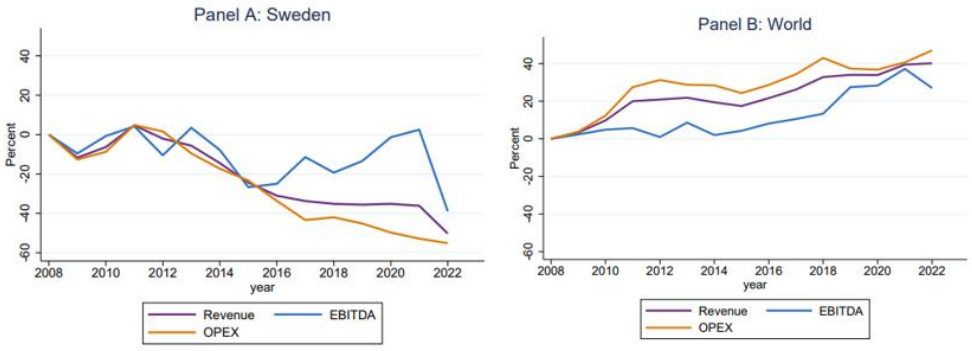
From the above, PTS observes that both ratios (ROIC and ROCE) more or less declined. However, while the investment capital turnover also declined for Sweden, the NOPAT margin increased slightly.[90]

PTS looks further into the components of the numerator of ROIC, that is, earnings before interest, depreciation and amortizations (EBITDA), revenues and OPEX.[91]

[90] Telia is not included for 2008 as it was considered an outlier with a large and negative NOPAT margin.

[91] OPEX is calculated as the difference between Revenues and EBITDA, i.e., this measurement of costs can be compared to costs to generate revenues as it does not include fixed costs, etc.

Figure 14 Changes in revenues, OPEX and EBITDA



Source: PTS based on data from Bloomberg

In Figure 14, PTS sees that revenues, OPEX and EBITDA decreased in Sweden, indicating decreasing business opportunities in the market. In contrast, the measures increase internationally.

Altogether, the general trend for telecom operators across the world is a declining return on investment, regardless of which measure PTS uses. In the case of Sweden, this is mostly driven by declining profits (NOPAT), while investments have been fairly stable. In the rest of the world, total investments have grown, but NOPAT has not grown simultaneously. The reason for the increase in investments could be that more firms are now listed companies, or that already listed firms have grown.

It is worth noting that operators are still making investments in Sweden. For example, while MNOs claim that poor financial performance impedes investment, they continue to invest and to plan for future investments. For example, Ofcom notes that this, in particular, seems to be the case where the demand for mobile data is high.[92] However, this could indicate that less interest is given to areas with lower demand.

[92] Ofcom (2022). Ofcom's future approach to mobile markets and spectrum, Conclusions paper, December 6, 2022. Online at Conclusions paper: Ofcom's future approach to mobile markets and spectrum.

6. Conclusions, analysis of potential implications and a potential trend

This report examines trends in the market for electronic communication in terms of revenues, investments, data traffic, and returns. In addition, and because the policy landscape is shaped by a positive view on scale by Letta, the European Commission's White Paper and the mobile industry, including ETNO and GSMA, we provide a list of 24 mergers in the Appendix in order to perform an analysis of the potential implications of European mergers. Moreover, the empirical analysis gives special attention to returns on investments, as this will ultimately influence the strategic priorities for the operators and the level of future investments. While the main focus is on Sweden, the results are placed in an international context. The data used in the report mostly are mostly on company level, which means that typically, general conclusions cannot be drawn from the results for different markets because many companies have operations in different segments.

6.1 Conclusions

While retail revenues from electronic communications in Sweden have been stable, the share of revenues from electronic communications in relation to GDP has fallen from 1.44% in 2008 to 0.8% in 2022. However, this does not mean that the sector has become less important, as it can be seen as a facilitator for productivity in other sectors.[93]

Mobile investments, in relation to sales and in absolute terms, decreased between 2008-2020 and increased from 2021-2022. In contrast, investments in fixed broadband networks increased from 2008-2017 and fell thereafter due to the increased coverage of fiber infrastructure.

