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How liberalized is the optical fiber broadband market? Examining the role of public money in the fiber deployment in Sweden

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How liberalized is the optical fiber broadband market? - examining the role of public money in the fiber deployment in Sweden

Working paper

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Abstract

This paper builds on the notion that the market for electronic communication is doing the investments in broadband. Taking its starting point in the aim for the Digital Agenda the paper examine the role of public money in the deployment of broadband networks, so called Next Generation Networks (NGA). Using a unique data set of broadband investments, the paper reveals that one of most advanced broadband nations, Sweden, is benefitting from a substantial involvement of public money. In the Swedish case, City Urban Networks, owned by municipalities and spurred by public money, have been of significant importance. Through the City Urban Networks, a real alternative to the incumbent has been established and increased roll out and uptake of fiber has taken place. The public money has altogether shrugged the market and provided more choices to the consumers – while at the same time making the broadband target set in the agenda reachable.

Keywords: Next Generation Networks, fiber networks, City Urban Networks, super fast broadband, investments, Digital Agenda, broadband targets

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1 Introduction

1.1 Policymakers embracing broadband

The Digital Agenda for Europe, which the European Commission launched in 2010, target that all citizens in Europe should have access to broadband with at least 30 Mbps and at least half of the population should be able to subscribe to 100 Mbps by 2020.² Inspired by the Digital Agenda for Europe the Swedish government launched a Digital Agenda in October 2011 which focus on broadband roll-out, usage and services.³ It was based on broadband targets that the Swedish Government set in 2009 stating that competition among market players should be able to provide 100 Mbps to at least 90 percent of the population by 2020 at the latest.⁴

Sweden is not unique. Most European governments have set ambitious broadband targets and launched broadband strategies. The availability of high-speed broadband is a priority for policy markers as it is considered to drive innovation and economic growth. Consequently, substantial investments in Next Generation Access Networks (NGA), i.e. optical fiber, are required to realize the potential of the digital economy and reach the broadband targets.⁵

The availability of superfast broadband varies considerable throughout Europe. Around half of the population in Europe has access to over 30 Mbps, while the availability of fiber in the access network is limited in most countries in Europe, see figure 1. But there are exceptions like Lithuania, Slovak republic and Sweden, where almost half of the population has access to fiber.⁶ Altogether, substantial investments in fiber optics networks are still required all over Europe to meet the broadband targets. The EU Commission has therefore strived to promote the deployment of high-speed broadband through various initiatives – with the Digital Agenda as the flagship project.⁷

The Digital Agendas in Europe as well as elsewhere are commonly based on two assumptions (OECD, 2011):

1.) An extensive deployment of fiber networks is required to reach national broadband targets and thereby drive economic growth,⁸ and

² <http://ec.europa.eu/digital-agenda/>

³ <http://www.regeringen.se/sb/d/14375>, in English <http://www.government.se/sb/d/2156/a/163994>

⁴ The Swedish Government published the broadband targets in October 2009, see Broadband strategy for Sweden, November 6, 2009, Government Offices of Sweden, available at <http://www.regeringen.se/content/1/c6/13/49/79/c6390240.pdf>

⁵ The concept NGN refers to Next Generation Network and NGA stands for the Next Generation Access Network. It is a technology neutral concept as several technologies could qualify for being the future network, such as coax with DOCSIS 3.0 (Data Over Cable Service Interface Specification), copper through vectoring, mobile with LTE, and fiber optics. Fiber is, according to OECD, considered as future proof with no capacity constraints in the technology as such because the capacity is determined by the active equipment.

⁶ Sweden scores among the top countries when broadband access and usage is measured across countries by the World Economic Forum, The Economist Intelligence Unit and ITU. Source: WEF, Global Information Technology Report 2012, <http://www.weforum.org/reports/global-information-technology-report-2013/>, 2013-07-05; EIU, “Digital Economy Rankings”, http://www.eiu.com/site_info.asp?info_name=digitaleconomy_2010 2013-07-05; and ITU, “Measuring the information society”, <http://www.itu.int/ITU-D/ict/publications/idi/>, 2013-07-05

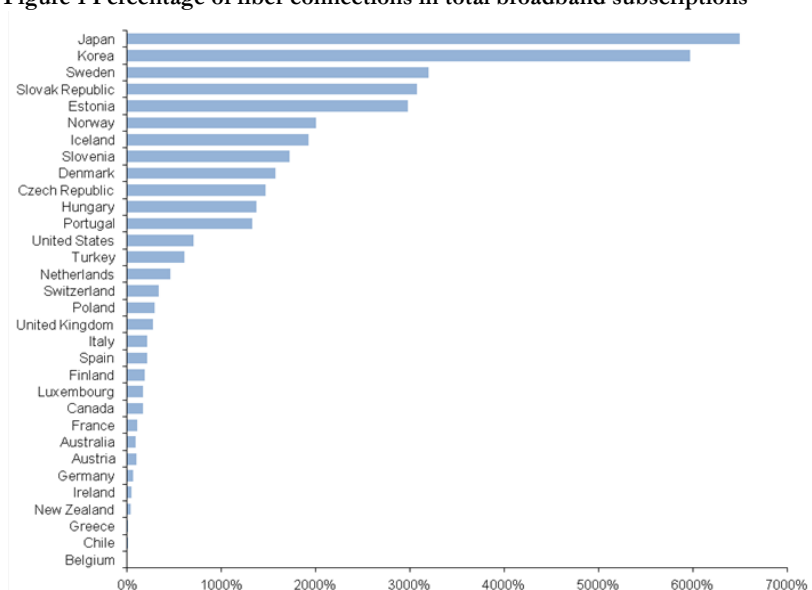
⁷ The EU Commission through the Commissioner Neelie Kroes has consistently strived to promote the deployment of fiber in Europe, through recommendations, policy documents and other initiatives.

⁸ Fibre is, according to OECD, the most future-proof technology and it is easy to enhance capacity by adding another wavelength of light. OECD emphasize that investments need to be planned in a way that the connections could be upgraded to fiber. Source: OECD, “The Role of communication infrastructure investment in economic recovery”, 2009. DSTI/ICCP/CISP(2009)1/FINAL

2.) the deployment of NGN should be market based, which implies a hands-off approach for public money.⁹

From a public perspective, the market based approach is preferred. By using capital provided by the equity and debt market, the possibility increases that networks are kept up-to-date and gradually expanded, while public money can be allocated to other areas. It is also a reflection of what Cave (2010) characterize as the general assumption that “the telecommunications sector had permanently escaped from reliance on public finances and its inevitable accompaniment – subjection to the dead hand of government control, which often had anti-competitive consequences. The sector was rich enough to fend for itself; privatization gave access to private capital; and governments saw it largely as a source of, rather than a sink for, public funds”.

Figure 1 Percentage of fiber connections in total broadband subscriptions



Source: OECD Communications Outlook 2013

The EU Commission’s current policy is based on the assumption that competition will drive investments and that markets will allocate the resources required for broadband infrastructure investments. But the viability of the market based model for allocating extensive investments in fiber infrastructure could be questioned. Because Cave (2010) underscores “that the enormity of expenditure on next generation networks (NGNs), and particular in next generation access networks (NGAs, the successor to the copper local loop), under pressure from the credit crunch, the earlier view has now virtually reversed itself. Some form of public funding is now seen as necessary and appropriate almost everywhere, not simply as an aberrant feature of Asian economy.”

Given that Sweden, with an explicit market based approach in policy, is in the forefront of the fiber deployment, it is relevant to examine what has made the broadband position possible. Contrary to what can be expected, a large share of the fiber networks in Sweden has been deployed by City Urban Networks¹⁰, predominately owned by municipalities. It is therefore relevant to examine the relation between policy, which is based on the market model, and the actual market development, where a large share of the existing fiber infrastructure has been deployed by public money. With public money we refer to the resources that it is provided by publicly owned companies or municipalities. But it is not the same

⁹ According to the OECD: “Governments need to carefully consider their decisions to ensure competition in the market which lowers prices, boosts speeds and encourages innovation”. Therefore “Governments must... take great care not to displace private investment”. OECD, “The Role of communication infrastructure investment in economic recovery”, 2009. DSTI/ICCP/CISP(2009)1/FINAL

¹⁰ City Urban Networks is stadsnät in Swedish.

thing as state aid as the regulatory framework in Europe defines investments provided by public bodies as market investments given that they fulfill the requirements of the market investor principle.¹¹ The aggregated investments provided by City Urban Networks are close to 30 percent of the annual total broadband investments, implying that it has a significant impact on the market. It could also be illustrated by the fact that the incumbent TeliaSonera approximately has 35 percent of the fiber lines while City Urban Networks control the remaining share. It raises an interesting policy question as broadband is growing in importance for the society as a whole and for everyday activities. There are even signs that broadband infrastructure is moving towards being socially critical. However, investments levels are considered too low to meet the broadband challenges. This also explains the anxiety among policy makers. On a European scale it is obvious that the market is not delivering what policy would like to see, creating a gap between the free market paradigm and real world policy expectations. It is also related to the issue of the fundamental idea of infrastructure competition and unbundling.

Issues of broadband investments are therefore of great relevance, also underscored by the EU Commissions Single Market Initiative where the Commission aim to impose a virtual unbundling of local loop over fiber or copper as a standardized product throughout Europe.¹²

1.2 Paper objective, research question and contribution

The liberalization of the market for electronic communication have resulted in a legal framework, in the form of the Electronic Communication Act, that stipulates that the market should drive investments and competition should safeguard that end-customers are able to choose between a broad variety of price worthy services. It is therefore interesting to note that the publicly owned networks have been instrumental in the deployment of fiber optics networks in Sweden. The aim with this paper is to examine the significance of public money¹³ in the deployment of NGN, with a special focus on the deployment of fiber networks in Sweden.

Next Generation Networks (NGN)¹⁴ refers to packet-based networks based on the Internet Protocol (IP) that provide communication services, QoS enabled transport technologies and where services are separated from underlying transport-related technologies.¹⁵ This makes NGN to general purpose networks able to provide transmission of any kind of service or traffic such as voice, data, video and multimedia.¹⁶

This paper addresses the following research question: *what is the role of City Urban Networks on the Swedish broadband market*, and more specifically: how has City Urban Networks affected the broadband coverage in Sweden, and what is the significance of public money in the deployment of fiber based NGA networks in Sweden.

The expected contribution of the paper is to

- Conduct an analysis of City Urban Networks and the impact on the Swedish broadband market.
- Give a view of City Urban Networks in the deployment of fiber
- Give input to the policy discussion on how to reach the broadband targets

¹¹ For example the EU Commission has cleared state aid for a rural development program with a total budget of EUR 136 million for 2010-2013, which roughly translates into to 5- 6 percent of the annual broadband investment. For more information see: <http://www.jordbruksverket.se/amnesomraden/landsbygdsutveckling/visionerochprogram/landsbygdsprogrammet20072013/vadarlandsbygdsprogrammet.4.7a446fa211f3c824a0e8000171998.html>

¹² It should be noted that the availability of fiber with a FTTH structure has created a situation with no demand for virtual unbundled local access products (VULA) at this point.

¹³ About public money

¹⁴ The deployment of NGN has been extensive in a number of European countries during the last couple of years- Besides fiber it includes cable-tv networks with DOCIS 3.0, vectoring over copper networks and mobile access through LTE.