[93] For the relationship between productivity growth and telecommunications, see, for example, Dholakia & Harlam, 1994; Röller & Waverman, 2001; Pan et al., (2022).

ROIC was around 8% to 13% in 2008 in the regions analyzed. By the end of the period, all four regions had a ROIC of around 5%-7%, and there is no clear difference between North America, Europe, Sweden or the rest of the world in terms of ROIC. The conclusion that there is an observable declining trend is also valid when return is measured as ROCE. In the case of Sweden, the decline in ROIC is mostly driven by a decrease in NOPAT. The capex to sales ratio is higher in Sweden than both the rest of Europe and North America from 2013 and onwards, while Europe and North America have been on a similar level since 2015.[94]

Finally, potential emerging bottlenecks in the fixed network have been analyzed, and PTS concludes that an upgrade of gateways is the only change that is likely to be necessary, and that costs for this should be manageable in relation to the initial cost of building the network.

Based on the data and analysis, PTS makes a number of observations that could have implications for the future development of the market.

1. Swedish consumers have gotten more value for money since connectivity costs, measured as cost per data unit, have decreased substantially since 2008. This has facilitated a CAGR for data of 25% compared to a CAGR of 0% for revenues. Consequently, the revenue per GB has decreased from SEK 140 in 2008 to SEK 5 in 2022.
2. Due to extensive investments in fiber networks in Sweden, about 84% of Swedish households had fiber access in 2023. Hence, high-capacity communication extends to the majority of Swedish end-users.[95]
3. Returns (measured as ROIC and/or ROCE) for listed telecom carriers have declined, with some variations between regions. In order to increase return on investments, it is likely that companies will attempt to increase prices, reduce costs and/or search for consolidation opportunities.
    a. It should be noted that these results are on the company level, that is, they do not separate business areas such as mobile or fixed broadband or other services.
    b. In relation to cash flows, it can also be noted that segments have been divested or separated. This has generated liquidity for the companies, which could enable new investments. However, the liquid funds have, at least to some extent, been distributed to shareholders.

All in all, the empirical analysis shows declining financial performance when measured as ROIC or ROCE. Additionally, the White Paper by the Commission argues

[94] Except 2022, when North America is in between Sweden and the rest of Europe.
[95] PTS mobiltäcknings- och bredbandskartläggning 2022, 03/27/2023, PTS-ER-2023:13., online at PTS mobiltäcknings- och bredbandskartläggning 2023, retrieved 04/30/2024.

that scale is needed to invest in the networks of the future. Thus, a short discussion of potential implications is presented.

6.2 Potential implications for the market

In this report, PTS has acknowledged limitations and clarified how these have been handled. Based on the empirical analysis and the current policy agenda, PTS can state that there are potential implications in different areas for Swedish operators.

First, there is generally a positive view of large-scale operators presented in the White Paper,[96] by Letta[97] and among stakeholders such as ETNO and GSMA. Moreover, one potential effect of a declining return on investment could be that telecom operators will search for opportunities to reverse the trend, where consolidation could be one potential solution. According to the list of merger cases in the Appendix, we can also note that there is already an amount of merger transactions have already taken place.

Second, potential price increases may occur due to general inflation, but they may also occur if in-market consolidations take place. Price increases also entail a potential for the telecom carriers to increase revenues. Many European operators have already announced higher prices on specific markets.[98] However, PTS has not studied whether this is above the inflation rate or whether it is in line with increases in costs in recent years. Moreover, if consolidations do occur in a particular market, it is likely to result in further price increases if consolidation leads to weakened competition.

6.3 Competition from other stakeholders

The main focus of this report is on telecom operators and their return on investments. However, competition from other stakeholders in the ecosystem could be worth exploring in future analyses, as it could have an effect on the telcos. Content and application providers (CAPs), particularly the large providers, can be seen as competitors within specific services, as well as complementary in others. While CAPs are far ahead in video streaming, they do not have a large share in the access network; however, some competition can be observed, and more competition can arise in the future. Current examples that point in this direction are

[96] European Commission (2024). White paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com 81 final.

[97] Letta, E (2024). Much more than a Market. Speed, security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. April, 2024.