¹⁵ Source ITU, http://www.itu.int/ITU-T/studygroups/com13/ngn2004/working_definition.html

¹⁶ Source ETSI, <http://www.etsi.org/technologies-clusters/technologies/next-generation-networks>

Given that this paper is limited to Sweden and an initial piece of research it gives a platform for further research. Consequently, a number of interesting and relevant issues for further research are listed in the concluding section.

This paper is based on ongoing research that the authors are conducting at the Swedish Post and Telecom Authority (PTS) as well as the Swedish Broadband Forum¹⁷. However, this is an independent research¹⁸ where the authors have based the analysis on open sources, for example published statistics and reports by PTS and the EU Commission. The figure on investments made by the City Urban Networks is based on investment data for 180 City Urban Networks in Sweden and has been collected from annual reports and interviews. The data on broadband investments from other operators has been retrieved from annual reports, of which a number of operators are listed. The concept of investments is defined as investments in physical assets which are reported from cash flow statement, or from balance sheet for network assets.¹⁹

1.3 Disposition

This paper is organized in the following way. First, an introduction is made to the framework of the liberal doctrine ruling the telecom market economy. Second, City Urban Networks are explained in the Swedish context, giving way to some hypothesis about the role of public money. The results are then finally summarized in a brief conclusion, pointing to further research in the field.

¹⁷ Set up in 2010, the Swedish Broadband Forum is part of the government's broadband strategy to promote deployment of broadband throughout Sweden. It is formed as an organization within the Ministry of Enterprise and Communication, headed by the IT-minister.

¹⁸ Disclaimer, the views expressed in this paper are those of the authors and do not necessarily reflect those of PTS and the Swedish Broadband Forum.

¹⁹ This implies that it is not possible to discriminate between investments in active and passive equipment.

2 Related work and framework for the broadband market

2.1 Liberalization of telecommunications

The big wave of liberalization of telecommunications that took place during the 1990s opened the market for competition, created opportunities for new entrants and attracted investments into the telecommunication sector. In a broad sense the terms “liberalization” and “deregulation” refer to the removal of restrictions such as political regulations and the introduction of greater freedom and thereby a change in the market structure moving towards a competitive market (Noam 1992). The underpinning of the liberalization is that investments is funded by the capital market, rather than public money, implying that government money and public-sponsored players should have a subordinated role, as it otherwise would risk to distort competition. Consequently, public money, if used at all, should be allocated to areas where no commercial opportunities exist, i.e. in rural and sparsely populated areas.

Despite a liberal theorem there is extensive government regulation. The regulatory framework for electronic communication in Sweden is set by the Electronic Communications Act (2003:389), which is based on EU regulation. The aim with the Act is to ensure that private individuals, companies and public authorities have access to secure and efficient electronic communications at the greatest possible benefit regarding the range of services and their price and quality. The objective of the Electronic Communications Act should be achieved through efficient competition and international harmonization of the sector.²⁰ Efficient electronic communication refers to competitive and flexible communications that are provided on a non-discriminatory basis, which promote efficient investments in infrastructure.²¹ If the market is dominated by a strong player that controls an essential facility the way to enhance competition is to facilitate for new entrants to get access to existing infrastructure by complying with obligations for the dominating operator decided by the regulatory authority. This could be described as a facility-based entry to the market enabling new entrants to gradually advance on the investment ladder (Cambini & Jiang, 2009).

Access to infrastructure is not without conflict. The tension between promoting competition and stimulating broadband investment has been noted in the literature and described by, among others, Laffont and Tirole (2000). Atkinson (2009) discusses the role of broadband policy and the state’s role in promoting competition, and concludes that, within a liberalized economy, there is no panacea for solving perceived or real limitations in a nation’s broadband infrastructure. The potential conflict has also been addressed by Camini and Jiang (2009). In a literature review they note several contradicting results in terms of impact from regulation. Bauer (2010) analyzes broadband investments and public policy and points to the fact that the relationship is further complicated by the trade-off between short-term and long-term policy objectives. Teppayayon and Bohlin (2010) discuss the specific role of governmental intervention in the telecom market and the absence of perfect competition, concluding that contextual factors must be considered in order to decide when and how governmental interventions can be justified. Contextual factors are also underscored by Nitsche and Wiethaus (2011) and they analyze how different types of access regulation for NGN affect investments and consumer welfare and point to several trade-offs when interfering. Another contribution is given by Lestage et al. (2013) showing that the competitive pressure impact differently depending on which actors are involved.

The different outcomes indicate that the discussion about competition and investments is still vibrant. It has even intensified as policy, for one reason or another, has departed from the liberal theorem choosing more pragmatic approaches. This paper will not be able to clarify the entire development, but simply feed in to the current discussion about the role of government versus private competition.

²⁰ The Electronic Communications Act (2003:389), section 1

²¹ Proposition 2003, the Electronic Communications Act (Regeringens proposition 2002/03:110, Lag om elektronisk kommunikation)

2.2 Competition as a cornerstone

While specific regulations have been widely debated, competition is still a universal ingredient in NGA deployment. Most visible is probably the fact that it has been incorporated into the legal system, such as the Electronic Communications Act in Sweden. This sector specific regulation is based on an *ex-ante* approach. Besides this regulation the Competition Act ensure that neither public organizations nor corporations (private or public) distort competition by abusing potentially dominating position on the market. This is an *ex-post* regulation.²²

During the last 15 years the European Commission has used directives and recommendations as tools for the transition from monopoly to competition. Starting with the package launched in 1998 several directives have been presented to advance regulation covering topics like access, general authorizations as well as recommendation on relevant product and services markets.²³ In accordance with the market development, policy has developed and gradually expanded.

In the revision of the framework in 2010 the overarching principle was to develop the market under competitive conditions, and it was accompanied by programs and initiatives focusing on the digital agenda, broadband strategies and spectrum policies (Freund and Ruhle, 2011). In 2013 a new initiative was launched by the Digital Agenda Commissioner Neelie Kroes.²⁴ Following the path of previous frameworks, the Commission's ambition is now to move forward towards a single telecom market by focusing among other things on:

- A single authorization for operating in all 28 member states (instead of 28 authorizations).
- A demanding legal threshold for regulating telecoms sub-markets (which should lead to a reduction in number of regulated markets).
- Further harmonizing the way operators can achieve access to networks owned by other companies in order to provide a competing service.

The new initiative shows that although the European Commission has worked for a consistent European approach to electronic communication there is still pluralism on the national level both in terms of access regulation as well as development of the market in different countries. This implies that the view expressed by Cave (2005) still is valid: "The question of the respective roles of competition law and regulation, and the related (but identical) question of the appropriated areas for ex-post and ex-ante interventions will remain a key policy question" (Cave & Crowther, 2005).

2.3 State aid and the market investor principle

Closely related to competition is the question of state aid. The EU Commission monitor issues around state aid very carefully as state aid risk to crowd out private investments and distort competition. Rules and conditions regarding state aid is based on the Treaty on the Functioning of the EU (TFEU), article 107(1), which establishes a general prohibition of state aid. But state aid could be compatible with the regulatory framework given that it concerns investments in broadband in areas where there are no commercial conditions for NGA network and no rollout of networks is foreseen in the near future.²⁵ It is determined by article 107(3) in TFEU, which outlines conditions that are required for the EU Commission to accept state aid requiring that it promotes economic development of underdeveloped

²² OFT, "Quick guide to competition law compliance", [http://www.offt.gov.uk/shared_offt/ca-and-cartels/competition-awareness-compliance/quick-guide.pdf] . See for example: European Commission, The treaty on the functioning of the European Union, [<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:115:0047:0199:EN:PDF>]

²³ A collection of directives and documents can be found at: <http://ec.europa.eu/archives/ISPO/infosoc/telecompolicy/en/Main-en.htm>

²⁴ More information is given at the portal for the Digital Agenda for Europe: <http://ec.europa.eu/digital-agenda/en/news/commission-proposes-major-step-forward-telecoms-single-market>

²⁵ Treaty on the Functioning of the EU (TFEU), available at <http://eur-lex.europa.eu/en/treaties/new-2-47.htm>

areas, supports the execution of an important project of common European interest or to remedy a serious disturbance in the economy of a member state.²⁶

On the other hand should public funding of broadband investments, according to the EU regulatory framework, not be regarded as state aid if one of the following two exemptions are valid: 1) the market economy investor principle (MEIP) is applicable, which require that the public authority invests under the same condition as a private investor, or 2) that it concerns services that is of general economic interest (SGEI), and that the public contribution is restricted to the compensation for service of general economic interest.²⁷

An example where the market economy investor principle has played a crucial role is the EU Commission's decision in 2007 concerning the City of Amsterdam's involvement in Reggefiber (which at that time was named GNA). The EU Commission stated that it could not be considered as a state aid as it was rather an example of the market economy investor principle as the municipality was involved in the project on the same terms as the other market investors. The network company was founded by ING Real Estate, Reggefiber, five housing companies, and the City of Amsterdam. The aim was to deploy an open FTTH network that was managed by a wholesale operator which on a non-discriminatory basis provided wholesale products to interested operators that could provide broadband access to end customers.²⁸ The EU Commission underscored that the clearance of the City of Amsterdam should not be interpreted as a general acceptance for public authorities to invest in projects and claim that they act as any market investor. Public authorities have to demonstrate that they fulfill the MEIP through a sound business plan.²⁹ Although clear in theory and legal statement, the clearance has created a window of opportunity for public intervention policy with a corresponding active role for public money.

²⁶ Source: http://www.cullen-international.com/report/7226/c108632#Tracker_30

²⁷ It should be clearly defined by the regional and local authorities, source the revised SGEI framework

²⁸ Commission of the European Communities, Commission decision of 11.XII.2007 on the state aid case C 53/2006, investment by the city of Amsterdam in a fiber-to-the home (FttH) network, Brussels 11.XII.2007, C (2007) 6072 Final

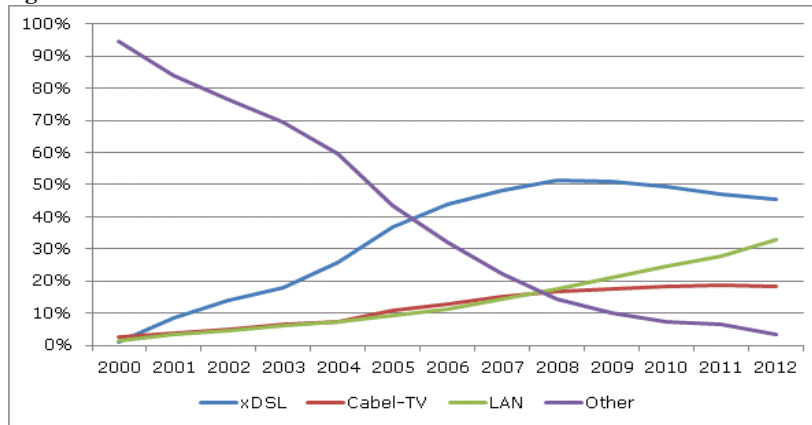
²⁹ EU Commission, press release 11 December 2007, State aid: Commission concludes City of Amsterdam investment in fiber network is not state aid, available at http://europa.eu/rapid/press-release_IP-07-1889_en.htm

3 High speed broadband in Sweden and the role of City Urban Networks

3.1 The broadband market in Sweden

The fixed broadband market in Sweden has maintained quite stable during the last couple of years. The major change is a gradual switch from xDSL to fiber – as a response to increased demand for speed and streaming services. With the current development it is, more or less, just a question of time before fiber subscriptions outnumber the previously dominating xDSL. (See figure 2)

Figure 2 Fixed broadband subscribers in Sweden



Source: Svensk telemarknad, PTS, 2013.