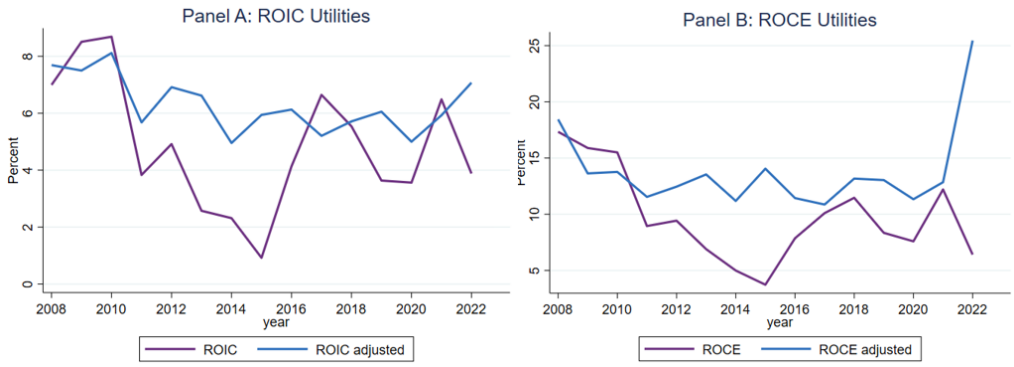
[98] Dattani, A. Soni, A. Ng, C. (2024). European Telecoms. 2024 Outlook: This could finally be the break-out year – update, January 4, 2024, J.P. Morgan.

the satellite operator Starlink, which provides internet access to end consumers[99] and fiber networks provided by Google in the United States.

The likelihood and impacts of the above developments would need a deeper analysis before any conclusions can be drawn.

Appendix

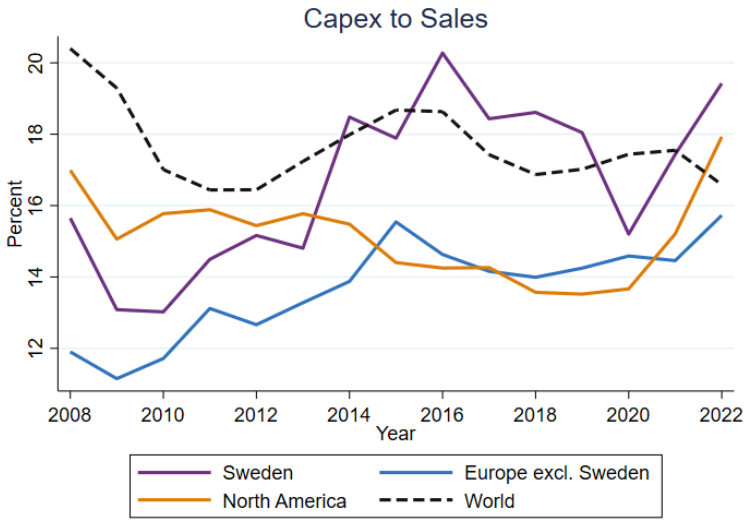
Figure A1 Comparative measure of adjusted ROIC and ROCE for the utility sector



Source: PTS based on data from Bloomberg

Figure A2 Capex to sales ratio

[99] Starlink | Så här fungerar Starlink



Source: PTS based on data from Bloomberg

Table A1 Examples of merger transactions during the last 20 years

Announced	Buyer	Seller	Target	Market/comment	Value MEUR	Finalized
11/30/2023	Stonepeak	Cellnex Sweden, Cellnex Denmark	4,600 mobile towers in Sweden and Denmark	Stonepeak buys 49% of Cellnex Nordics	730	03/30/2024
03/14/2023	EQT	CK Hutchison Holdings Ltd	Network infrastructure & radio core/Wind Tre SpA	EQT acquires 60% of Wind Tre's mobile and fixed networks to provide wholesale mobile and fixed communication services in Italy. Hutchison will own 40% of the business	3,000	03/30/2024
10/31/2023	Zegona Communications plc	Vodafone Group PLC	Vodafone Holdings Europe SL	Vodafone is the third largest operator in Spain with a 24% market share. Zegona strives to stabilize returns, target business customers and boost the use of its network in order to enhance value.	5,000	06/31/2024
10/16/2023	KKR & Co (including Abu Dhabi Investment Authority)	Telecom Italia SpA	Phone network business, Telecom Italia	The deal is a structural separation of Telecom Italia's fixed network by establishing a NetCo. Formal notification planned for January 31, 2024.	22,000	06/30/2024
09/15/2023	Norlys AMBA	Telia Co AB	Operations & network assets in Denmark	Norlys is an energy and telecommunication company in Denmark with networks in the west part of the country. The acquisition will add fixed and mobile networks to the existing networks.	838	03/31/2024
06/22/2023	Pantheon Infrastructure PLC	EQT	GlobalConnect AB, minority stake	Investment in GlobalConnect through a co-investment vehicle managed by EQT	23	02/01/2024