TeliaSonera dominates the Swedish broadband market with a substantial share of its broadband customers on xDSL. In recent years the company has changed business strategy and is now investing in fiber as a way to compete and keep customers in the long run.

Overall, the total investments in broadband infrastructure in Sweden are around EUR 1.0 billion per year, of which EUR 0.5m consists of fixed broadband. Almost half of the fixed broadband investments are made by the market leader TeliaSonera, and a third of the investments are made by City Urban Networks, which are local or regional fiber networks deploying fiber in the access network. (See table 1)

Table 1 Market share and investments 2012

Actor	Market share of the total broadband subscriptions	Investments in fixed broadband (EUR, billion)
TeliaSonera	38.5	251
Telenor	17.8	32
Tele2	7.5	29
Com Hem	17.7	34
City Urban Networks (CUNs)	18.5	128

Source: Company reports & PTS, 2013

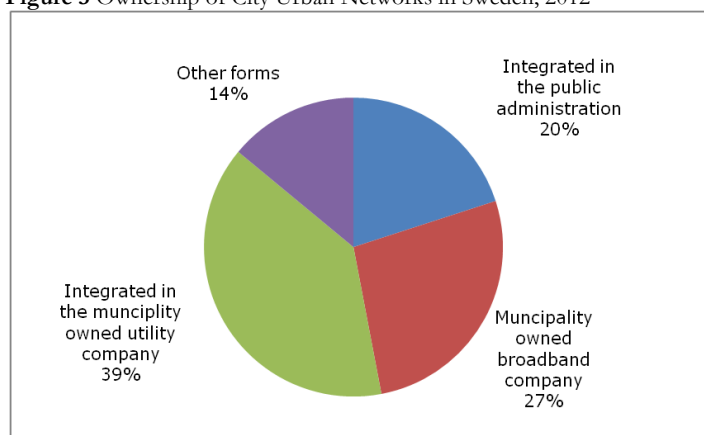
3.2 City Urban Networks

The majority of the City Urban Networks in Sweden were established in the late 1990s as it was a way to circumvent the incumbent TeliaSonera. This was driven by the fact that local and regional policymakers and businesses regarded that TeliaSonera overcharged for providing dark fiber and fiber access and thereby hindering the deployment of NGA.³⁰ It was also an effect by that alternative operators were reluctant to invest. Further motives to establish City Urban Networks was that many local policy makers regarded broadband as another infrastructure that required similar planning, robustness and coordination as "traditional" infrastructures, like roads, sewers and electricity, which falls under the core competence of municipalities in Sweden. It should also be noted that the emergence of City Urban Networks took its starting point at the time when the telecom monopoly regime was still in the mindset of many urban planners, making them reluctant to regard electronic infrastructure as an issue that should be handled by the market.

3.2.1 Locally owned broadband

There are currently around 180 City Urban Networks in Sweden, with a wide spread in both size and form, but commonly organized as part of local public administrations, local electricity/utility companies or standalone companies fully owned by municipalities. There are exceptions. A number of the City Urban Networks are owned by private companies, where for example TeliaSonera and private equity has acquired some smaller networks. As a number of the City Urban Networks are collaboration between several municipalities around 200 of Sweden's 290 municipalities have City Urban Networks.³¹ (See figure 3)

Figure 3 Ownership of City Urban Networks in Sweden, 2012



Source: Authors' calculation based on input from SSNf, 2013

The 15 largest City Urban Networks account for about 80 percent of the total investments made by City Urban Networks. (See figure 4) The city urban network in Stockholm, Stokab, is the biggest network reaching nine out of ten households in Stockholm, and invests around EUR 35 m per year, representing 6-7 percent of the total annual broadband investments in Sweden.³² Given that TeliaSonera have around 35

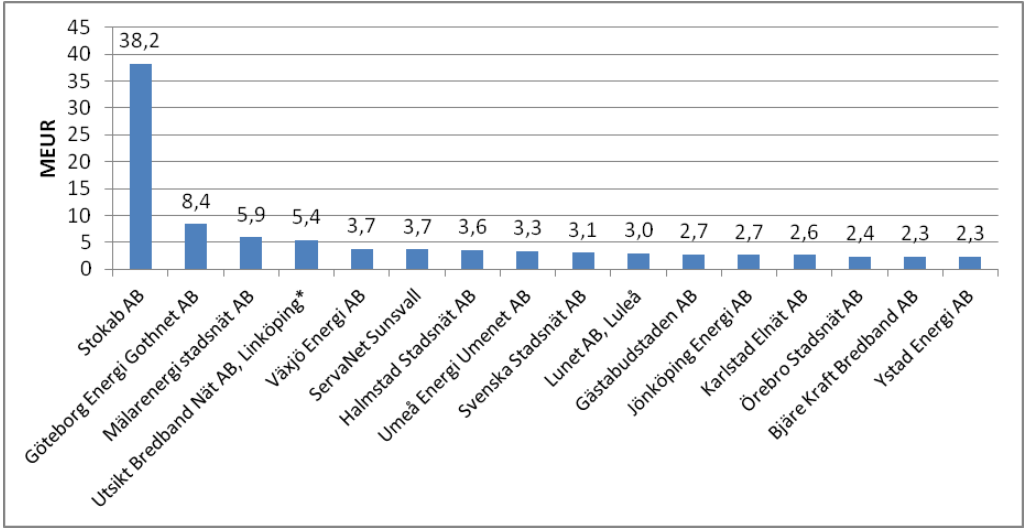
³⁰ Source: Industry representative

³¹ SvD, "De vill ta upp kampen om den svenska bredbandsmarknaden", [http://www.svd.se/naringsliv/eqt-rullar-igang-miljardsatsning-pa-fibernat_8165914.svd] . 24i, "Telia Sonera köper stadsnätet", [<http://24i.se/telia-sonera-koper-stadsmatet/>], IDG, "Telia köper Svenska stadsnät" [http://www.idg.se/2.1085/1.435376/telia-koper-svenska-stadsnat?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+idg%2Fvzss+%28IDG.se%3A+Hetaste+IT-nyheterna+fr%C3%A5n+IDG.se%29], [<http://www.teliaSonera.com/en/newsroom/press-releases/2012/3/teliaSonera-acquires-svenska-stadsnat-ab/>]

³² Stokab, Annual report 2012

percent of the fiber connections (not subscriptions) and City Urban Networks stands for the remaining share, City Urban Networks have an extensive footprint and an important position on the market.³³

Figure 4 Investment made by the largest City Urban Networks 2012



Source: Company reports

Three factors characterize the City Urban NetworksCity Urban Networks, explaining why they have become significant players: 1) public ownership, 2) limited geographical presence, and 3) focus on fiber

Public ownership: City urban networks are predominately publicly owned by regions, municipalities, or local utility companies The Swedish Local Government Act provides the Swedish municipalities with a mandate to make independent decisions. This means that local politicians are semi-independent and used to run their own businesses, including utility companies, in order to provide water, gas and electricity to the inhabitants. The utilities can be organized in many ways, most commonly as stand-alone companies, divisions within companies or integrated parts of overall local public administrations. Nevertheless, the public influence is substantial in all of these cases. What City Urban Networks try to do is really to combine societal goals of public good, with business requirements of delivering a reasonable return on investments.

Limited geographical footprint: City Urban Networks deploy and operate local or regional networks dictated by boundaries of municipalities, which limits the geographical scope for City Urban Networks. The reason for this is that the Swedish Local Government Act prohibits local public entities to expand beyond their administrative or municipality borders. Although, electronic infrastructure is not part of a mandatory task for municipalities they are able to deal with issues that are perceived to be in the interest of the general public. This can be used as a justification for policy makers to get involved in a wide area of activities including broadband, as long as they pursue the activities within their own municipality. The geographical limitation for City Urban Networks has created a multitude of small networks. The advantage is that it gives the City Urban Networks a local commitment making it easier to build new infrastructure or creating aggregation of demand. But on the negative side is that the small scale is subscale. It creates overhead as every network must have their own organization with technicians, customer support and sales, and it is difficult to have sufficient with competence to handle complex technical issues. The primary focus for City Urban Networks is on passive infrastructure, in particular dark fiber. However, a large number of City Urban Networks also provide active services, including that it is pursuing the role as Communication operator or even ISP.

³³ Authors estimate

Focus on fiber: A rationale for policymakers to establish City Urban Networks have been to connect public facilities, enabling super fast broadband to public administrations, as well as to residential areas. Backhaul for mobile base stations has also been an import driver for network expansion. Policy makers have considered that ownership of fiber is a way to maintain networks open, avoiding walled gardens associated with cable television or being locked into one network owner. The open net approach implies that other market players, such as new or existing operators can be offered dark fiber as well as opportunities to provide internet access. Although restricted from expanding outside their home municipalities City Urban Networks have gradually strived to deploy their networks to all parts of their municipalities. As the fiber networks have been rolled out to cover public facilities, deployment to households and businesses have simultaneously taken place. This includes ducts suited for multiple fibers and strategic nodes reaching densely populated areas.

3.2.2 Competitive advantage

City Urban Networks have invested while new entrants i.e. the private LLUB operators have fell short. Given that City Urban Networks are publicly owned and controlled, they have in several ways an advantage in the competition with the incumbent. Among the factors that favor the investment position and their capability to compete are access to privileged information, access to passive infrastructure and access to capital.

Access to privileged information: Firstly, personal connections between policymakers and managers operating City Urban Networks facilitate exchange of information about operations, market development, and upcoming public infrastructure projects. This creates possibilities for co-ducting, synchronizing of plans for expansion and localization of strategic nodes. It can also contribute to that planned work rescheduled to better suit the needs of the City Urban Network.³⁴ Moreover, personal connections help to establish informal problem solving and avoid misunderstandings.³⁵ It also creates a framework for long-term thinking which is an advantage for City Urban Networks as broadband is included in the policy agenda.

Access to passive infrastructure: Secondly, the cost of establishing a broadband network depends on several factors, like access to ducts and other passive infrastructure. Approximately two thirds of the cost to deploy optical fiber networks in the access networks is made up by the cost for civil works.³⁶ As municipalities often are land owners they have the means to grant City Urban Networks access to deploy ducts on favorable conditions as well as permission to use existing infrastructure (sewers, ducts and poles) (PTS, 2009³⁷). One example is Stockholm, where the City Urban Network has a monopoly on civil works and utilization of ducts, which are two factors that speed up broadband deployment.

Access to capital: Thirdly, there is a substantial risk to invest in broadband networks as the investments require extensive capital, investments are irreversible and the demand uncertain. Given that City Urban Networks are parts of municipalities or utilities they are able to obtain capital at favourable conditions compared to smaller commercial network operators. This means that there rarely is a problem to raise capital for broadband investments, and with guarantees from municipalities access to funding is facilitated. (PTS, 2000³⁸)

³⁴ PTS, "Effektivare samordning av planerade grävarbeten", 2010, available at [<http://www.pts.se/upload/Rapporter/Internet/2010/2010-11-samordning-gravarbeten-100525.pdf>] 2013-08-05

³⁵ The drawback of this informal chatting is that it creates real challenges for transparency and accountability.