Announced	Buyer	Seller	Target	Market/comment	Value MEUR	Finalized
06/14/2023	Vodafone	CK Hutchison Holdings Ltd	Joint venture in the UK with Vodafone and Three UK	EU has no objection. The merged company will be the largest mobile operator in the UK. This will reduce the number of mobile operators from four to three	4,640	12/31/2024
09/30/2022	Vodafone Portugal	Llorca JVCO Ltd (Masmovil Ibercom SA)	Nowo Communication (Cabonitel SA)	Mobile and fixed operations in Portugal		03/31/2024
03/08/2022	Orange	Masmovil (controlled by holding company Lorca)	Merger of their respective Spanish operations	The Commission has approved the merger subject to an optional roaming agreement and the divestment of spectrum to their rival operator Digi. The merged company will have 40% and 42% market shares in mobile and fixed broadband, respectively. The merger will reduce the number of operators from 4 to 3	10,900	02/20/2024
10/19/2022	Altice USA Inc	Vodafone Group PLC	JV Fibreco in Germany (Vodafone FTTH)	The plan is to invest EUR 7 billion in FibreCos' deployment of FTTH to 7 million homes in Germany	1,200	03/08/2023
07/14/2022	Brookfield Infrastructure Partners LP	Deutsche Telekom AG	GD Towers	DT sold 51% of its tower unit to Brookfield and Digital Bridge	10,000	02/01/2023
01/28/2022	Alecta & Brookfield Co	Telia Co AB	Telia Tower Sweden	Telia sold 49% of its tower business in Sweden (Telia Tower) which includes 3,800 mobile sites	522	06/01/2022
09/07/2021	Warburg Pincus LLC	Deutsche Telekom AG/Tele2	T-Mobile Netherlands BV	The largest mobile operator in the Netherlands, but it also has a substantial fixed broadband operation	5,100	03/31/2022

Announced	Buyer	Seller	Target	Market/comment	Value MEUR	Finalized
09/16/2021	Ooredoo Asia	Ooredoo Group	CK Hutchison	Ooredoo Group and CK merge their Indonesian business	5,800	01/14/2022
10/23/2020	Cellnex	CK Hutchison Holdings Ltd	Mobile towers in Austria, Denmark, Ireland, Sweden	2,864 mobile sites in Sweden are included in the agreement, which also covers roll out of 2,550 new sites		01/26/2021
10/06/2020	Polhem Infra KB	Telia Co AB	Telia Carrier AB	Extensive international backbone network	900	06/01/2021
09/11/2020	Next Alt Sarl	Altice Europe NV	Altice Europe NV	Cable and satellite TV	39,738	01/27/2021
05/23/2019	Kazakhtelecom JSC	Tele2 AB	Tele2 Kazakhstan	National mobile network in Kazakhstan set up as a JV, but Tele2 made an exit	151	06/28/2019
07/20/2018	Telia Co	Bonnier AB	Bonnier Broadcasting	Telia buys a media company TV4, C-More, Finnish MTV	886	06/30/2019
01/10/2018	Tele2	Com Hem	Tele2 AB	Tele2 expands in cable tv and fixed broadband	3,735	11/02/2018
12/15/2017	Deutsche Telekom AG	Tele2 AB	Tele2 Netherlands BV	A merger between DT Netherlands and Tele2 Netherlands, where Tele2 owns 25%.	190	01/02/2019
06/21/2016	Tele2 AB	TDC A/S	TDC Sverige AB	Added market shares in the B2B segment	312	10/31/2016
12/21/2015	Axiata Group Bhd	Telia Co AB	Ncell Pvt Ltd (Nepal)	Telia exits the mobile market in Nepal	944	04/11/2016
07/07/2014	Telia AB	Tele2 AB	Tele2 Norway	It increased Telia's mobile market share in Norway N from 23%to 40%	549	03/31/2015
06/30/2000	Telia AB	SEC, Orkla and KLP Försäkring	Netcom Norway	Netcom had a 29% market share in Norway	2,077	06/30/2000