³⁶ PTS, "Effektivare samordning av planerade grävarbeten", 2011. [<http://www.pts.se/upload/Rapporter/Internet/2010/2010-11-samordning-gravarbeten-100525.pdf>] 2013-08-05

³⁷ PTS, "Öppna nät och tjänster", 2009 [<http://www.pts.se/sv/Dokument/Rapporter/Internet/2009/Oppna-nat-och-tjanster---PTS-ER-2009/>]

³⁸ PTS, "Kommunernas verksamhet inom området nät- och nättjänster för IT-kommunikation", 2000 [<http://www.pts.se/upload/Documents/SE/Kommunernas%20verksamhet%20inom%20området%20nät-%20och%20nättjänster%20for%20ITkommunikation.pdf>]

3.3 The role of the City Urban Networks

The data points to the fact that City Urban Networks have positioned themselves as a distinctive group of players in the Swedish telecom market. Their size and market share might differ based on local and regional conditions, but there are still some general indications about their role

First, it seems like the City Urban Networks have really created a strong competitive pressure, forcing the incumbents to react and increase their current investments. In general, City Urban Networks have created a situation at the local level where the incumbents are forced to offer generous customer discounts in order to win contracts for expansion of networks in residential areas made up of single family houses. Second, there are indications that City Urban Networks have become the preferred choice of newcomers, using the City Urban Networks as a platform to reach potential customers. This means that City Urban Networks are improving customers' choice and contributing to pluralism among ISPs as well as other service providers. Third, City Urban Networks have been relatively keen on trying new business models, experimenting with partnerships and new ways of rolling out fiber cheaper and more efficiently. One example is extensive collaboration with village networks in rural areas, i.e. villages where the inhabitants are investing time and money to build their own networks, combining societal goals with business requirements. Fourth, City Urban Networks' have been important ambassadors for fiber based solutions. Their discussions with policy makers as well as communication with end customers have increased awareness and helped moving (local) broadband policy forward. Furthermore, it has helped to educate all user groups about the limits with the old technical solutions (copper) and the possibilities for society and end users with a fiber based architecture.³⁹

3.3.1 Impact on broadband coverage in Sweden with City Urban Networks

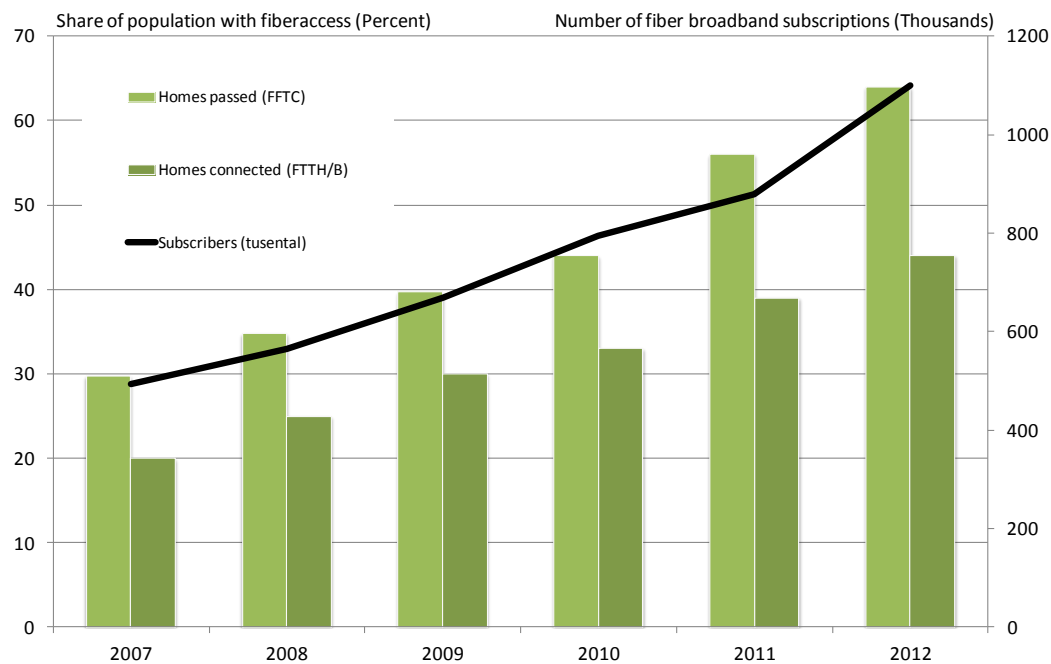
The investments made by City Urban Networks have been widespread, covering new access networks in both single dwelling units (SDUs) and multi dwelling units (MDUs). Also, resources from City Urban Networks have been used to strengthen backhaul networks, in particular for mobile broadband sites. Even though specific data on different kinds of investments are not available, it is reasonable to assume that City Urban Networks have made a substantial contribution to homes connected, homes passed and subscriber uptake. (See figure 5)

Homes connected: The number of connected households has shown a strong progress. During the period 2007-2012, the share of the Swedish population that are able to subscribe to fiber based access increased with 25 percentage points. This implies that almost 45 percent of the Swedish households had fiber to the home in 2012, corresponding to 4.2 million persons. The majority of the homes connected are located in cities and urban areas.⁴⁰

³⁹ Bredbandsforum, "Fiber till villa", 2013, Bredbandsforum, "Säskapas bredband i världsklass för hela landet", 2012, Bredband i hela landet", 2013. All reports available at: www.bredbandivarldsklass.se

⁴⁰ The gap between rural and urban areas is hard not to notice. While some 50 percent of the population in urban areas has fiber to the home, the share is less than 10 percent in rural areas. In other words, investments are primarily made in densely populated areas.

Figure 5 Homes connected, homes passed and subscribers to fiber based broadband in Sweden 2007-2012



Source: Authors calculations based on PTS "Bredbandskartläggning" 2010-2012

Homes passed: The distance between end customers and fiber nodes has been reduced. Almost 65 percent of the Swedish population, corresponding to some 6.1 million persons, has fiber at the curb, i.e. they are living within 350 meters from a commercial fiber node. This means that the potential market for fiber based broadband has grown with an additional 25 percentage (during 2007-2012) as it could move from homes passed to homes connected with only 350 meter construction work.