Source: Bloomberg, company reports

References

Breton, T. (October 10, 2023). A 'Digital Networks Act' to redefine the DNA of our telecoms regulation. LinkedIn. A 'Digital Networks Act' to redefine the DNA of our telecoms regulation

British Telecom. (2022). Networks at BT. Online at Networks at BT - Investor business briefing presentation slides

Bryson, J. J., Malikova, H., Garbe L., & Backovsky, D. (2023). Big Telcos Aren't Necessarily Better: A Case Study of EU Versus US Market Concentration. SocArXiv. doi:10.31235/osf.io/m42uh

Cisco. (2024). Cisco 8000 Series Routers Data Sheet. Online at Cisco 8000 Series Routers Data Sheet - Cisco retrieved 04/30/2024.

Clover, J (2022). Alexa voice assistant will be integrated into Organge UHD set-top. Online at: Alexa voice assistant to be integrated into Orange UHD set-top, retrieved 04/30/24.

Cogent. (2023). Investor presentation, Q3 2023. Online at PowerPoint Presentation (cogentco.com), retrieved 04/30/2024.

Covarrubias, M., Gutiérrez, G., & Philippon, T. (2020). From Good to Bad Concentration? US Industries over the past 30 years. *NBER Macroeconomics Annual*, 34(1), 1-46.

CPI. (2023). Competition policy international (July 24, 2023). Online at Spain's Watchdog CNMC Reports Lower Traffic Growth on Telecommunication Networks (pymnts.com)

Dagens Industri. (2024). Nya storägaren tar järngrepp om Tele2:s styrelse. Online at Nya storägaren tar järngrepp om Tele2:s styrelse (di.se)

Dagens Industri. (05/31/2024). Jättarna ser guldläge i kommunernas fibernät. Online at: Kommunernas fibernät lockar EQT, Nordity Fiber och Telia

Dattani, A. Soni, A. Ng, C. (2024). European Telecoms. 2024 Outlook: This could finally be the break-out year – update, January 4, 2024, J.P. Morgan.

Daws, R. (April 18, 2024). EU antitrust chief warns against telecom mergers. Accessed at: EU antitrust chief warns against telecoms mergers (telecomstechnews.com)

Deloitte. (June 2023). Decision time for Europe's telcos: As overcapacity makes connectivity a commodity and customers don't care anymore, telcos need to take action. Available at Decision time for Europe's telcos | Deloitte Netherlands

Deutsch, J. (November 9, 2023). Big Tech Gets a big policy win in Europe. Accessed at EU Fair Share Setback Is a Win for Big Tech - Bloomberg

Dholakia, R. R., & Harlam, B. (1994). Telecommunications and economic development: Econometric analysis of the US experience. *Telecommunications Policy*, *18*(6), 470-477.

Etno. (July 18, 2022). Joint EU and National telecom sector statement on "fair contribution". Online at News (etno.eu)

Etno. (April 19, 2024). GSMA and Etno welcome Letta's report, call for Member States to support the EC White Paper on digital infrastructure needs. Online at News (etno.eu)

European Commission. (February 23, 2023a). Exploratory Consultation, The future of the electronic communications sector and its infrastructure. Online at The future of the electronic communications sector and its infrastructure | Shaping Europe's digital future (europa.eu)

European Commission. (February 23, 2023b). BEREC EU Survey response – EC Explanatory Consultation, The future of the electronic communications sector and its infrastructure. Online at The future of the electronic communications sector and its infrastructure | Shaping Europe's digital future (europa.eu)

European Commission. (2024). White Paper: How to master Europe's digital infrastructure needs? Brussels 21.22004 Com 81 final.