Subscriber uptake: The number of actual fiber based broadband subscribers has increased. A surge in demand has doubled the subscription base during the period 2007-2012 and the number of subscribers passed 1 million in 2012. This means that currently every third subscription to fixed broadband is fiber based. With increased demand there are more incentives to maintain the investment levels.

3.3.2 The significance of public money

While it is difficult to pinpoint every aspect of how public money is actually influencing the broadband market, the examination of City Urban Networks generates two hypotheses.

Hypothesis I: Public money has shrugged the market. Without the activities of the City Urban Networks, the Swedish broadband market would have been a darker place with a slower pace of deployment. The public money has in this sense been a catalyst to the market forces and made contributions that should not have occurred otherwise. City Urban Networks have been movers and shakers and their contributions, spurred by public money have added value and created a leverage effect.

Hypothesis II: Public money has increased consumer choices. The City Urban Networks have, in contrast to several other actors, such as the incumbent, embraced the open network approach. This policy, despite some flaws and examples on inconsistent behavior⁴¹, has paved the way for increased freedom of choice among consumers complementing other market players. The open network approach has created increased robustness, more services and higher speeds to affordable prices and public money have in other words benefitted the consumers.

⁴¹ P4, "Mälarenergi inför rätta", <http://sverigesradio.se/sida/artikel.aspx?programid=112&artikel=4567860>, 2013-09-13

4 Conclusions

This paper has examined the influence of public money on the Swedish broadband market. Based on the analysis the following factors and findings have been identified.

The established market model underscores that market players are the driving force in broadband deployment, a view also held by policy makers. Sweden is a leading country in terms of broadband deployment, confirming the viability of the market-based theory.

This paper has shown that City Urban Networks have been of significance for the fiber deployment in Sweden. A substantial share of the broadband investments in Sweden consists of public money, provided by 180 publicly owned and controlled City Urban Networks (City Urban Networks). The City Urban Networks' access to privileged information, passive infrastructure and funding opportunities contribute to leveling the playing field and put competitive pressure on the incumbent.

The City Urban Networks have built extensive fiber optic networks and primarily taken an open network approach, i.e. opened their networks for wholesale buyers, like alternative operators which have been reluctant to invest in fiber deployment. This has established infrastructure competition and an alternative to the incumbent. The analysis has shown that City Urban Networks play more than a complementary and subordinate role in the Swedish market. The City Urban Network's fiber networks have challenged the incumbent's existing copper based business model by providing fiber access.

City Urban Networks serve as a catalyst for the transformation to NGA, through a long-term commitment to the local market. Furthermore, the open network approach provided by City Urban Networks means more choices enabling consumers to choose among a greater number of service providers, reducing the dependency on the incumbent.

However, the interweaving with policy makers in municipalities and the contribution of public money in the deployment of broadband infrastructure are neither what the theory prescribe nor what policy address even though it provides consumers and businesses in the majority of Swedish municipalities with an alternative to the incumbent. A gap has emerged between market and policy. On a European scale the market has failed to deliver in accordance with the ambitions set up by policy.

As City Urban Networks take "the public good" into consideration, profit is not their only priority in terms of success – giving degrees of freedom for strategic activities with a longer pay off. City Urban Networks expand their networks in order to serve new areas with potential customers (such as those located in sparsely populated areas) or power mobile broadband base stations with backhaul. City Urban Networks offer a pragmatic strategic cooperative partnership with entrants (private newcomers), bridging the lack of resources among actors.

The public money made it possible to establish broadband access in areas with lower population density which forced incumbents to reconsider its strategy. The favorable conditions for City Urban Networks made it possible to go ahead with the deployment. City Urban Networks have contributed to a faster roll-out of fiber networks that has benefitted consumers. Thanks to City Urban Networks the goals set in the Digital Agenda and the national broadband strategy are today more tangible, even if downside is a widening gap between policy and market.

The case of Sweden shows that the deployment of public money has been important in several ways. It has contributed to more access opportunities for market players as well as consumers. It has facilitated investments and the open network model. As broadband is crucial to a modern society, it seems like a risky business to imagine that policy makers, with the public good as their northern star, should leave all planning and investments to the market, especially when commercial incentives are weak or even nonexistent in several places. Public money has a much wider role to play than the theory of pure liberal model implies. As the fiber roll-out shows, public money can help to stimulate roll-out, it can create

favorable long-term conditions for investments, ensure an open access model and make sure that the incumbent meet real competition in a situation where the newcomers resources are limited.

5 Further research

Competition has spurred the development of the sector, and given the overall responsibility for investment to the market players. Still, the involvement of public money is crucial, and there are several questions still unanswered. One is the unclear governance structure that has emerged among City Urban Networks and municipalities, blurring the roles and responsibilities.

Another issue is the case of state aid and the market investor principle that governs the involvement of public money in a market. The model with City Urban Networks might be stretching the guidelines, something that is reinforced by a lack of transparency, and it is therefore motivated to further analyze if there is a widening gap between policy and the market.

In order to increase investments and reach ambitious broadband targets public money is required. The Commission has estimated that the funds needed to achieve the broadband goals with the European Digital Agenda for 2020 is in the magnitude of EUR 181 billion and EUR 268 billion in order to achieve the 100 Mbps target for 50 percent of European households. This raises questions on the tradeoff between infrastructure competition, requirements of unbundling and investor incentives that should be addressed in further research. On the other hand the broadband infrastructure is becoming an essential facility for everyday activities, meaning that consumers are sensitive towards the pricing of the broadband services. This raises a range of important questions that has to be addressed, like for example the governmental intervention (why, what, when and how), if open networks that are financed with long term money could be a potential solution, as well as issues around private public partnership.

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