Fair Share. (2023). A Fair Share proposal to ensure Europe can achieve its 2030 'Digital Decade' targets. Online at Who we are | Fair Share (fairshareinitiative.eu)

Germán, G. & Philippon, T. (2018). How EU markets became more competitive than US markets: A study of institutional drift. No. w24700. New York: National Bureau of Economic Research.

GlobalConnect. (2023). Annual Report 2022. Accessed at Års och hållbarhetsrapport - GlobalConnect

GSMA. (March 2024). New Rules for a New Era: Connecting Europe to 2030. Available at GSMA | New Rules for a New Era: Connecting Europe to 2030 - GSMA Europe

Kinnevik. (February 26, 2024). Kinnevik säljer hela sitt innehav i Tele2 till ett bolag som kontrolleras gemensamt av iliad och NJJ. Online at Kinnevik säljer hela sitt innehav i Tele2 till ett bolag som kontrolleras gemensamt av iliad och NJJ | Kinnevik

KPN. (2023). Annual report 2022. Online at KPN Integrated Annual Report 2022

KPN. (2023). Capital Markets Day, November 7, 2023. Online at KPN - News & Events - Capital Markets Day

Letta, E. (April, 2024). Much more than a Market. Speed, security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. Available at Enrico Letta - Much more than a market

Mauboussin, J.M. & Callahan, D. (October 6, 2022). Return on invested capital: How to calculate ROIC and Handle common issues. Morgan Stanley

Mauboussin, J.M. & Callahan, D. (June 6, 2023). ROIC and the Investment Process: ROICs, How They Change, and Shareholder Returns. CONSILIENT OBSERVER, Morgan Stanley, Investment Management.

Nokia. (2024). 7750 service router: Leads the industry in IP edge and core. Online at 7750 Service Router | Nokia

Ofcom. (March 28, 2018). Mobile Call Termination Market Review 2018-2021, final statement, Annex 10 Cost of capital. Online at Final statement: Mobile Call Termination Market Review 2018-2021 (ofcom.org.uk)

Ofcom. (December 6, 2022). Ofcom's future approach to mobile markets and spectrum, Conclusions paper. Online at Conclusions paper: Ofcom's future approach to mobile markets and spectrum

Pan, W., Xie, T., Wang, Z., & Ma, L. (2022). Digital economy: An innovation driver for total factor productivity. *Journal of business research*, *139*, 303-311.

PTS (2023). Data från svensk telekommarknad. Online at Svensk telekommarknad | (pts.se), retrieved 04/30/2024.

PTS (2024). Uppföljning av regeringens bredbandsstrategi 2024, (PTS-ER-2024:19). Online at Uppföljning av regeringens bredbandsstrategi 2024 (pts.se)

Röller, L. H., & Waverman, L. (2001). Telecommunications infrastructure and economic development: A simultaneous approach. *American economic review*, *91*(4), 909-923.

Schwartz. (updated October 7, 2020). Orange Will Wind Down Djingo Smart Speaker in Favor of Smart Home and TV Services. Online at

https://voicebot.ai/2020/10/07/orange-will-wind-down-djingo-smart-speaker-in-favor-of-smart-home-and-tv-services/

Statistics Sweden. (2024). National Accounts. Online at Nationalräkenskaper, kvartals- och årsberäkningar (scb.se), retrieved 04/30/2024.

Telia Co AB. (01/26/2024). Bloomberg transcript, Earnings call Q4 2023.

Telecom trainer. (updated March 3, 2023). Online at BH (Busy Hour) (telecomtrainer.com)

Telenor ASA. (04/302024). Bloomberg transcript, Earnings call Q1 2024.

Tele2 AB. (04/18/2024). Bloomberg transcript, Earnings call Q1 2024.

Vodafone. (2024). Technology and Innovation. M-PESA. Online at M-PESA

Wood, R., Killeen, K. & Dayan, J. (January, 2023). State of digital communications 2023: Research conducted for ETNO by Analysys Mason. European Telecommunications Network Operators' Association.

Williamson, B. & Howard, S. (January, 2022). Thinking beyond WACC – the investment hurdle rate and the seesaw effect. Communication Chambers. Report commissioned by ETNO.

WIK-Consult Report. (December 7, 2023) Study on the evolution of the competition dynamics of tower and access infrastructure companies not directly providing retail services. Commissioned by BEREC, BoR (23)206.